



Changes in residential land-use of Tripoli city, Libya: 1969-2005

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Abstract

This article focuses on the pattern of residential land use changes in the city of Tripoli which had been much affected by rapid urbanization in recent decades, especially within the period 1969 – 2005. The city comprises seven *mahalas* or zones, namely, Andalus, Sogaljumaa, Bosleam, Central Tripoli, Ainzara, Tajura and Janzur. This analysis involved all the seven *mahalas* and was facilitated by the utilisation of GIS land use maps and digital satellite imageries. In 1980s, the Libyan government introduced a comprehensive plan for the Tripoli city comprising a housing scheme to be implemented until 2000. During the first phase of the plan implementation (1970-1980) high urbanization rates and in-migration to the city centre and its vicinity had led to the expansion of residential land uses at the expense of other land uses. Thus, residential land use pattern in the *mahalas* near central Tripoli had undergone dramatic transformations during this period. In contrast, the second phase (1981-1992) had witnessed a slower pace of growth in residential development due to the lack of financial support. Even more recently (2000-2005), constraints in the supply of building materials and relatively high costs of labour had been the most significant factors in slowing down the pace of residential development in the city.

Keywords: city center, digital satellite imageries, GIS, in-migration, residential land use, urbanization

Introduction

Most urban land is devoted to residential use. However, within an urban place there is a great deal of heterogeneity and differentiation among areas and neighborhoods. In Libya, urbanization has begun as early as the 1920s but only accelerated in the 1950s and 1960s especially within the suburbs. As the interstate highway system and interurban expressways were completed, the frictions of distance which tied many activities to the urban core were reduced. Widespread automobile ownership enabled many households to move greater distances from their job places. At the same time, manufacturing and warehousing that require large parcels of land with convenient access to transportation routes also moved outward. These centrifugal forces continue to influence the form and structure of urban landuse.

The world's urban population is growing rapidly and the Great Jamahiriya is no exception. The majority of the Libyan population are already living in cities; still, with a fast natural population growth, the urban population is expected to increase by 50% over the coming 25 years (Habitat, 2007). In addition, the country is facing macro-economic changes and rapid economic growth. These had created both opportunities and challenges in the course of the Libyan cities development towards world class status. Tripoli is one of the oldest and most important cities in north Africa and the changing pattern of its urban and residential land uses is becoming highly visible manifesting the fact that the city is under various coping pressures. This study focuses on

the change in the distribution pattern of residential land use within Tripoli's seven zones or *mahalas* from 1969-2005.

Housing and residential issues in Libya

During the twentieth century, the population sizes of Libyan cities increased reaching the rate of more than 90 % (Saad, 1995). This accelerated urbanisation trend started after the discovery of oil in Libya in the 1960s which subsequently led to the inception of several, mainly urban-based, economic and social development programmes in the country. This process has pulled in more people, mostly from the rural parts of Libya to migrate into the cities particularly Tripoli, the capital city of Libya. This is not surprising as Tripoli was getting better services than other cities in the country. The rural influx has created major issues in Tripoli, such as housing problems. In 1970 and 1981, the government introduced a comprehensive plan for the city. The latter plan covered a housing scheme for the period until 2000.

Urban land use study is basic to, and the starting point for all city planning. However, to be entirely useful in planning analysis, the study should be able to consider growth potentials in terms of the city's population size, its composition and characteristics, and its spatial distribution. Population size gives an indication of the overall dimensions of the physical environment and serves as a basic yardstick for the estimation of the spaces needed for various categories of land use. When the time elements are introduced future trends in population size may be estimated and become the basis for estimating the city's future spatial needs (Chapin, 1972).

The salient features of urban growth in developing countries are that the urban population concentrated especially in the capitals and major regional centers; that urban population growth rates often outstrip those of public facilities and services; and that the resulting imbalances between the two generate many of the problems associated with urban population explosion .

Study area and method

Geographically, the city of Tripoli is located at 32°62'54"N and 13°22'75"E (Figures 1). Tripoli is the first city of the country which has high concentrated population and functionality when measured in terms of the level and scope of the services provided for urban communities (Saad, 1995). It is the focal point for the rest of the country as it is where the majority of service activities and institutions of national importance are located. Such standing increases the pressure on the city. Tripoli is a city with attractive features for immigrants looking for better paying jobs, better life, and improved standard of living. After the discovery of oil in the country in 1958, the petroleum extraction industry began operating in the sixties and had since generated employment opportunities which attracted by the droves Libya's farming population whose farms were increasingly suffering from lack of groundwater to migrate to the city in search of a better life (Saad, 1995, Mosbahi, 2004). The exodus into the city was also facilitated by the ease of transportation in and into the city . In addition, heavy rains make it easy for the ground water inventory to be renewed and sustained in the in the form of natural springs to cater to the need of the burgeoning city population.

This study relies on secondary data obtained from scientific documents, journals and reports. The analysis was based on land use maps (scale 1: 10000 and 1: 50000) and SPOT satellite images 2005 both of which had been identified as an appropriate means of acquiring information on residential land use change for the study area (Jensen, 2005). The image selection is based on the resolution quality of the scene.

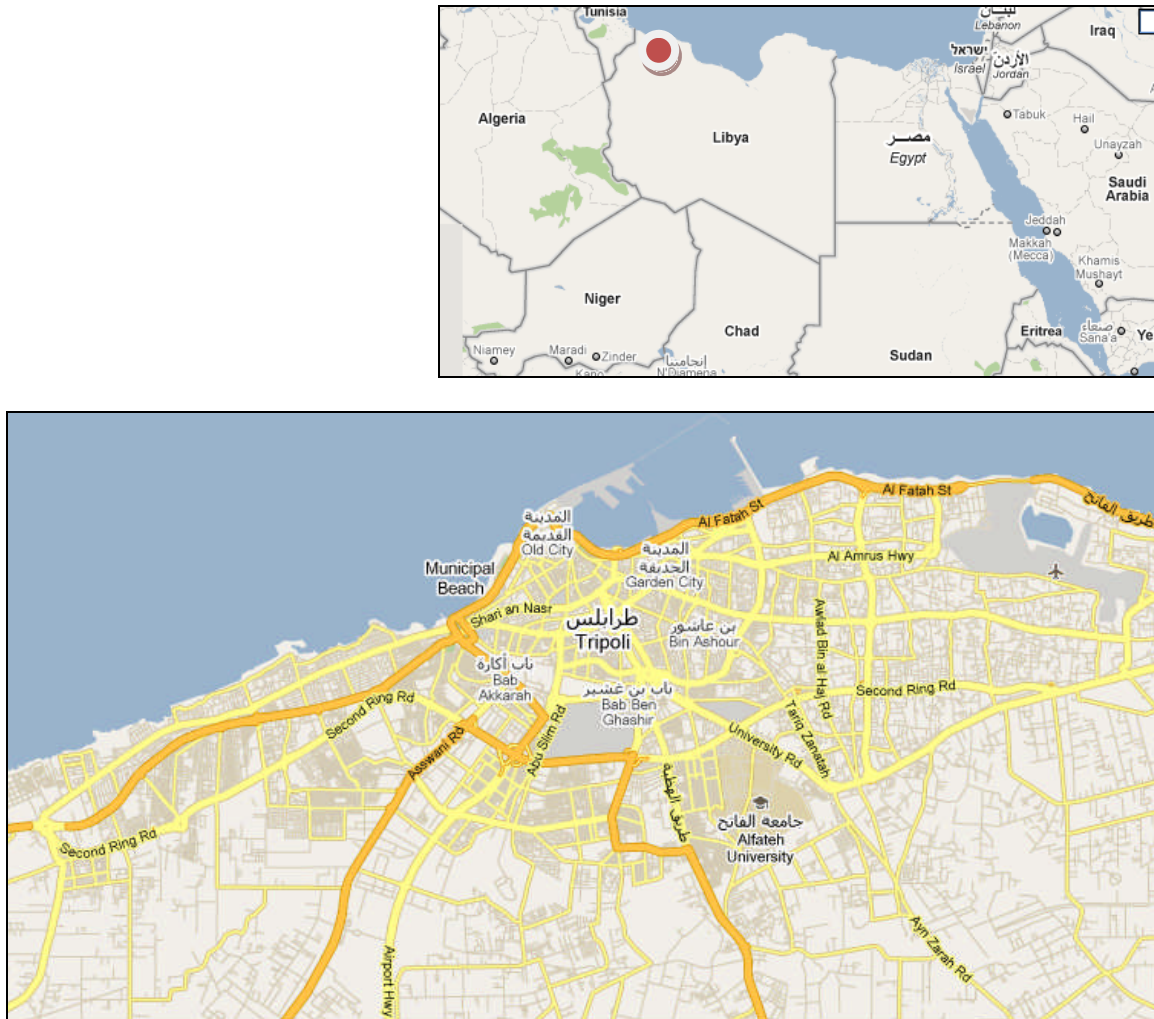


Figure 1. Location of Tripoli

The GIS provides a common framework for locating information from a variety of sources. As such it serves as a powerful tool for understanding and managing the results of residential land use change. The modeling and visualization capability of GIS provides a means of testing alternatives and turning data into information, and subsequently into knowledge. For this research applications, the following procedures have been conducted in order to obtain the results:

Capturing Data: This relates to obtaining data inputs such as geographic coordinates, attributes tables, maps, landsat satellite images and spot images.

Storing Data: Two basic data models for storing data to which the GIS analysis may be applied to, namely, the vector and raster .

Querying Data: This pertains to finding urban and housing change based on location or attribute value.

Analyzing Data: This is answering questions regarding the interaction of spatial relationships between multiple datasets (for examples, population with area, housing with area) that can be expressed in statistical relationships.

Displaying Data: This visualizes urban and housing land use through the application of a variety of colours to distinguish the city's urban land uses.

Output: This is displaying the results of the analysis in a variety of formats, such as maps, reports and graphics.

Residential land-use change

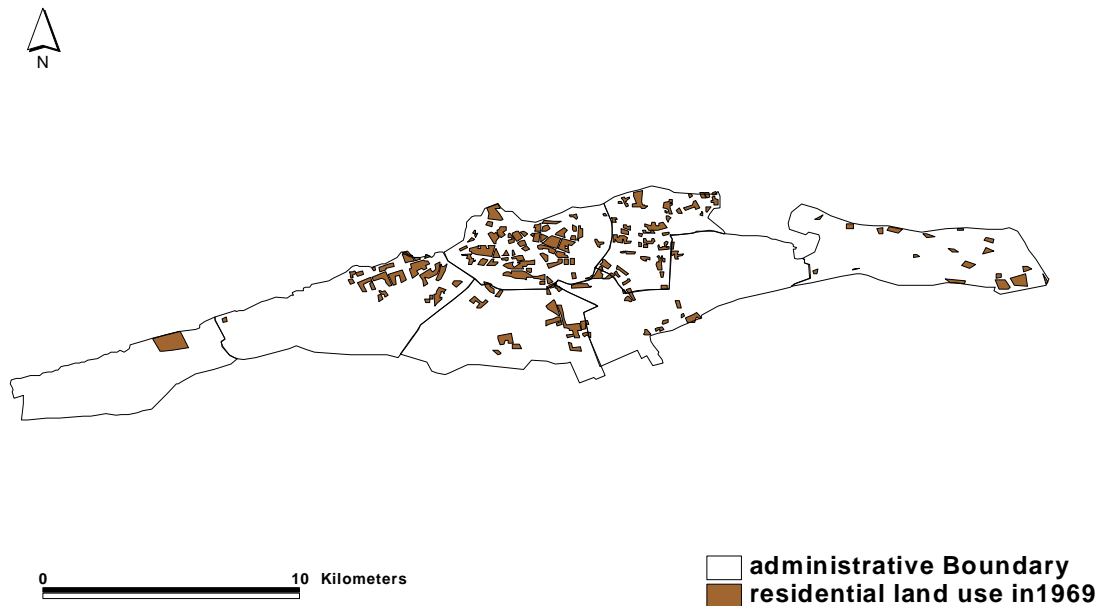
This section will emphasize on valuable residential land uses in the city of Tripoli as monitoring the change in this land use will indicate its future trends. This process of detecting changing residential land use trends was done with the help of land use maps for Tripoli city covering the period 1969-1980, as well as with the identification of residential land uses in 2005, using spot satellite imaging.

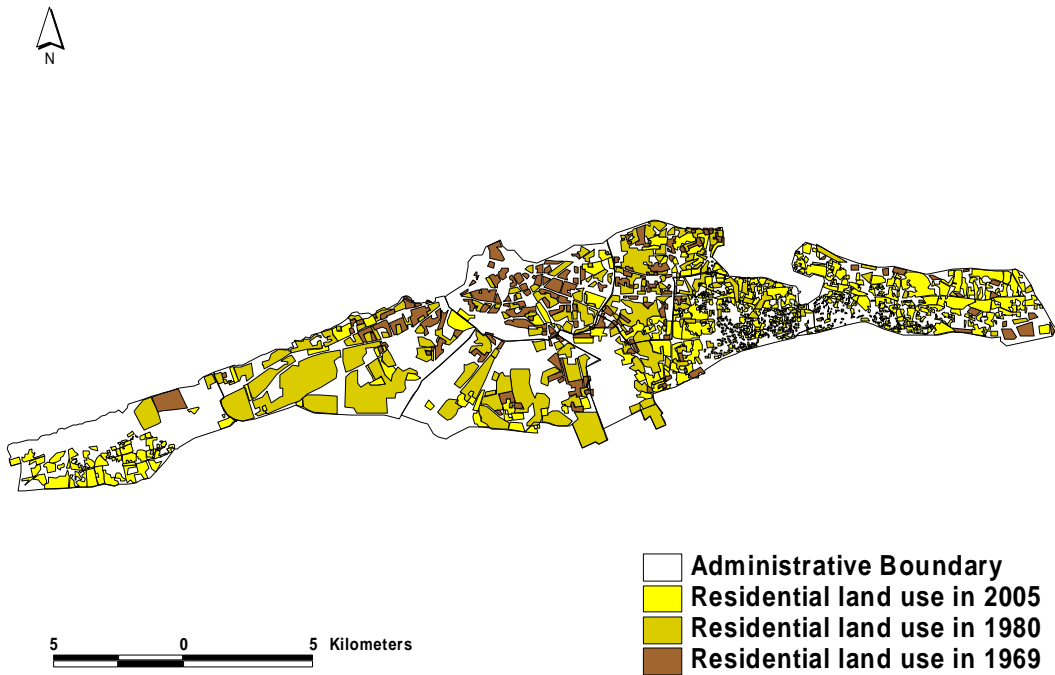
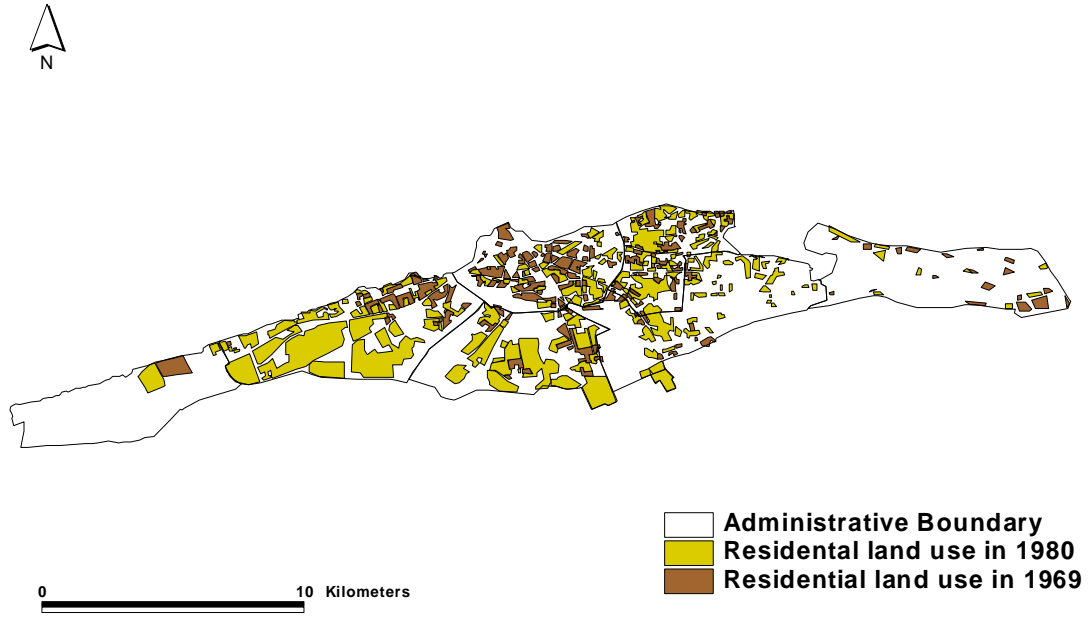
It may be noted (Table 1) that the extent of the residential land use in the city has expanded over the period observed, that is, from was approximately 1,126.8 hectares which is equivalent to 7.6 % of the total city area in 1969, to approximately 4,573.3 hectares or 30.8 % in 1980, and to 6,783.3 hectares or 45.7 % of the total city area in 2005 (Figures 1, 2 and 3).

Table 1. Residential land-use change in Tripoli 1969-2005

<i>Mahala / Year</i>	1969	(%)	1980	(%)	2005	2005	Total	(%)
Central Tripoli	405.6	22.6	680.7	38.0	796.6	44.5	1789.2	100
Sogaljumaa	207.3	15.3	678.9	50.2	901.8	66.7	1351.8	100
Tajura	166.7	7.2	181.3	7.9	156.8	50.5	2289.0	100
Ainzara	78.5	3.0	494.7	19.5	1226.5	48.3	2538.2	100
Bosleam	143.7	11.8	964.6	79.6	1099.8	90.8	1211.0	100
Andalus	205.7	7.4	1497.5	54.5	1674.4	60.9	2746.2	100
Janzur	78.1	4.0	170.1	8.8	645.1	33.6	1918.0	100
Total	1126.8	7.6	4573.3	30.8	6783.3	45.7	14845.2	100

Source: Land use map (1969-1980), satellite image spot 2005

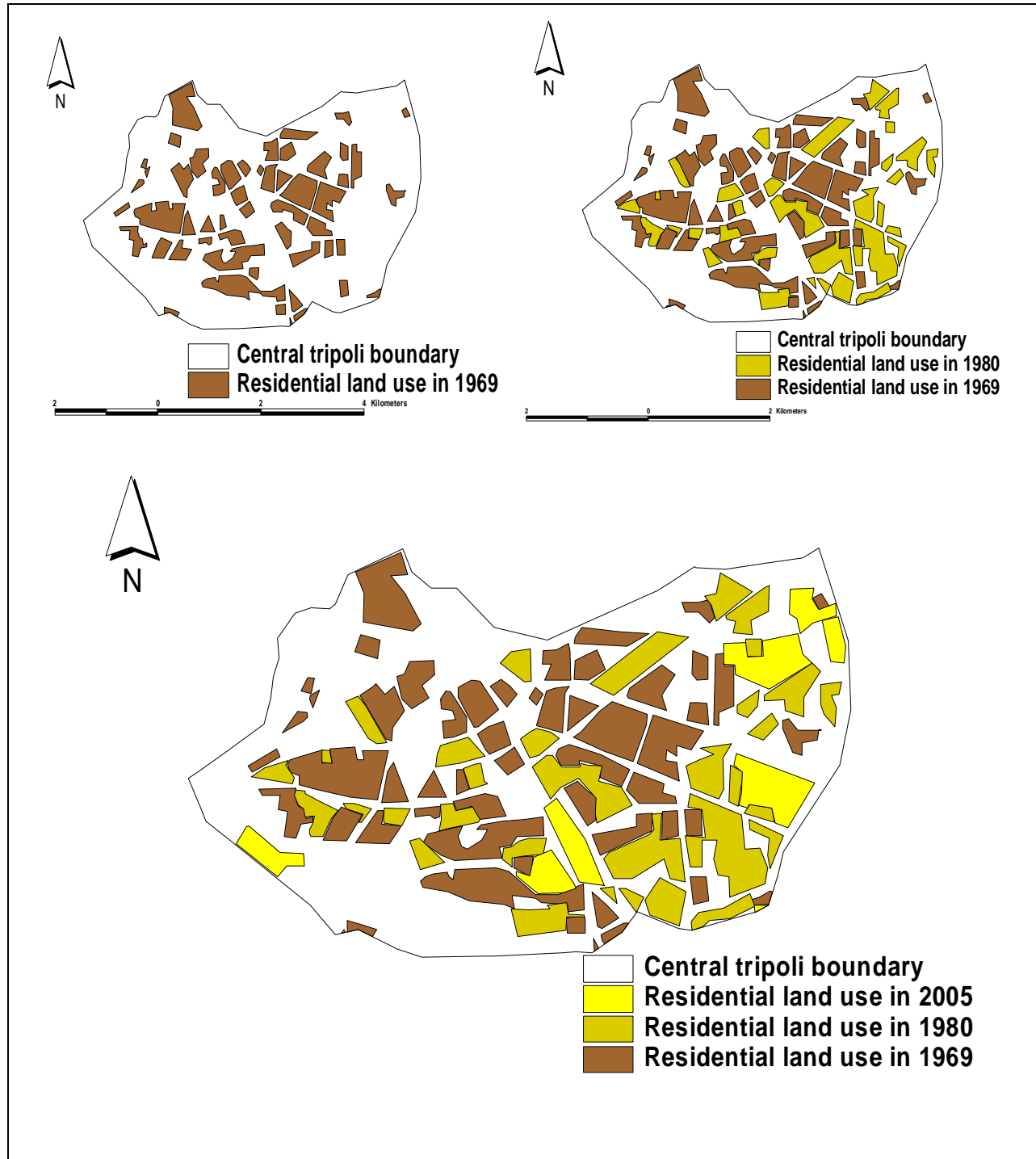




Source: Land use map (1969.1980), Satellite image (spot2005)

Figure 3. Residential and use change in Tripoli (1969, 1980 and 2005)

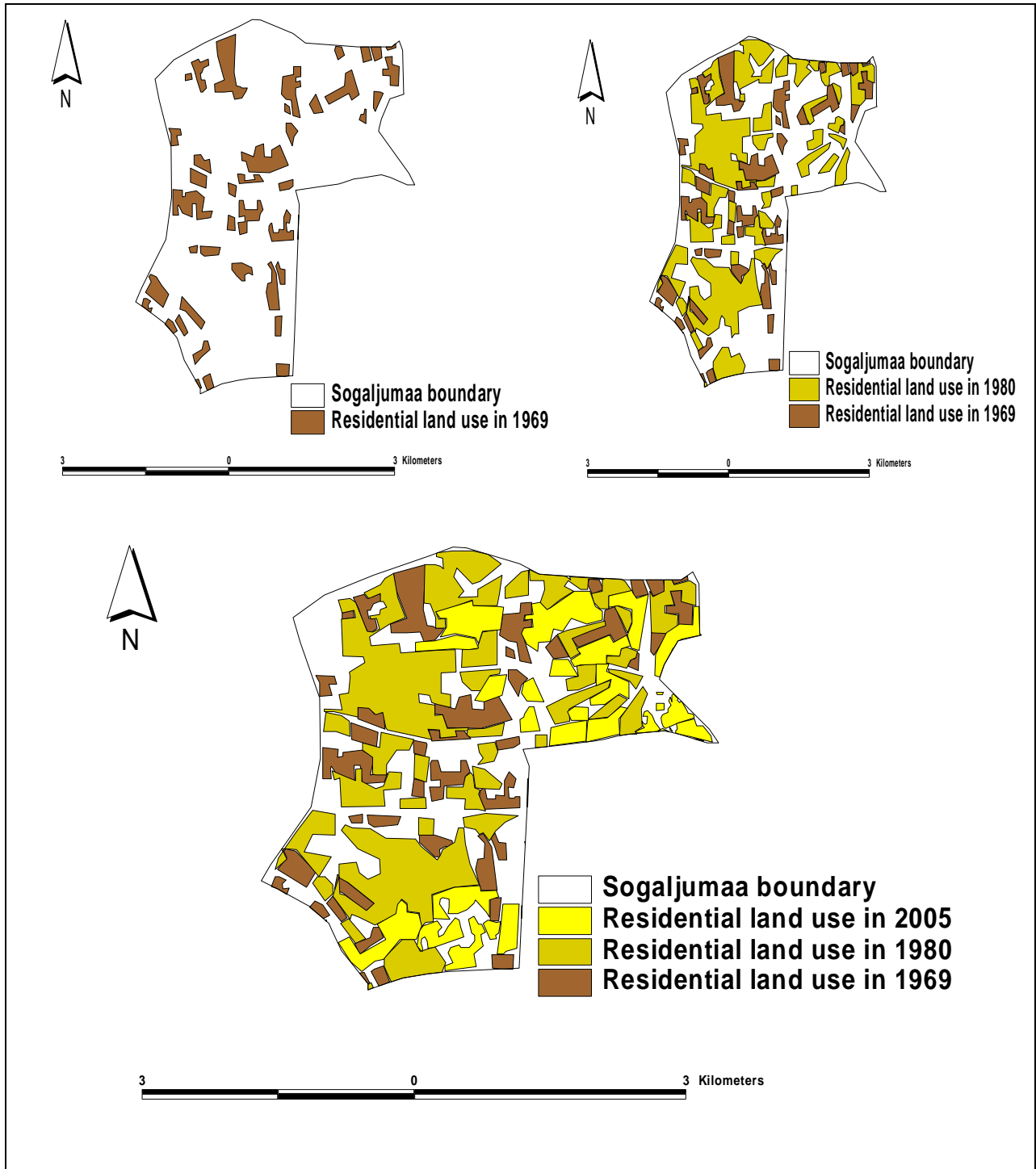
In the Central Tripoli *mahala* the land for residential use has expanded significantly between 1969-2005. In 1969, the residential land use area was about 405.6 hectares or 22.6 % of the total area of the Central Tripoli *mahala*. In 1980 the respective figures were 680.7 hectares and 38 %. By 2005 the figures were 796.6 hectares and 44.5 % respectively.



Source: Land use map (1969 and 1980), Satellite image spot (2005)

Figure 4. Residential land use change in Central Tripoli Mahala

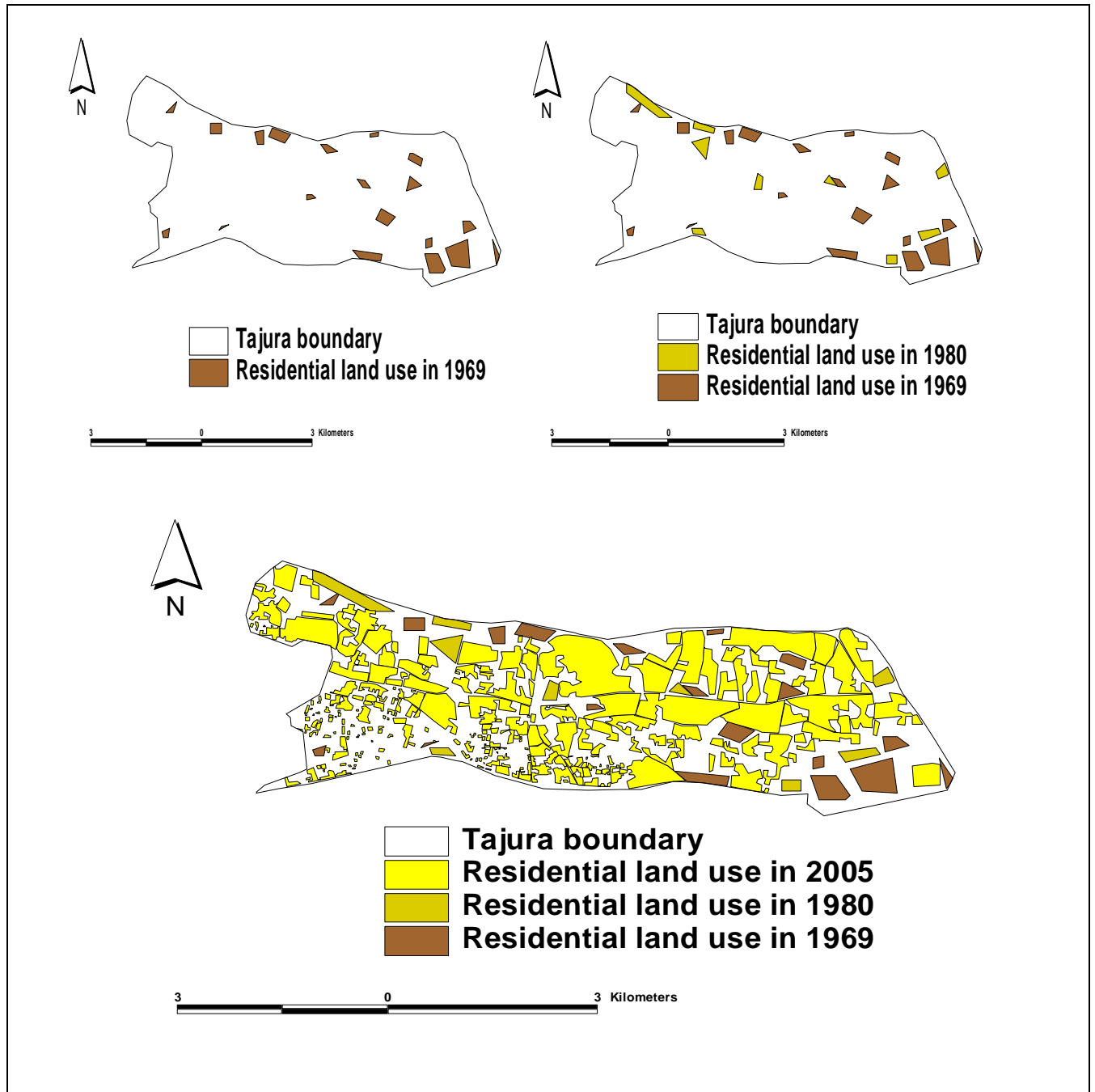
Similar expansion trends were observed in other *mahalas*. In the Sogaljumaa *mahala*, for example, the total area of residential land use in 1969 was about 207.3 hectares or 15.3 % of the total Sogaljumaa *mahala* area. In 1980 the figures climbed to 678.9 hectares and 50.2% respectively and expanded again in 2005 to 901.8 hectares and 24.7% respectively.



Source: Land use map (1969, 1980), Satellite image spot (2005)

Figure 5. Residential land use change in Sogaljumaa Mahala

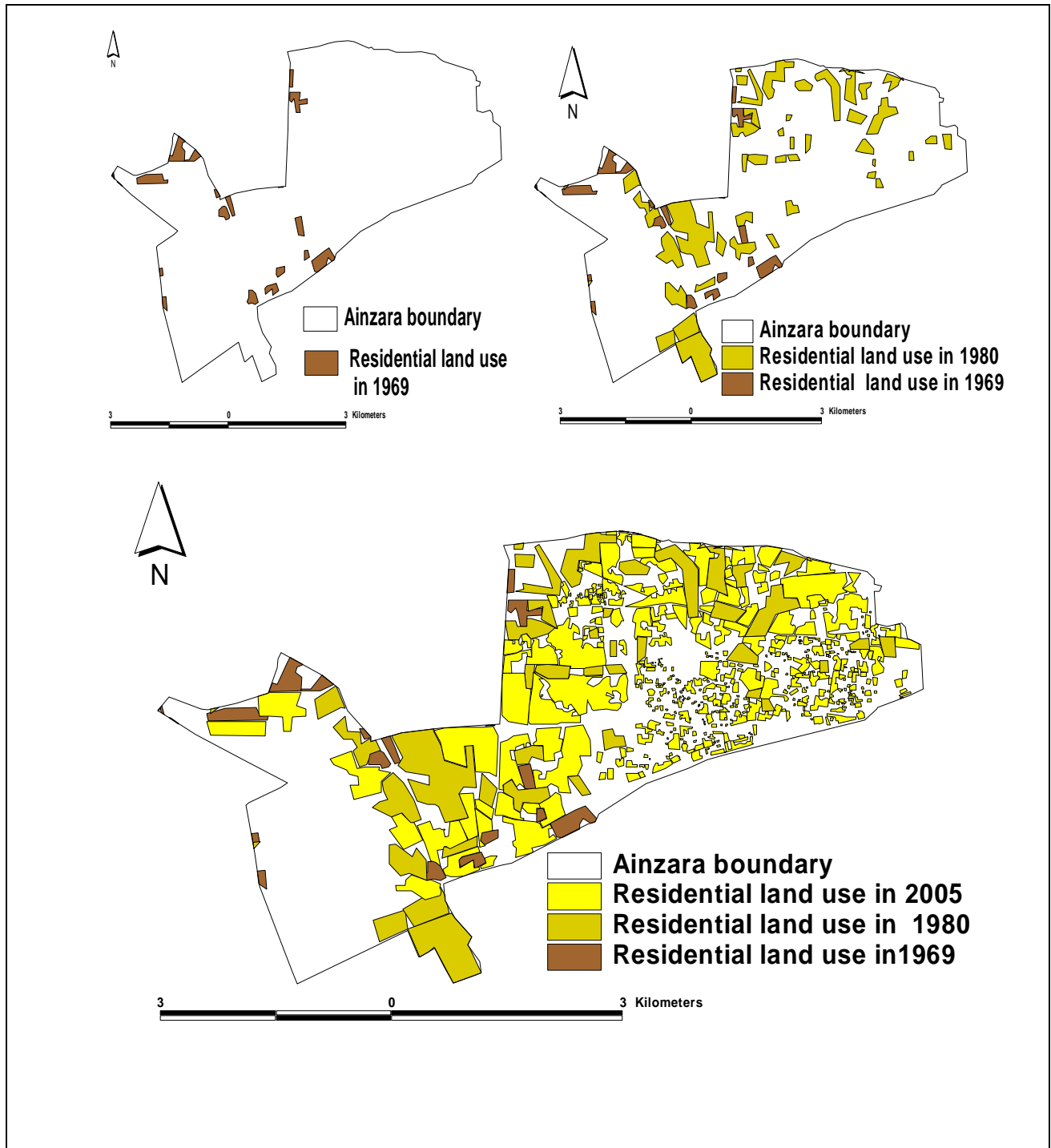
In the *Tajura Mahala* the residential land use of 1969 which stood at 116,7 hectares or 7.2 % of the total *mahala* area shot up in 1980 to 181.3 hectares and 7.9 % respectively, and expanded again in 2005 to 1156,8 hectares or 50.5 % of the total area of the *Tajura mahala*.



Source: Land use map (1969, 1980), Satellite image spot (2005)

Figure 6. Residential land use change in *Tajura Mahala*

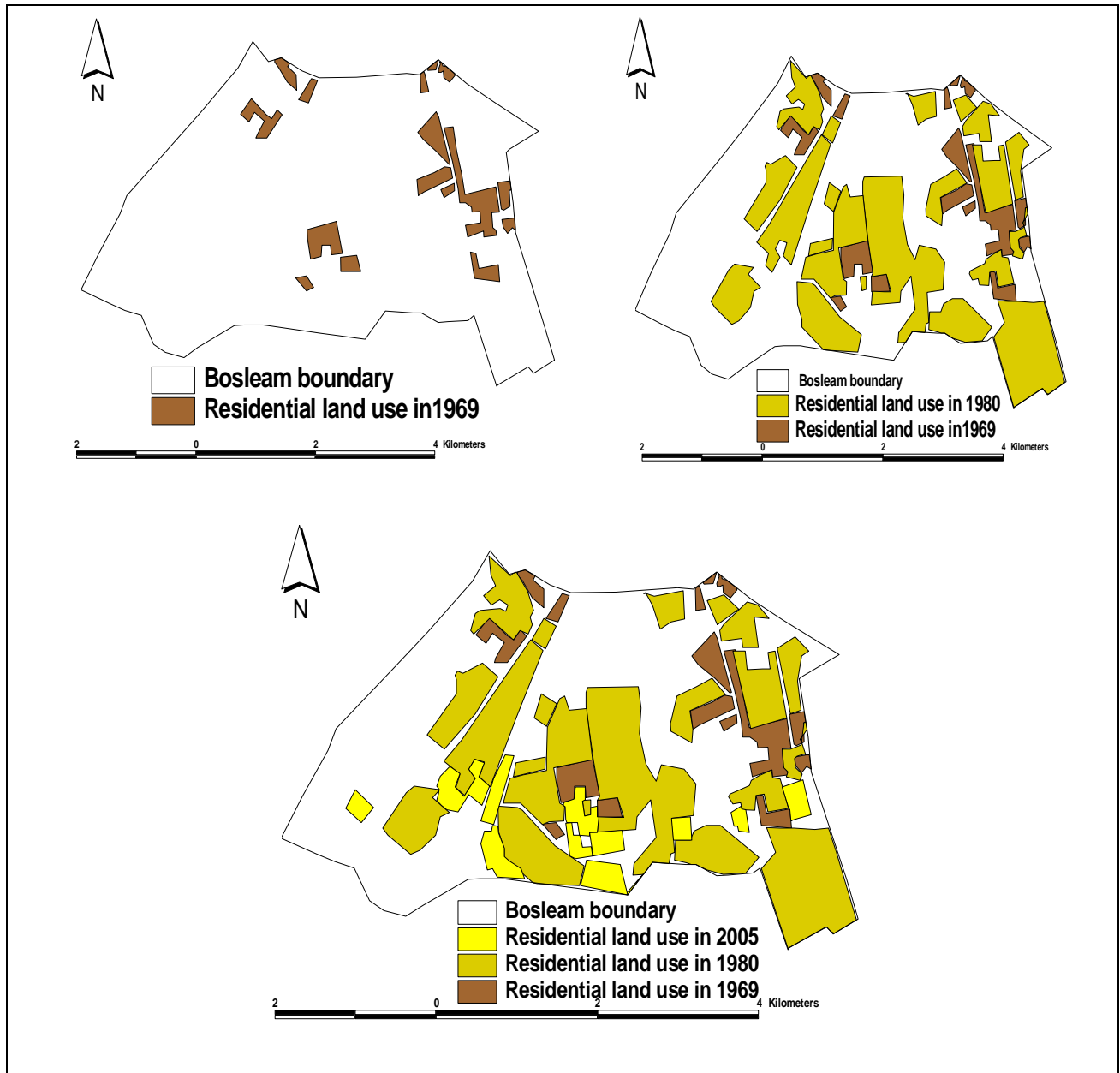
As for the Ainzara *mahala* the significant change in the residential land use was indicated by the expansion from 78.5 hectares or 3 % of the *mahala*'s total area in 1969 to 494.7 hectares or 19.5 % in 1980 and further to 1226.5 hectares or 48.3 % in 2005 (Figure 7).



Source: Land use map (1969, 1980), Satellite image spot (2005)

Figure 7. Residential land use change in Ainzara Mahala

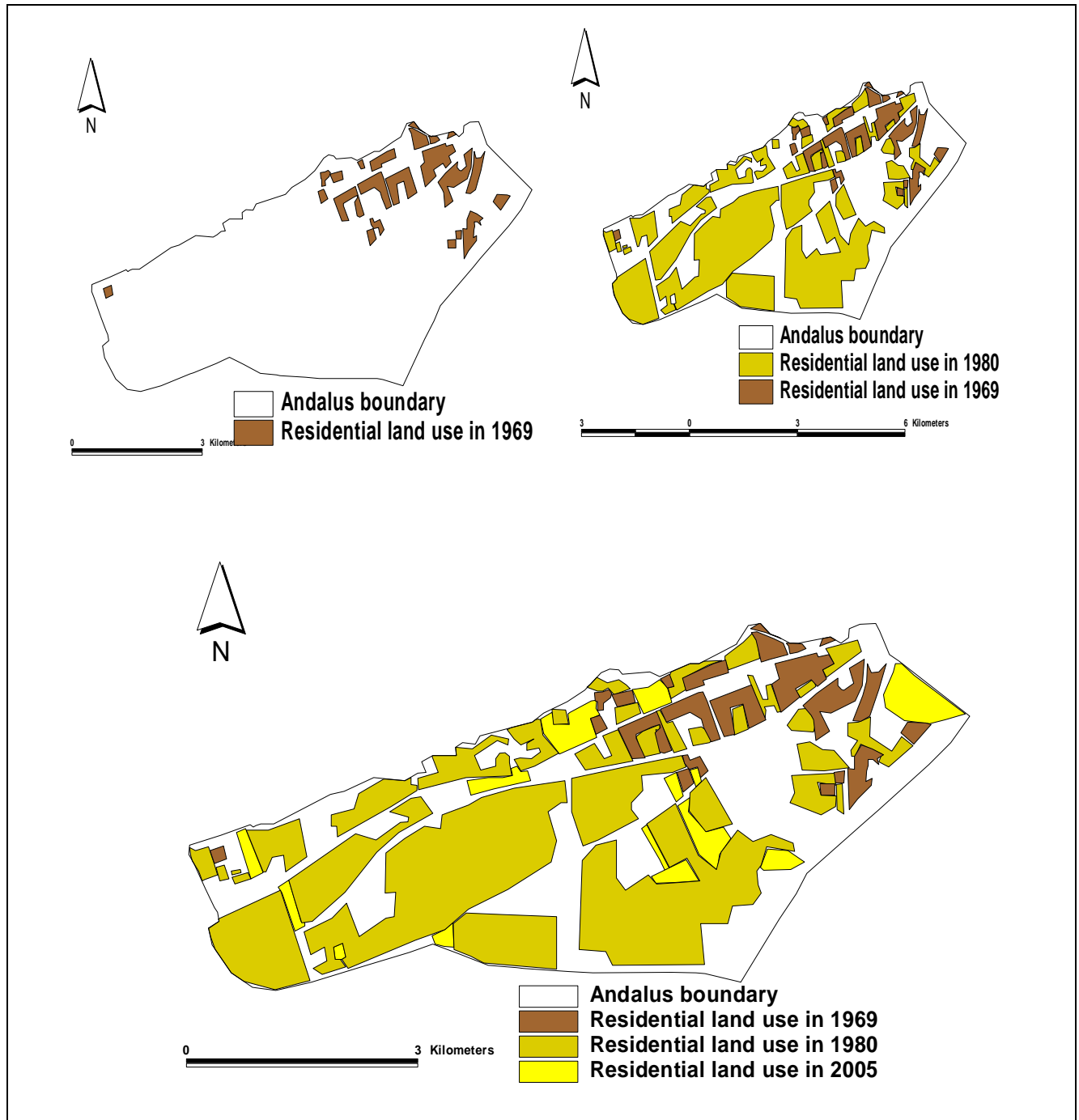
Even more dramatic changes were observed for the *Bosleam mahala*. As shown in Figure 8, the housing hectarage of 143.7 or 11.8 % of *mahala*'s total area in 1969 increased to 964.6 or 79.6 % in 1980 and to 1099.8 hectares or 90.8 % in 2005.



Source: Land use map (1969, 1980), Satellite image spot (2005)

Figure 8. Residential land use change in *Bosleam Mahala*

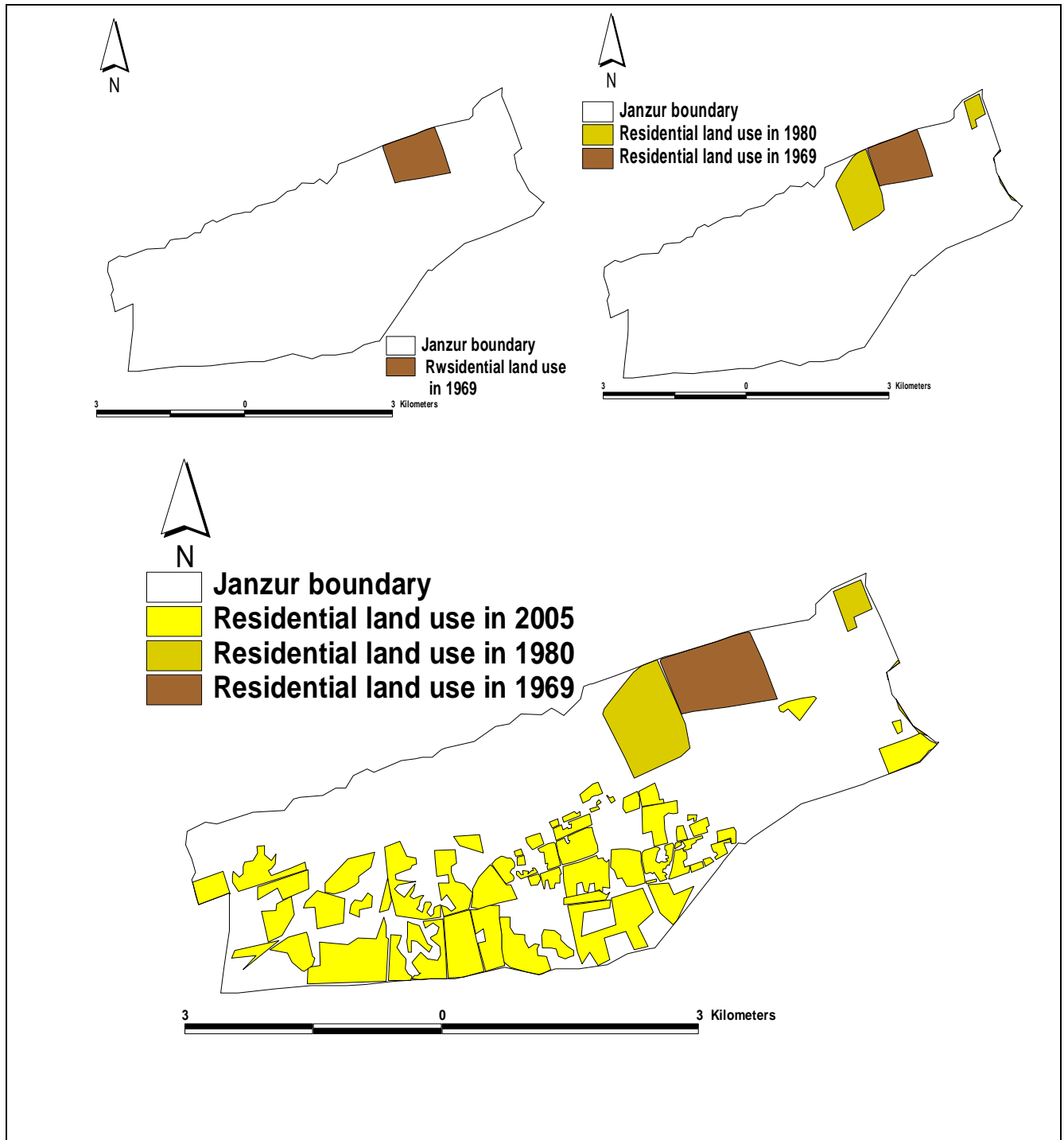
Regarding the *Andalus mahala*, the change of the housing land use was from 205.7 hectares or equivalent to 7.4 % of the total area of the *mahala* in 1969 to 1497.5 hectares or 54.5 % in 1980 and thence to 1674.4 hectares or 60.9 % in 2005 (Figure 9).



Source: Land use map (1969, 1980), Satellite image spot (2005).

Figure 9. Residential land use change in Andalus Mahala

Finally, Janzur *mahala*'s scale of change in its residential use was depicted by the figures of 78.1 hectares or 4 % of the *mahala*'s total area in 1969 to 170.1 hectares and 8.8 % respectively in 1980. As shown in Figure 9 the overall expansion of the residential area in this *mahala* within 1980-2005 was 645.1 hectares or 33.6 % of its total area .



Source: Land use map (1969, 1980), Satellite image spot (2005)

Figure 10. Residential land use change in Janzur Mahala

Result and discussion

In general, residential land use pattern in Tripoli city that are near to the central area have dramatically changed within the 1970-1980 period (Figure 11). The second phase (1981-1992),

however, has witnessed a slower pace in the residential development due to changes in the housing policy as well as the lack of financial support. The constraints in the supply of building materials and relatively high cost of labour force were the most significant factors influencing the slowing down in this second phase.

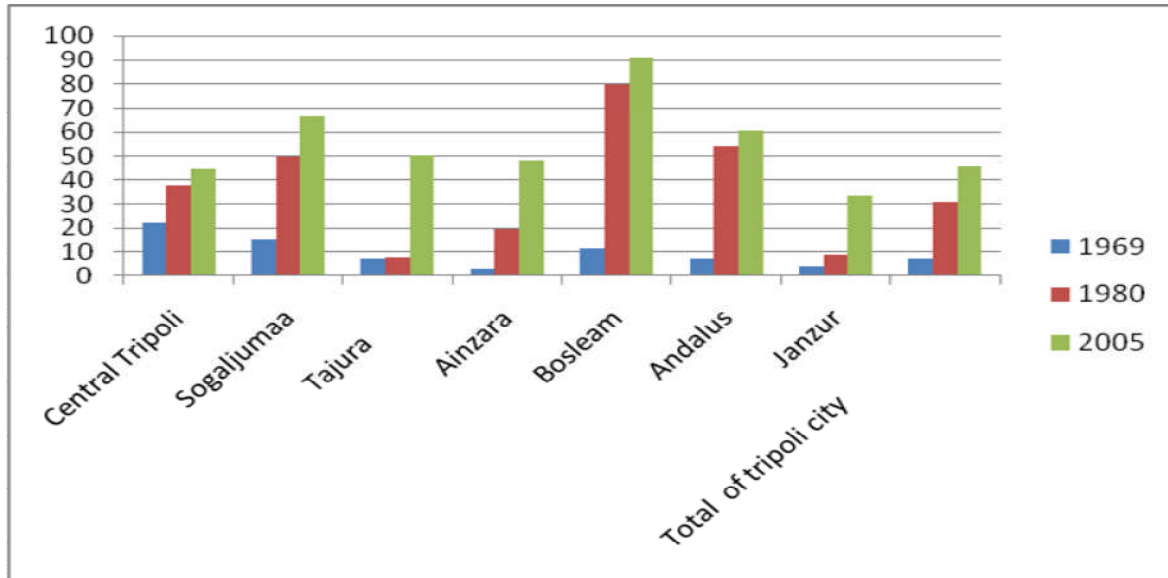


Figure 11. Residential land use change in Tripoli mahala 1969, 1980 and 2005

It must be acknowledged that the development in the city through out the period observed had been spontaneous, un-controlled and haphazard. At present, Tripoli has no effective master plans to guide its development, thus resulting in the preponderance of incongruous and unauthorized change in land uses. This lack of planning aggravated by large numbers of rural immigrants crowding on limited housing areas consequently contributed not only to the inadequate provision of housing but also to the appearance of highly ad-hoc informal settlement characterized by narrow roads, overcrowding, and poorly equipped houses.

The impact of population increase as a factor influencing the change of residential land use in Tripoli cannot be overemphasized. The 1973 census put the total population in the city at 615,161. This number grew to 994,136 in 1984, an increase of 38.1% in a decade. The next decade saw the population increased to 1,059,000 or 6.1% in 1995. Finally, the population reached a total of 1,065,405 in the 2006 census, an increase of only 0.6% (Table 2). This latter significantly lower rate of population increase between the two censuses (1995-2006) may be due to the low natural increase of the population, as well as the desire of the population to live outside the city, in particular, to the southerly direction because of the availability of cheap land there.

Table 2. Developing population in city of Tripoli during (1973-2006)

Year	Population	Percentage of Population increase
1973	615161	-
1984	994136	38.1%
1995	1059000	6.1%
2006	1065405	0.6

Source: Censuses 1973, 1984, 1995, 2006

Conclusion

This paper has described the residential land use change in Tripoli, Libya. To sum up, the residential area in the city of Tripoli had been on the increase between 1969 and 2005. In 1969 the residential land use was at 1,126.8 hectares or 7.6% of the total city area. This figure climbed in 1980 to 4,573.3 hectare or 30.8% of the total area, and to 6,783.3 hectares or 45.7% in 2005. In terms of the *mahalas*, in 1969 central Tripoli dominated with 22 % while Ainzara at 3 % was the lowest. In 1980, however, Bosleam had the highest score of 79.6 % and Tajura the lowest (7.9 %). Finally, in 2005, it was the Bosleam *mahala* which had the highest score of 90.8 %, while Tajura had the lowest of 33.6 % of total city area.

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