

SPATIAL GROWTH OF THE SEMI-SQUATTER SETTLEMENT IN TRIPOLI, LIBYA

Osama Kh Ali¹, Noorazuan Hashim², Katiman Rostam² & Hamzah Jusoh²

¹University of Garyounis, Libya.

²School of Social, Development and Environmental Studies, Faculty of Social Sciences
And Humanities, Universiti Kebangsaan, Bangi, Malaysia.

*Email: osa_kb2004@yahoo.com

ABSTRACT

A common understanding of urban growth and land use change is dominated by simplifications which, in turn, underlie many environment policies and development. The present paper analyzes spatial urban growth to the semi-squatter in Tripoli sub-region. The non-supervised classification of land uses in Tripoli region and sub-region will be employed, this analysis uses landsat satellite images for years 1984, 1988, 1992, 1996, 2000, 2003 and 2007, satellite images will classify according to the land use type namely; urban land uses, barred and vegetated land.

1. INTRODUCTION

According to UN estimates, the population living in urban areas has exceeded 50% of the world total in 2006 and approaching 60% in 2020. Most, if not almost all of this growth will occur in developing countries. While the explosive urban growth in developing countries is a well known phenomenon, the specific trajectories and patterns of growth are still relatively unknown. In most countries, urban growth appears to have taken the form of disperse or growth patterns, but case studies are needed to determine whether the "American model" of urban sprawl (Leichenko 2005) is dominant or, rather, it represents just one version of a much broader process.

Urban growth is a pattern of land use with a low level of eight distinct dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed uses and proximity. Density is the average number of residential units per square mile of developable land in urban areas. Continuity is the degree of building land was built near the existing urban fabric. Concentration is the degree of development is located disproportionately in relatively few square miles of the total urban rather than uniformly distributed. Clustering is the degree of development has been tightened to minimize the amount of land for each mile of developable land occupied by residential uses and non-residential. Centralization is the degree of non-residential or residential development (or both) is located near the Central Business (CBD) of an urban area. Nuclearity is the extent to which an urban area is characterized by a mononuclear (as opposed to neutrophils) model. Mixed use means that the degree to which two different lands uses are generally in the same small area. Finally, proximity is the extent to which different land uses are close to each other through an urban area (Glaster 2001). It is based on the fact that accessibility and agglomeration are two major factors behind the growth of space in urban areas (Adeel 2010).

Because of these characteristics, urban growth is said to be a threat to sustainable development in urban areas, because it implies an increase in the consumption space. The environmental impacts of urban growth have raised concerns among planners and stimulated other models of urban expansion such as "smart growth" (Gabriel 2006), that attempt to reverse the low values of eight dimensions mentioned above (Gill, 2008).

Studies of urban growth have mostly focused on large cities and metropolitan areas. However, medium and small urban areas can be effectively those who know the highest rates of urban growth. For example, Weng (2001), in a study on the Zhujiang Delta in China, found that the largest urban development in this area occurred in Dongguan, Baoan, Nanhui and Zhuhai, all located in relatively small towns the eastern delta. However, the oldest and largest cities, such as Guangzhou and Foshan, did not show a parallel increase of urban land. Jat, Garg and Khare (2008) found that growth in the urban area of the city of Ajmer, a medium sized city located in the state of Rajasthan in India, over a period of 25 years, tripled in population growth with an increase in the urban area of 488 ha in 1997 to 1259 ha in 2002. Also in India Sudhir (2004) for a town with less than 0.5 million people, reported the population increases by 54% between 1972 and 1999, and an increase in the urban area of 146% over the same period, nearly three times the rate of population growth. The growth of cities and urban land mid-size and small continue in the developed world as in Santa Barbara, California (Herold, 2003), or in several Swiss communes (gennaio 2009), among many other examples.

We found that 11% of Puerto Rico is covered by urban / built surfaces. The compact urban development covers 60% of the total and is limited to flat areas, while the other 40% occur in low densities and forms is widespread in much of the island facilitated by the extensive network of rural roads. Uncontrolled development has led to a high degree of spread 40% of Puerto Rico, with towns and cities populated and underserved areas surrounded by large spread.

Nearly half of the total development occurs outside urban solid, covering one fourth of the best land for agriculture, affecting watersheds and reduction of open spaces (Martinuzzi 2007).

While urban growth can be shared equally by developed and developing countries, the causes and characteristics differ considerably. In the developed world, for example, the causes for the range of urban growth based on consumer preferences for new strategies of capital accumulation in the cities through the development of real estate (Muniz 2007). However, the study of the causes of urban growth is less explored in the developing world. Other examples of how this process occurs in specific areas is needed to explore the trends, causes and consequences that enrich our understanding of the urbanization process in areas where this process is more intense. In many developing countries, rapid urban growth allows the growth of informal settlements. The squatters are the most common forms of settlements in the major cities in South America, Africa, South, West and South East Asia. A squatter is a settlement built on land illegally. In many cases these plots of land are normally restricted government land, or any other land, occupied or unoccupied or abandoned for a building, usually housing, the squatters do not own, lease or permission to use. The squatters were significantly more common in urban and rural areas, especially when urban decay occurs.

Libya functional urban services and all the important functions are in a metropolis. Thus, it is a hugely attractive place to stay, and attracts immigrants from other cities in the country and rural areas. The growth of Tripoli has been subject to many factors - political, economic and its coastal location. The discovery of oil in 1958 has created many jobs; attract people from around the state in search of a better life. Tripoli is located at the extreme western Libya, close to Tunisia, North Africa, more than a thousand kilometers from Tripoli of Libya's second city, Benghazi. Coastal oases alternate with sandy areas and lagoons along the coast of Tripoli in more than 300 km.

In this research the case of Tripoli region is presented, which is located northwest of Libya. Both Tripoli and Libya as a whole are interesting and relevant cases of explosive urban growth. The percentage of Libyans who live in cities has increased steadily from 50 percent in 1970 (the year after his stroke) to over 75 percent in 1985, but since 1985 the country just becoming more urban and in 2005, 77 percent of Libyans living in cities, according to the World Bank. Urbanization tends to be a sign of progress (Leonhardt 2011), as a comparison, Libya was almost as urbanized as Canada and Lebanon in 1985. In 2005, Canada had 80 percent of its inhabitants live in cities, and Lebanon had 87 percent. South Korea may offer the best contrast. In 1985, he was much less urban than Libya, with 65 percent of South Koreans live in cities and in 2005, 81 percent of South Koreans living in cities. In China, some people believe that the land in urban areas has great potential to absorb more of the urban population, while others think that the density of the urban population is very high, and has already caused many urban problems (Tan 2008).

Tripoli is one of the most ancient and important in North Africa under the centrally planned economy, also experienced rapid population growth during 1973-2006, exceeding the growth rate of the population. In recent decades, Tripoli region has experienced rapid urban growth through natural increase and migration. This urban growth has in fact caused problems in Tripoli. Thus, urban land grew spontaneously and uncontrolled. Today, Tripoli region as whole has no comprehensive plan may be this situation has allowed urban growth in random way. A lack of planning also contributed to the unplanned growth of land in the region of Tripoli, thus population growth and development policy may be macro factors affect the urban growth in Tripoli region. Libya has seen shift process and a fast-growing to, and Tripoli is one of the rapidly growing cities of physics and changing land cover and uses. The gap of the knowledge which will be touched by this study, the recent history of Tripoli includes a large number of dimensions mentioned earlier. Yet it also has some features that offer an interesting insight into the nature of urban growth in cities of the developing world. The accessibility and agglomeration are not major factors behind the growth of space in urban areas in the new trend 'semi-squatter'. And semi-squatter is a settlement built on land illegally, while semi-squatter built on land legal but without construction permission.

As known, when the population increases in natural or migration way that make spatial change in the urban land area and uncontrolled extension let to some urban issues. In Tripoli sub-region a result of urban growth is semi-squatter which has characterized based on the construction way which was legal land in term of ownership, but without construction permission. This new feature 'semi-squatter' is going to be highlighted by detecting patterns of population and physical characteristics that attracting the residents to this area.

Studies of urban growth have long been the subject of many researchers, including academics from several disciplines, particularly in the social sciences such as anthropology, sociology, architecture, planning, economy and geography. There is a growing body of evidence to show that the expansion of urban growth and informal settlements in cities in developing countries which characterized by the growth of low-cost housing like slum and squatter. This research is focusing on urban growth in Tripoli region as whole and semi-squatter in Tripoli sub-region. In Instead, semi-squatter dominated by the high cost and new design of housing, thus it is different with other kind of informal settlement, for that, we rename it 'semi-squatter' as for the present study attempts to shed some light on the issue.

So, semi-squatter is not common phenomena in many countries, but the case of Tripoli has been exceptional. Extension of the urban area in Tripoli region effects the growth in Tripoli sub-region under semi-squatter, thus the pattern of extension has a new trend in urban growth. Moreover, the growth of semi-squatter has some characteristics; they are entirely different with the official rules. For that, urban growth in Tripoli sub-region is likely to extend over time and no decision to stop squatting was done, well resulting in uncontrolled growth. The problem of semi-squatter (as so called) is temporary; arise because of the government decision not to grant planning permission. Once the government lifted this restriction may be the issue will no longer exist. The residents are not squatters, they own the land, and the problem is they couldn't get the official planning permission because the land not suitable for construction and it is agricultural land. For this, the paper question is: what is the spatial growth in Tripoli region?

2. METHODOLOGY

Trends of urban expansion are discussed here by using satellite images. Remote sensing is profitable and technologically reliable, and therefore, being used for the analysis of urban growth. In addition, remote sensing techniques have advantages in the characterization of temporal and spatial patterns of urban growth using images in several steps and providing a basis for projecting future urbanization. The use of satellite images will help us to identify spatial and temporal trends of urban land expansion of the Tripoli region, and change detection stations in the sub-region in particular as regards the relationship between urban uses and arid land.

Urban land use classification is to show growth of urban area in Tripoli region and tipoli sub-region specifically 'semi-squatter' and the analysis uses Erdas software to classify landsat images in periods 1984 to 2007 within Tripoli region administrative boundary and subset Tripoli sub-region to detect growth of semi-squatter there, and a result can show urban, barren and vegetated lands within the study area.

The analysis will be used remote sensing through Satellite images are an appropriate means for acquiring information on land-cover and land-use change for urban areas. This part explores using RS to detect land use change in urban area.

3. DATA ANALYSIS

Semi-squatter is located in Tripoli sub-region, this settlement has built by the people themselves, and the people own the lands, also they divided the lands to small plots and selling to each other. The process of buying and selling was done with private commissioner without certifying in the department of urban planning and agricultural to release agricultural character, thus the process is illegal. Tripoli authority close eyes on this growth because when Tripoli authority wants to stop the construction process it must provide the people new housing units.

It must be acknowledged that the development in Tripoli sub-region throughout the periods that 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 changes in land uses. This lack of planning aggravated by population growth on limited housing areas consequently contributed not only to the inadequate provision of housing, but also to the appearance of highly semi-squatter characterized by narrow roads, overcrowding, and unorganized neighborhoods. The impact of population increase as a factor influencing the changes of the urban land use in Tripoli sub-region should not be underestimated.

The semi-squatter had appeared as a solution to the housing crisis. As a result of the random construction, the area look of the settlement has become so confused with all the land area being occupied by the informal residential buildings. The mobility to this area led to new spatial characteristics, which were results of the mobility there. Thus, the new inhabitants maybe are looking for dwellings characterized by style not available in the urban areas. In order to understand the situation in the semi-squatter, it must present growth of this settlement in side of urban land growth.

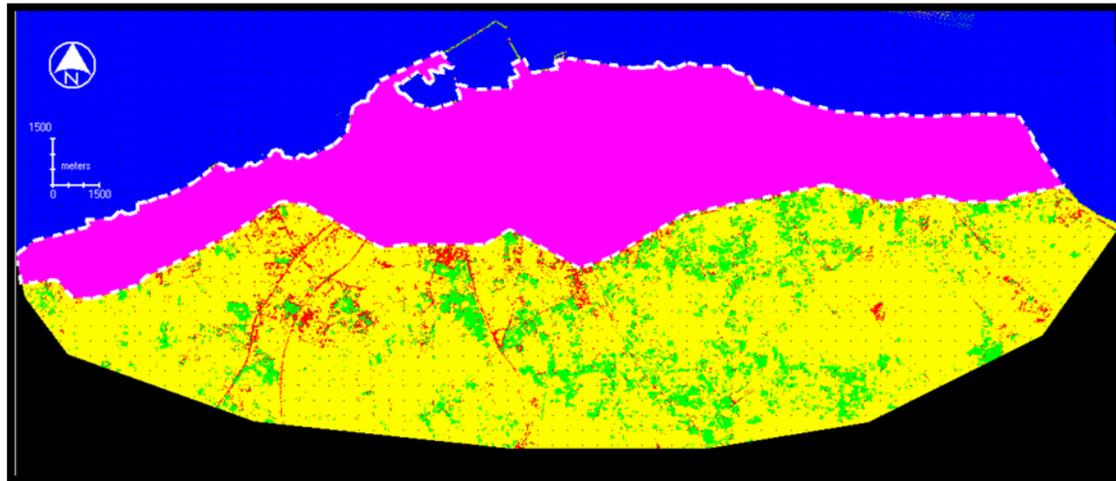
In reference to the semi-squatter the total area is around 18421.29 hectares. the semi-squatter area has an estimated by satellite image. In this section will be classified the semi-squatter area into three classes; vegetated, barren and urban land. In year 1984, the area of vegetated land within the administrative boundaries to the semi-squatter was 2409.3 hectares or 13 % of the total area in the sub-region. The barren land covered 15524.1 ha, or 84.3 %. While, the urban land area covered 487.89 hectares or 2.7 % of the total area in the semi-squatter.

In the year 1988, the vegetated land area was 2328.93 hectares or 12.6 % of the total area of the sub-region of Tripoli. Thus, the barren land area amounted to 15582.06 hectares a percentage of 84.6 %. The area of urban land has reached approximately 510.3 hectares or 2.8 % of the total area at Tripoli sub-region. In year 1992, the vegetated land was less than the previous year. It was 2550.15 hectares or 13.8 % of the total area of the region. While the barren land in this year has reached 15208.2 hectares or 82.6 %. The area of urban land continued to increase to 662.94 hectares or 6.3 %.

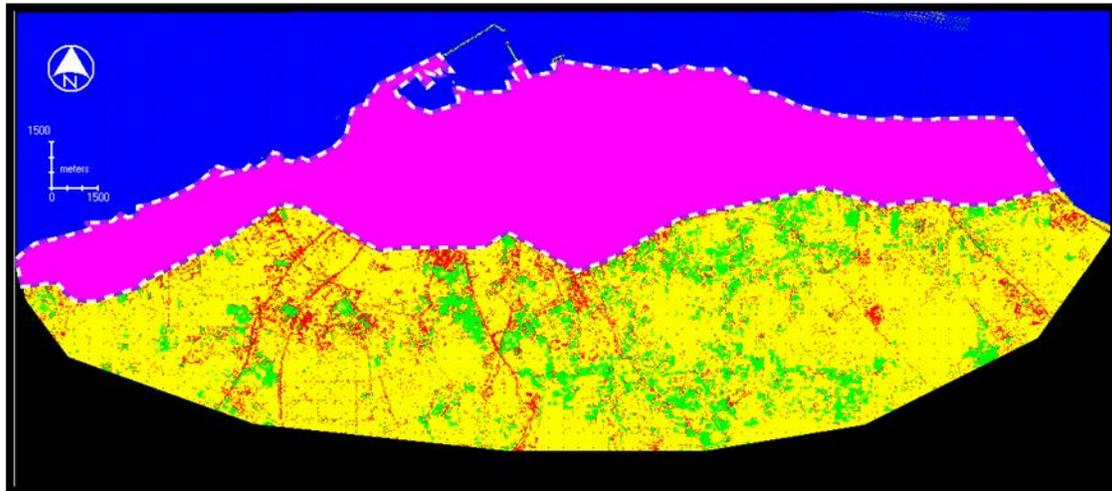
In the year 1996, there has been a change in the land uses within the region boundaries. The vegetated land area was about 2606.58 hectares or 14.1 % of the total area of the sub-region. This percentage has been less than the previous time. While the barren land decreased at this year to 15004.98 hectares or 81.5 %, the area of urban land area has become 809.73 hectares or 4.4 % of the total area. At the present time, there has been a significant increase in area of urban land area as compared to the previous time. While at the year 2000, the vegetated and barred lands have decreased a little. The vegetated land area has reached to 2520.81 hectares or 13.7 % of the total area. Whereas, the barren land area decreased to 13505.49 hectares or 73.3 % of the total area. The urban area has expanded to be 2394.99 hectares or 13 %.

While at the year 2003, the vegetated and barred lands have faced a big decrease. The vegetated land area has reached to 2514.69 hectares or 13.6 % of the total area. Whereas, the barren land area decreased to 9127.15 hectares or 49.6 % of the total area. The urban area has expanded to be 6779.45 hectares or 36.8 %. In the year 2007, there has been a change in the land uses within the tripoli sub-region. The vegetated land area was about 1872.72 hectares or 10 % of the total area of the sub-region. This percentage has been same with the previous time. While the barren land decreased at this year to 6241.14 hectares or 34 %, the area of urban land area has become 10307.43 hectares or 56 % of the total area in Tripoli sub-region. At the present time, there has been a significant increase in area of urban land area as compared to the previous time.

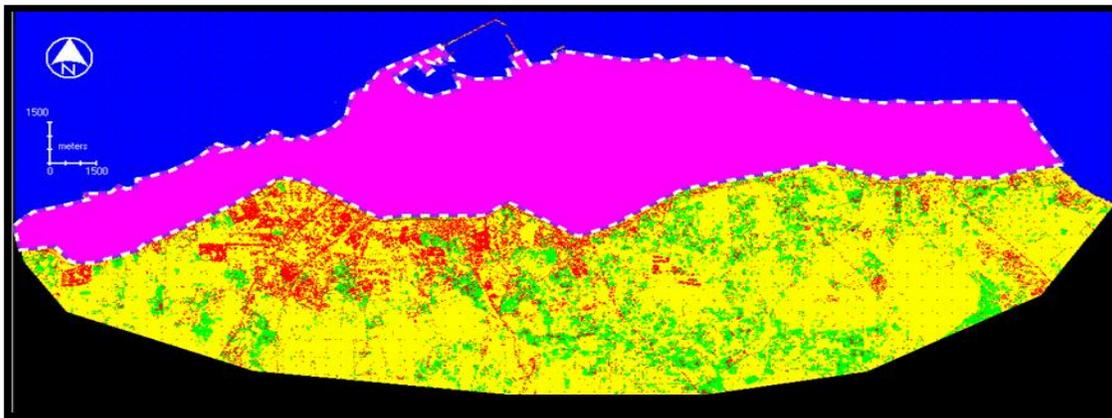
1984



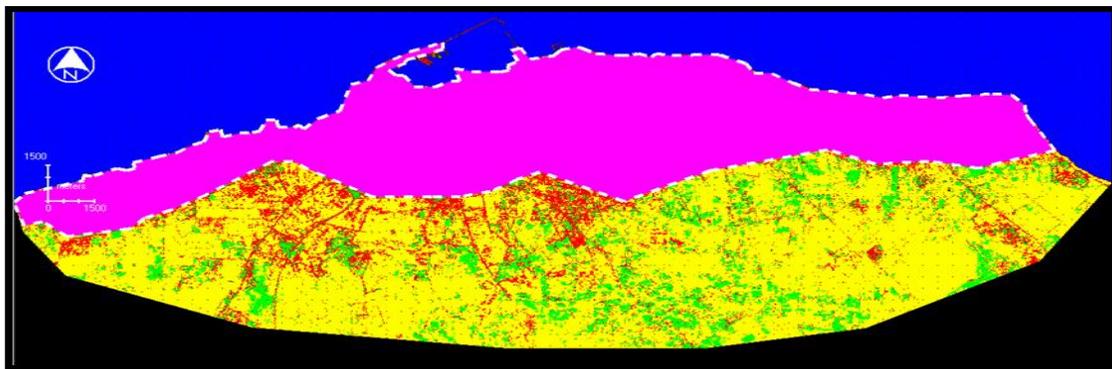
1988



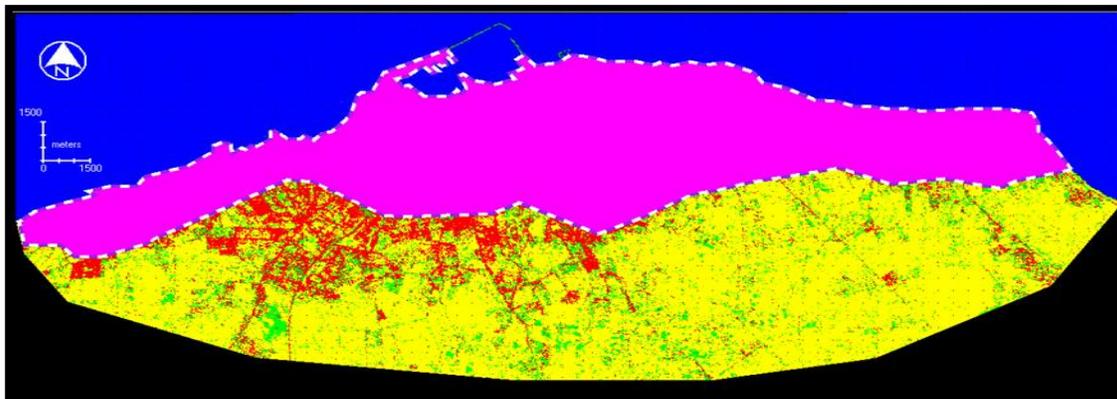
1992



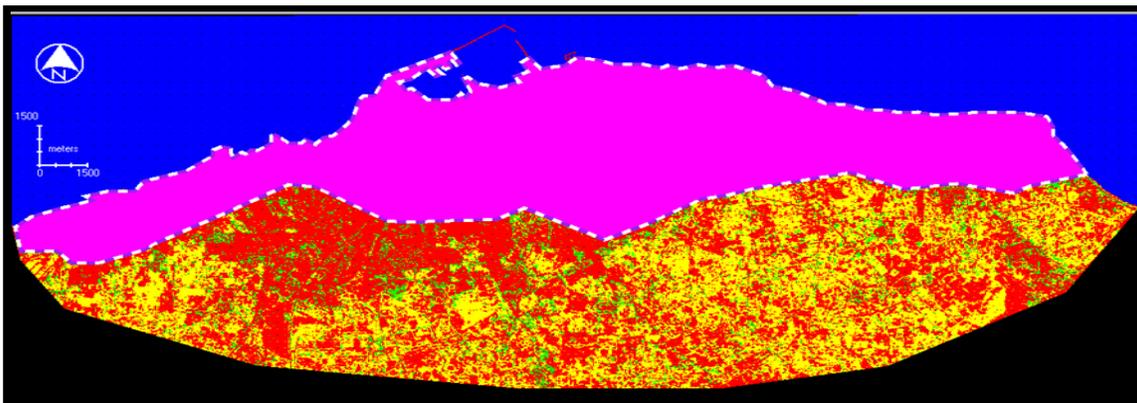
1996

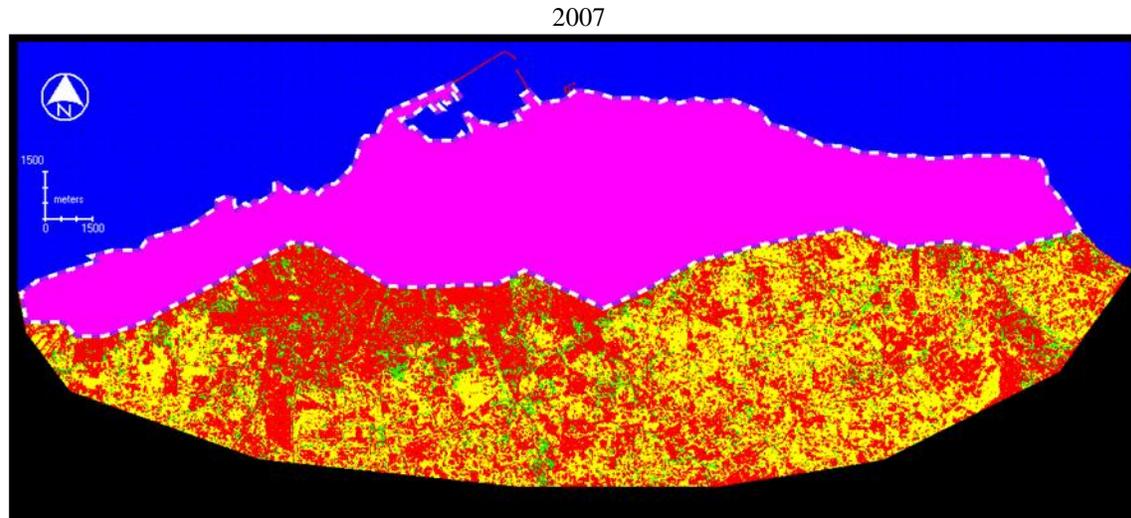


2000



2003





Source: landsat images (1984, 1988, 1992, 1996, 2000, 2003 and 2007)

FIGURE 5.3 Land use changes in a semi-squatter in Tripoli sub-region during stage 1984 – 2007.

Growth of urban land area in the semi-squatter has increased and expanded because of population growth and development policy as mentioned in previous chapter. Rapid growth come due to Tripoli is the capital of Libyan state it is attractive to population, all that has led to an increase in the area of urban land at the expense of other land areas. During the 1984-1988 periods an area of vegetated land has decreased 80.37 hectare. Whereas, during the 1988-1992 periods, the vegetated land area got increase amounted 221.22 hectare, while during the 1992-1996 periods, the vegetated land has added about 56.43 hectare. While during the 1996-2000 periods, the vegetated land has missed about 85.77 hectare. Whereas, during the 2000-2003 periods, the decrease of the vegetated land area was 6.11 hectare. Finally, at the period 2003-2007, the vegetated land decreased area amounted 641.97 hectares.

The changes in the barren land were entirely different from other land uses. Between the years 1984-1988 periods, the barred land use had increased about 57.96 hectare, while, during the 1988-1992 periods, the decreased area in barren land was 373.86 hectare. Also, during the 1992-1996 periods, there was decrease in the barren land was 203.22 hectare. At the periods of 1996-2000, the barren land had missed 1499.49 hectare. And in periods 2000-2003, the increase in barren land was 4748.81 hectare. Lastly, between the years 2003-2007, the barren land area had lost 2886.01 hectare.

High urbanization has led to an increase in the urban land uses, and on the other hand, led to a decrease in the vegetated and barren land in the informal settlement in sub-region of Tripoli. The urban land had increased through 1984-1988 periods to about 22.41 hectare, and of course the other land uses faced decrease. Also, the urban land had increased about 152.64 hectare through 1988-1992 periods, and between years 1992-1996 periods, the urban land uses had got increase was 146.79 hectare, and this increase was less than previous stage.

In the period between 1996-2000 periods, the urban land had got increase amounted to 1585.26 hectare. During 2000-2003 periods, the increase in urban land uses was highest comparing with other stages, maybe due to lack in housing projects and absence of master plan to control the growth in the region all that pushed the people start building their own housing southern direction, the area that expended by urban land was 4384.46 hectare. The rapid increase in the urban land at expense other land uses are due to natural increase of population. Also, this increase in urban land can be justified because expiration of the region plan plan in year 2000 and the growth become uncontrolled that effect appearing semi squatter. The urban land uses still continue rising up during 2003-2007 periods, the increase in urban land uses was 3527.98 hectare and the expansion of urban area still going up. On the other hand, of course there was decrease in vegetated and barred lands, table 5.1 showing land use changes in Tripoli sub-region in stage 1984 – 2007. This part has analyzed in details the changes of urban land use in the semi-squatter in the sub-region of Tripoli. The process had been carried out by classifying the land uses into three classes, namely; urban, vegetated and barren land areas.

TABLE 5.2 Land use changes in a semi-squatter in Tripoli sub-region during stage 1984 – 2007

Type of land Years and changes	Vegetated		barren		Urban		Total area Count
	Count	%	Count	%	Count	%	
1984	2409.3	13	15524.1	84.3	487.89	2.7	18421.29
Change %	80.37	-0.4	57.96	+0.3	22.41	0.1	
1988	2328.93	12.6	15582.06	84.6	510.3	2.8	18421.29
Change %	221.22	1.2	373.86	-2	152.64	0.8	
1992	2550.15	13.8	15208.2	82.6	662.94	3.6	18421.29
Change %	56.43	0.3	203.22	-1.1	146.79	0.8	
1996	2606.58	14.1	15004.98	81.5	809.73	4.4	18421.29
Change %	85.77	-0.4	1499.49	-8.2	1585.26	8.6	
2000	2520.81	13.7	13505.49	73.3	2394.99	13	18421.29
Change %	6.11	-0.1	4748.81	-24.3	4384.46	23.8	
2003	2514.69	13.6	9127.15	49.6	6779.45	36.8	18421.29
Change %	641.97	-3.6	2886.01	-15.6	3527.98	19.2	
2007	1872.72	10	6241.14	34	10307.43	56	18421.29

Source: landsat images (1984, 1988, 1992, 1996, 2000, 2003 and 2007)

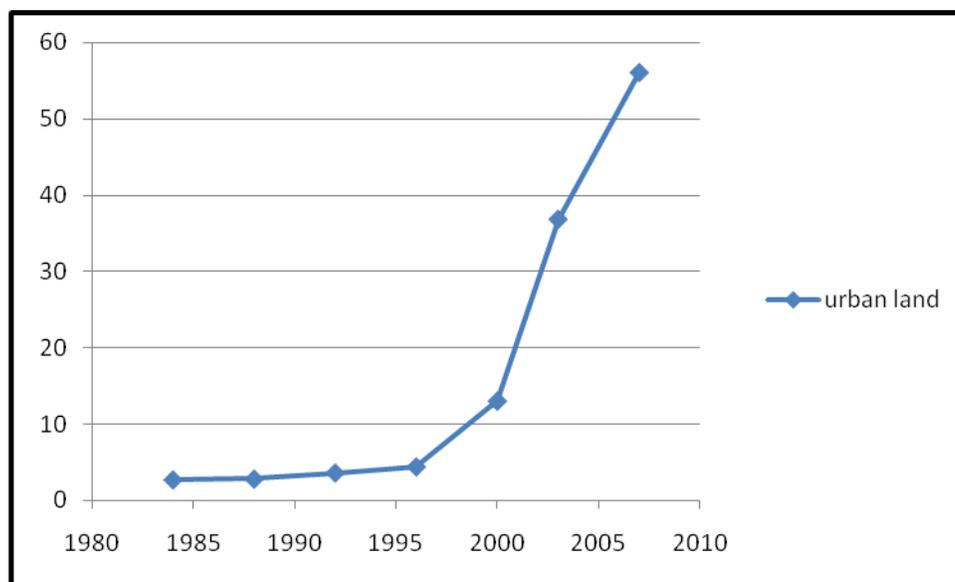


Figure 5 urban land use changes in a semi-squatter in Tripoli sub-region during stage 1984 – 2007.

4. DISCUSSION

This paper analysis has detected changes of the urban land area in the semi-squatter in the sub-region of Tripoli. The semi-squatter as part of Tripoli sub-region had undergone a rapid urban growth during the periods of 1984-2007. Such a process has brought some spatial impacts on the sub-region resulted an expansion of the semi-squatter. In short, Figure 5.4 shows urban growths in the semi-squatter in Tripoli sub-region in stage 1984–2007. Informal settlement had seen an important growth in the urban land area, while the vegetated and barren land areas had decreased significantly. For more details, in the year 1984 the urban land area was estimated for around (2.7%) of the total land area in the the semi-squatter in Tripoli sub-region, while, there were total land area increments in the years 1988 (2.8%), 1992 (3.6 %) , 1996 (4.4%) 2000 (13%), 2003 (36.8%) and 2007 (56%) respectively. From this detect to urban growth it can be noted that, the growth of the semi-squatter was very slow below year 2000 after jumped rapidly in years 2003 and 2007. This high-rise in the semi-squatter refer to the old urban area because it got full extended and no place into the planned area for new extension, for this reason the semi-squatter grew in the sub-region.

There are many studies have investigated and focused on urban land use change issue and those studies are different with this study in term of analysis method and the level of change, and in this section we will introduce some of

them to highlight our result and these studies such as: a study on urban growth in the city of Yazd, Iran, urban growth and other land uses were calculated through treated satellite images for four periods: 1975, 1987, 2000 and 2009. Results reveal that from 1975 to 2009, the urbanized area increased from 1843 ha to 13,802 ha; that is a rate close to three times the population growth observed for the same period (Shahraki 2011). Morelia city, Mexico is undergoing a fast, unplanned development. The city area grows without any consideration on the landscape types that are being transformed. Speculative processes seem to lack control from authorities, a process already described for other cities in Mexico and elsewhere in developing countries. This explains the fragmentation of the urban area and the increase in vacant lots. In addition, no measures are being taken by the government concerning urban development on landscape units under geologic and seismic risk (Lopezza 2001).

While, Concomitant with the rapid economic development and urbanization, land use in the city proper of Hangzhou was rapidly changing: 10.03% of the total area underwent changes from 2001–2003. It was found that the built-up land and construction site notably increased in this area, while the cropland and orchard decreased. The extension of urban land constituted major loss of the cropland along with the industrialization and urbanization (Jin-Song 2009). In another about Xuzhou city got different result, the changes in urban land cover from 1987 to 2007 and found that built-up land had experienced a dramatic increase, while farmland had seen a serious loss due to urban growth and human activities. As one important indicator of urban settlement and the environment, vegetation change has been paid increasingly more attention in urban studies (Peijun 2010).

In study on Greater Dhaka, Bangladesh assesses changes and the dynamics of urban expansion in using RS data in conjunction with socio-economic variables. Urban expansion was quantified for the last 28 years using the post-classification comparison technique. Greater Dhaka was found to have experienced rapid changes in LULC, particularly in built-up/urban areas. Analysis revealed that urban areas increased by 6131 ha during 1975–1992 and 4422 ha from 1992 to 2003, which resulted in a substantial reduction in the area of water bodies, vegetation, cultivated areas and wetlands/lowland. The dramatic expansion of the urban areas of Dhaka exhibited clear spatio-temporal differences. The conversion of water bodies, vegetation and low-lying areas to urban land has caused extensive and varied environmental degradation in the study area, and the vulnerability to flooding and the growth of slums have been the main negative outcomes associated with the rapid urban development. Urban land expansion has been largely driven by elevation, population growth and economic development (Dewan 2009).

This paper has analyzed spatial urban growth in semi-squatter in Tripoli sub-region from 1984 until 2007. Thus, the analysis has shown that, urban land use grew rapidly in Tripoli sub-region, to detail this result out, in year 1984 the urban land area was estimated around (2.8%) of the total area of Tripoli sub-region, while in years 1992 (3.6%), 1996 (4.4%) 2000 (13%), 2003 (36.8%) and 2007 (56%) respectively.

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