

## **POPULATION GROWTH, DESERTIFICATION AND LAND DEGRADATION IN THE NORTH-WESTERN LIBYA**

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### **ABSTRACT**

Over the last 30 years, Libya's population has grown at rates of about 2-3% per year. According to the Department of Statistics and Census, the total population in the country was 3.23 million in 1984 and it increased to 5.5 million in 2006. Human activities and over-exploitation of the available resources are the main reasons influencing and accelerating the phenomenon of desertification in the north-western Libya. The main objective of this study is to assess the impact of population growth factor on desertification and land degradation in the region. The findings of this study suggested that the population growth rate is an important factor that influenced desertification and land degradation in the study area. Moreover, the rapid population growth and high population density in the region contributed clearly in the deterioration of the weakened and fragile environment through exploitative hypersensitive pressure caused by the growth. In addition, the overexploitation of the region resources by man had led to the deterioration of vegetation, groundwater depletion and soil erosion. These perpetuated the prevalence desertification and increased its severity in the region.

Keywords: Population Growth, Desertification, Land Degradation, Overexploitation, North-western Libya.

### **Introduction**

This paper explores the human causes of land degradation and desertification in the North-western region of Libya. The high population growth in the region is one of factors that make it the most influential factor contributing to the phenomenon of desertification in the region. This rapid population growth and high population density in the region significantly affect the availability of natural resources through exploitative hypersensitive pressure caused by the growth.

Desertification is defined as 'land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors such as climatic fluctuations and human activities' (United Nations Convention to Combat Desertification (UNCCD), 2007). According to Millennium Ecosystem Assessment (MEA), 2005), desertification is caused by a combination of factors that change over time and vary by location. Desertification, drought and climate change often represents slow onset hazards. Desertification is a gradual process by which the productivity of land is reduced, and this process affects about 46% of African continent (Reich et al., 2001). Land degradation is caused by many factors as discussed widely in the literature (Thomas, 1997; Lambin et al., 2001; Reynolds and Stafford Smith, 2002; Geist & Lambin, 2004). However, most authors, e.g. Turner et al. (1995), Puigdefábregas (1998) and Geist & Lambin (2004) agree that there is no single factor that serves as the basis for desertification or land degradation. Despite other human activities, the over-exploitation of available natural

resources is the main reason for the desertification and its acceleration in many areas. The natural factors, particularly the climate, are supporting factors for the process of desertification through the creation of severely fragile and more sensitive environments susceptible to desertification in those areas (El-Tantawi, 2005).

In this paper, the population growth and high population density in the region are discussed. This study therefore, focused on determining the relationship between population growth, desertification and land degradation in the north-western Libya, with special reference to some part of Jafara plain as an essential step of proposing ways of reducing the aggravation of desertification in the area.

### **Study Area**

This study is conducted on part of Jafara plain, as shown in Figure 1, which is the largest plain in Libya. It is a flat coastal plain that extends in the north west of the country in the form of a triangle; its head is in the east (at the city of Al Khums), and increases towards west until it reaches its maximum size at the Libyan-Tunisian border, about 120 km north-south direction. It occupies an area of more than 17000 km<sup>2</sup>, and it is home to more than half of Libyan population, thus making it the most densely populated area. In addition, it contains more than 60% of the total irrigated agricultural area in Libya (Fadel & Abu Luqma, 1995).

Jafara plain is located in a transitional territory between the Mediterranean climate in the north and the desert climate in the south. It is exposed to the effects of the moving depressions over the Mediterranean Sea from west to east, which leads to rainfall and lower temperature in the cold half of the year. Moreover, it receives the effects of stable dry desert air in the warm half of the year from the south. Therefore, the Jafara plain climate is characterized by mild to cool winters that last from November to April and hot and dry conditions for the remaining months. Average annual temperatures range from 28.6 °C in August, to less than 12.1 °C in January. Annual precipitation ranges from 200 to 600 mm. Rainfall occurs between November and March, for approximately 37-53 days (Emgaili, 1995;

Daou & Mohammed, 2008).

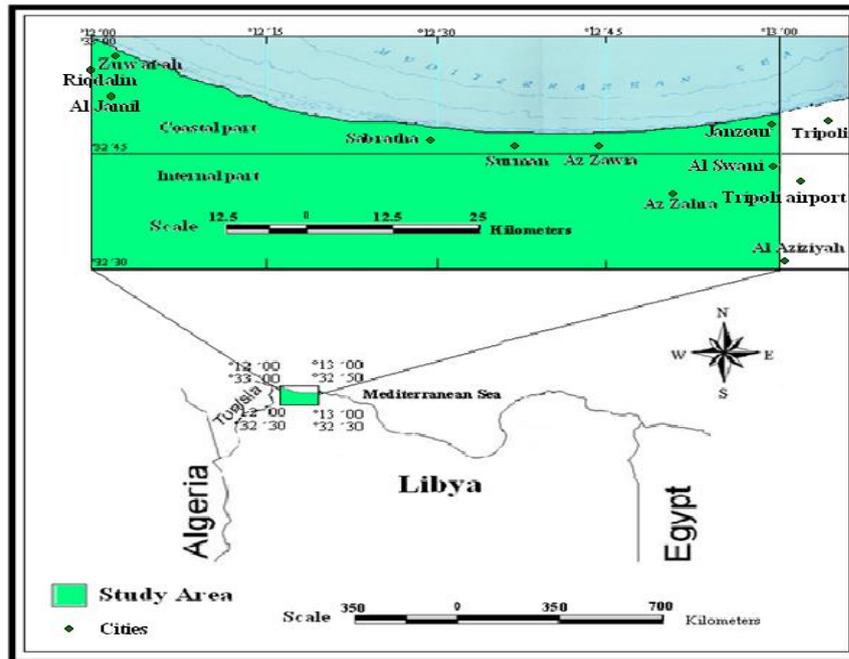


Figure 1. Location of the study area

## Materials and Methods

The main source of data in this study is the population data published by the Libyan Department of Statistics and Census in Tripoli. The study relies on the population data for Shabias located within the study area, and the three Shabias namely, Shabia Al-Jafara, Shabia Az-Zawia and Shabia Zuwarah. The data for the population of these Shabias were obtained from 1984 to 2006, see Table 1. Moreover, after collecting the raw data, the presentation and analysis of the study are conducted through the following steps:

### a) Quantitative methods

This present study employs the use of some quantitative techniques in the analysis stage. Several rules and statistical equations are used in the data analysis; the quantitative analysis is conducted through the following steps:

1. Determining the arithmetic density,  $\bar{X}_d$  for the population density in the study area

using the formulae:

$$\bar{X}_d = \frac{T_p}{T_a}$$

Where  $T_p$  represents the total population and  $T_a$  is the total area.

2. To compute the percentage of the annual increase in number of population in the area and the relation between this increase and the phenomenon of desertification via reviewing the population pressure on the weak natural resources. This is shown by Saeid (1997), the percentage of population growth rate,  $r$  is calculated using these two equations:

**First**, the average annual population growth,  $R'$  is calculated using this equation:

$$R' = \frac{P_2 - P_1}{t}$$

**Second**, the average total of population in two successive censuses,  $P'$  is calculated using the equation:

$$P' = \frac{P_1 + P_2}{2}$$

**Finally**, we can extract the growth rate as follows:  $r = \frac{R'}{P'} \times 1000 = \frac{\frac{P_2 - P_1}{t}}{\frac{P_1 + P_2}{2}} \times 1000$

**Where:**

$P_1$  Represents the total number of people in the previous census;

$P_2$  The total number of people in the following census; and

$t$  Represents the time or years number separating between the two censuses

## Results and Discussion

The population indices in the study area, particularly population growth, are characterized by certain factors that make it the most effective in supporting the phenomenon of desertification. The location of the region within the semi-arid climate contributes largely in creating rapid deteriorating and fragile environments. The population growth contributes clearly to the deterioration of the weakened and fragile environment as a result of human exploitation. In addition to the vulnerability of the region for extended periods of successive drought led to the deterioration of vegetation and soil erosion. This assisted in the spread of the desertification and increases its severity. Generally, the key features characteristic of the population growth of the study area and its relationship to desertification can be summarized as follows;

Over the last 30 years, Libya's population has grown at rates of about 2-3% per year (IMF, 2003). According to Libyan Department of Statistics and Census (2006) and Libyan Statistics Book (2007), the total population in Libya was 3.23 million in 1984, has increased to 4.38 million in 1995 and to about 5.5 million in 2006 with a population density of about 3.2 inhabitants per km<sup>2</sup>. However, growth rate of population illustrates that a remarkable decrease had occurred during these periods. Table 1 shows the numerical and proportional growth of population in Libya between 1984 and 2006.

Table 1. Libyan population in censuses and the average of the growth in "1984, 1995, 2006"

Year	1984	1995	2006
Population	3231059	4389739	5323991
The annual growth rate	4.21	2.86	1.83

Source: Libya General Information Authority, 2006

As shown in Table 1, the population growth rate in Libya tends to decrease within the highlighted periods. It dropped from 4.21% in 1984 to 2.86% in 1995, and subsequently to 1.83% in 2005. However, this progressive decrease in population growth reflects a considerable

rise in environmental awareness.

The population in the study area (as shown in Table 2) presents a continuous increase of the population of Shabia Al-Jafara. In the 1984 population census, the population stood at 260,701. It increased to 34899 in the 1995. The population of the region continued to grow up to 2006, in which it showed a drastic increase to 422999. Therefore, the percentage of population growth on yearly basis stood at 2.2%. In Shabia Az Zawia, the population as at the 1984 census stood at 159598. While in the subsequent years, the population noticed a significant increase. In the population census of 1995, it increased to 220,135 and in the year 2006, it increased to 270751. The yearly increase in percentage of Az Zawia stood at 2.3%, which is regarded as the highest percentage among the three Shabias of the study area. However, the population of Shabia Zuwarah in the 1984 population census was about 171134, this rose to 225771 in the census of 1995, and finally in 2006 the population reached 269553. The percentage of the population grow rate between the first and last censuses reached 2.0% per annum.

Generally, the total population of the study area in the census of 1984 reached 591433, in 1995, it rose to 794904 and finally in 2006, it reached 963303. This means that there is a significant increase in the population growth of the area between the two censuses of 1984 and 2006 with actual number of 371870 inhabitants. The approximate percentage increase stood at 2.2%. Meanwhile, population density in the area has increased significantly through the same period, where it rose from 190.5 inhabitants per km<sup>2</sup> in 1984 to 256.1 inhabitants per km<sup>2</sup> in 1995 and then to 310.3 inhabitants per km<sup>2</sup> in 2006. The reason behind this development is the improvement in standard of living with the availability of efficient health facilities. These provisions brought about increase in birth and mortality rate during the stipulated period of the study.

Table 2. The increase in population and growth rate of the study area during the period (1984-2006)

Area	Population in 1984	Population in 1995	Population in 2006	Growth rate (%)		
				1984-95	1995-06	1984-06
Al Jafara	260701	348998	422999	2.6	1.7	2.2
Az Zawia	159598	220135	271751	2.9	1.9	2.3
Zuwarah	171134	225771	269553	2.5	1.6	2.0
Total	591433	794904	963303	2.7	1.7	2.2
Density/ sq km	190.5	256.1	310.3			

Source: Libya, Secretariat of Planning, Department of Statistics and Census, 1984, 1995 and, 2006

### **Conclusions and final comments**

This study aimed at assessing the relationship between population growth and desertification/land degradation in north-western Libya. The following conclusions and comments are drawn from the above stated discussions and they correspond to the study that is still in course. The total population in study area has increased during the period (1984-2006), from 591433 in 1984, to 794904 in 1995 and later to 963303 in 2006. This gives a resultant increase of 371870 inhabitants within the period of study. On the other hand, the population density in study area has increased significantly between 1984 and 2006, rising from 190.5 inhabitants per km<sup>2</sup> in 1984, to 256.1 inhabitants per km<sup>2</sup> in 1995 and then to 310.3

inhabitants per km<sup>2</sup> in 2006, see Table 2.

This rapid population growth and high population density in the region significantly affects the available natural resources through exploitative hypersensitive pressure caused by the growth. Furthermore, the rural-urban migration over the past decades generated drastic pressure on the available facilities in the urban centres. The effect was sustained by expansion in the urban centres with creation of network of roads, linking the centres as well as increase in the number of animals which serve as the main source of economy to the populace. Thus, this requires a significant increase in agricultural land and water supply. The abuse of environmental resources by deforestation and ploughing the soil in unsuitable weather condition should be discouraged. These contributed to the degradation of soil and vegetation, low levels of water and finally degraded the quality and quantity of groundwater. In conclusion, the status of population growth in the region is alarming, hence it is regarded as the most influential factor for the spread of desertification in the area.

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