

Impact of Future Climate Change on Egyptians Population

By

Khaled El-Sayed Hassan

Economic Demographer and Statistical Expert

Egyptian Society for Migration Studies

Ph.D. in Economic management

Email: kehassan@gmail.com

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Abstract:

Egypt is one of the potential vulnerable countries to the effect of climate change (warming). The negative consequences of climate warming are Sea Level Rise (SLR), water scarcity, agriculture and food insufficiency, and pressures on population dynamics and dimensions. The most probably impacts of climate change are: migration of part of the Egyptian population, increase in population density, adverse impacts on human health (crowding and tropical diseases), exaggerated the problem of water supply and demand, food insufficiency, and contamination of fresh ground water. Climate change will affect all economic activities in Egypt with different levels. Agriculture sector will be the mostly severely impacted followed by the industrial sector and tourism sector. Fisheries and tourism are likely to be the most impacted jobs by climate change. Because of climate change, population growth and development pressures, international conflicts could arise over rights to shared Nile River. Concrete sea walls to protect the beaches along the Mediterranean, reducing the population growth to the replacement level, and producing 20% of total energy from renewable and clean sources are the most important strategies to confront the problem.

Keywords:

Climate change – Egypt – Population dimensions.

Economic Demographer and Statistical Expert,

Demographic Consultant at UNDP-Kuwait.

Ph.D. in Economic Management, Sadat Academy for Management Sciences,
Egypt.

E. mail : kehassan@gmail.com

I. Introduction:

Egypt is one of the potential vulnerable countries to the effect of Global climate change or Global Warming (World Bank, 2009), and regarded as the fifteenth most populated country in the world with susceptible human-induced of environment that would worsen the prevalent problems (El-Shahawi, 2004). Egypt's negative environmental consequences of climate warming represents in the rise of sea level, water scarcity, agriculture and food insufficiency, and pressures on human health and national economy (Saber, 2009). The future impact of the above negative environmental consequences of climate change on the Egypt's population dimensions and dynamics are the main points of our concern in this study.

1.1 Data sources:

The present study based on data of the assessment of the elements of climate change obtained from different sources such:

- Center for Remote Sensing at Boston University,
- World Bank,
- Center of International Earth Science Information Network,
- Center for health and the Global Environment, Harvard Medical School,
- Climate Prediction and Application Center (ICPAC),
- The Intergovernmental Panel on Climate Change (IPCC),
- United Nations Environment Program (UNEP),
- World Meteorological Organization (WMO),
- Egyptian Environmental Affairs Agency, and
- Central Agency for Public Mobilization and Statistics, Egypt.

1.2 Methodology:

The study pursued the descriptive approach in analyzing data collected from different sources about the emphasis of climate change and its future impacts on the demography, geography, and economic situations of Egypt.

II. Emphasizes of climate change in Egypt:

Egypt is expected to suffer from many emphasizes of climate change in the recent century. These emphasizes can be summarized in the following points:

1. The future predictions of average temperature in Egypt, as a result of global warming to an increase by 4°C in Cairo and by 3.1 to 4.7 °C in the rest of Egypt by 2060 (Brauch, 2002). The International Plant Protection Convention (IPPC) projected a further 2-11 degree Fahrenheit (1.4 to 5.8 °C) rise in average global surface temperature during the 21st century (Yarian, 2007).

2. The annual precipitation may drop by 10 to 40% over most of Egypt by 2100 (Boko, 2007).

3. Raising the Mediterranean Sea level by 0.5m by 2050 (Brown et al., 2011). This will lead to flooding the coastal areas along the Nile Delta.

III. Climate change and Egyptian population:

Of course, the occurrence of the above emphasizes of climate changes will associate with doubling the Egyptian population to be 160 million by the middle of the century (2050) (UN, 2005). Such association between climate change and population increase will lead to many unfavorable demographic, geographic and economic factors, can be summarized in the following sections:

3.1.1 Population and water security:

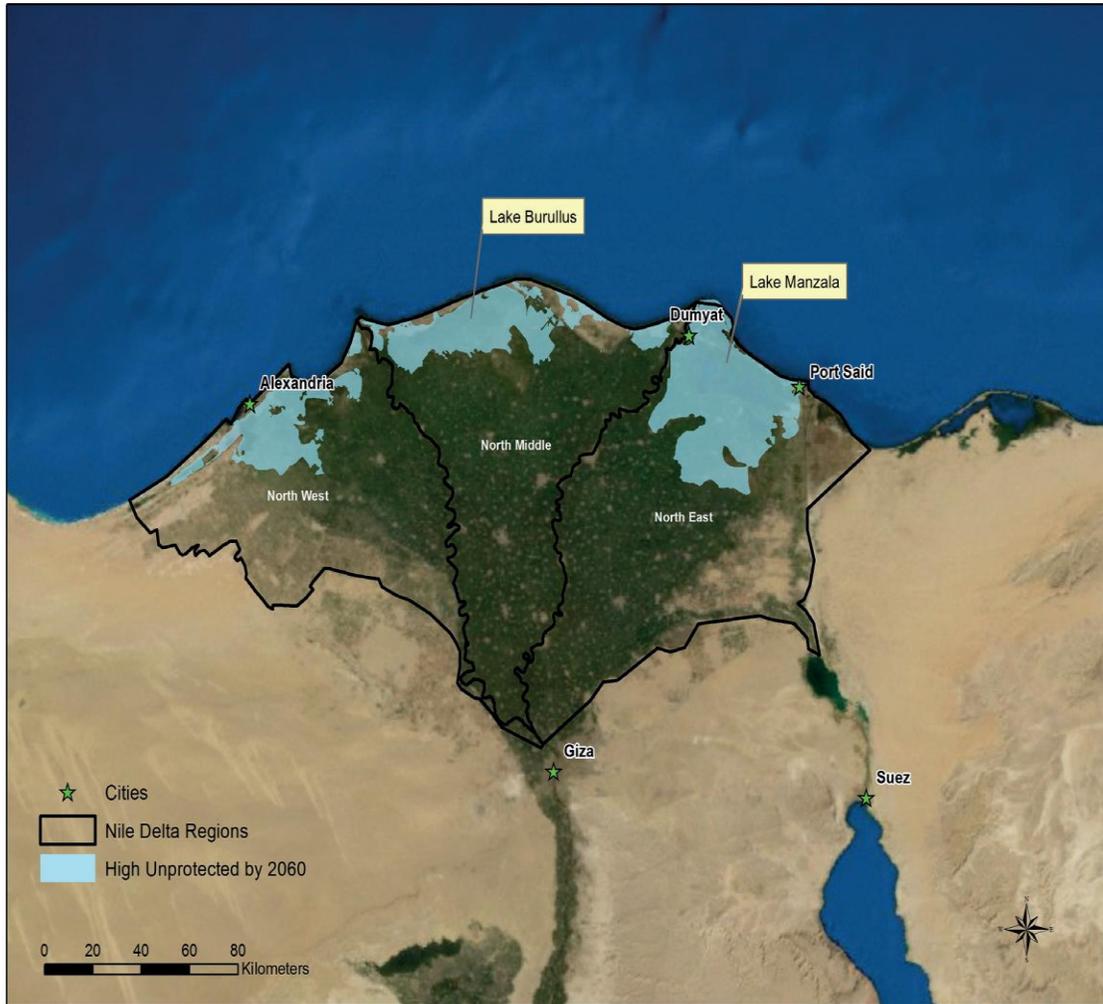
The first impact of climate change in Egypt is likely to be the felt in water domain. Water is already a limited resource, with per capita share at the edge of poverty line, below 1000m³ per year (El Quosy, 1999). Nile River provides more than 95% of all water to Egypt. The annual rainfall varies from a maximum of 180mm/year on the North coast, to an average of 20 mm on the middle of Egypt to 2 mm/year on the Upper Egypt. Both water supply and demand are expected to be exaggerated by climate change. It is expected by 2050 that climate change will raise water demand by an average of 5% (Eid, 1999). Most of the future projections indicate to declines in water availability, reach in some cases to 70% (El Quosy, 2008). Agriculture sector will be the most effected economic sector by the shortage of water, it consume 80% of water budget (Latif, 2012), absorb 40% of Egyptian labor, and constitutes 20% of gross national Product (GNP).

3.1.2 Population and food security:

Sea level rise is another emphasize of climate change. Nile Delta is already subsiding at a rate of 3-5mm per year. A rise of 1.0m would flood one-fourth of the Nile Delta (Figure 1), forcing about 10.5 percent of Egypt's population from their homes (World Bank, 2009 and UNDP, 2013). The impact would be more staggering if Egypt's population, as expected, doubles to about 160 million by the middle of the century, with the current population density in Delta of about 4,000 people per square mile.

As a result of sea level rise and flooding a great part of Nile Delta (the most cultivated part of Egypt's land), food production and supply would be effected. Nearly half of Egypt's crops, including wheat, bananas and rice, are grow in the Delta. On the other hand the remain areas of Nile Delta (not under water) would also be affected, with salt water from the Mediterranean Sea which will contaminate the fresh ground water used for irrigation. Agriculture activities and self-sufficiency of food will expose to an additional effect as a result of temperature increase. The decline in agriculture activities due to temperature increases is expected to range from 10 to 60% (UNDP, 2013).

Figure 1: Impact of Sea level rise on the Delta of Nile River, according to estimates of UNDP, 2013



Source: United Nations Development Programme (UNDP), (2013). “Potential Impacts of Climate Change on the Egyptian Economy.

Note: Flooded areas highlighted by light blue color.

Approximately the same result of the impact of sea level raise on the Delta of Nile River is observed by Hans study (Hans. 2002). The study indicated to the same effect and the same location of expected flooded areas are in great consistency with UNDP, 2013 study, as explained in the map included in Figure2.

Figure 2: Flooded areas and locations of the Delta of Nile River, according to Hans study, 2002



Source: Hans Günter Brauchm G. H. (2002). "Climate Change and Conflict Prevention" Can climate change impacts increase conflict potentials? German Federal Ministry for the Environment.

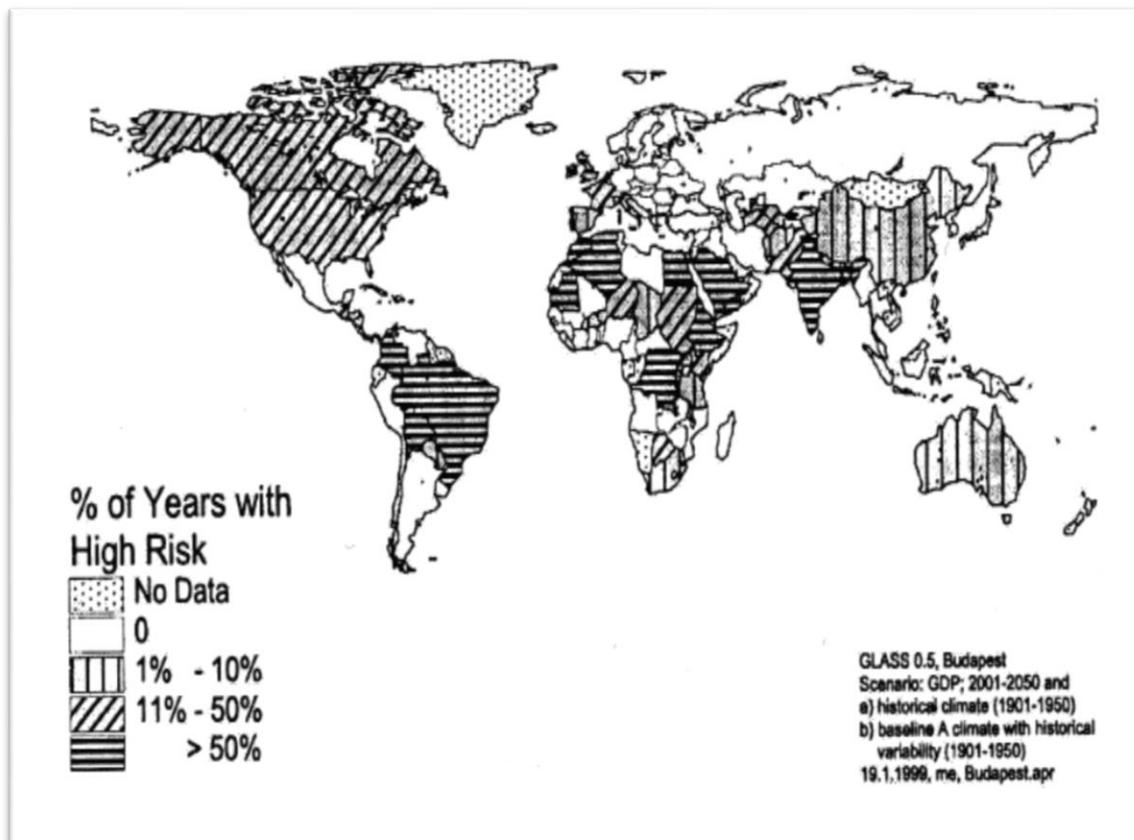
Note: Flooded areas highlighted by blue color.

The production of the strategic crops will achieve significant reduction by the middle of the century (2050). The production of wheat will reduce by 18%, production of rice will reduce by 11%, and production of maize will reduce by 19%.

The risk of malnutrition and hunger among population will increase if such losses is not planned and financed (Nellemann, 2009), especially with the low level of Gross Domestic Production (GDP) and per capita income (below US\$ 1.200 per person). The

following map explains that Egypt is among the high potential countries/regions for food crisis during the coming 40 years.

Figure 3: Distribution of world's countries/regions according to their potential food crisis 2001-2050



Source: Hans Günter Brauchm G. H. (2002). "Climate Change and Conflict Prevention" Can climate change impacts increase conflict potentials? German Federal Ministry for the Environment.

The increase in temperature will associated with some changes in ecological system and increase in air pollution as a result of emissions, soil erosion and wind speed. The new climate situation would increase the amount of Saharan dust carried across the

country causing health and economic problems. Such emphasizes will lead to some case of demographic dislocation (increasing of immigration pressure to Europe), socioeconomic disruptions, Increase in population density. Water/per-capita will reduce to 452m³ in 2060 (World Bank, 2009).

3.1.3 Population and Health:

Climate change is expected to have adverse impacts on human health in Egypt, and will be aggravated by high population densities. These may include increases in the prevalence and severity of asthma, and infectious diseases, vector borne diseases, skin cancer, eye cataracts, and heat strokes. Extra deaths from cardiovascular and respiratory illness, diarrhea and dysenteric infections are expected. High rate of child mortality and more frequent cases of child malnutrition are expected (Saber, 2009).

Egypt ranked as the 31st in total emissions with 221.1 million tons of carbon dioxide CO₂ emitted yearly, making Egypt is responsible for 0.6% of global emissions. Egypt ranked as 94th in terms of per capita emissions with 3 tons of CO₂ per person. The World Bank categorizes Egypt as one of the top level of countries in terms of growth in emissions and states “under usual business conditions (World Bank, 2009b), Egypt could face a 50% increase in greenhouse gas emissions (from 2007 level) in the electricity sector alone” (Shardul et al., 2004).

Climate change will affect the population’s economic activities. Just a quarter of meter rise in sea level would devastate the populous cities that drive Egypt’s economy. Forty percent of Egyptian industry is located in Alexandria alone; a 0.25m rise in sea level would put 60% of Alexandria’s population of 4 million below sea level, as well as 56.1% of Alexandria’s industrial sector. A rise of 0.5m would be even more disastrous, placing 67% of the population, 65.9% of the industrial sector, and 75.9% of the service sector below sea level. Thirty percent of the city’s area would be destroyed, 1.5 million people would have to be evacuated, and over 195,000 jobs would be lost. Alexandria is not the only Egyptian city that would be devastated by even a 0.5m rise in sea level. A

0.5m rise would cost over 2 billion dollars and eliminate over one third of the jobs located in Rosetta, another city in the Delta. The Egyptian Report to the United Nations Framework Convention on Climate Change (UNFCCC) in 1999 estimated that sea level rise would force the migration of 2 million people currently living in the Nile Delta. Other cities threatened by a rising sea level in the delta include Port Said, Matruh City, and Arish City (Shardul et al, 2004).

Climate change will harm Egypt’s tourism sector through sea level rises. The Nile Delta is home of many of Egypt’s tourism, and for cities like Alexandria and Matruh City, the threat of a rising sea level will reduce both their capability to sustain tourism as well as the desire of tourists to visit them. Forty-nine percent of Alexandria’s tourism industry would be underwater if sea level rose 0.5m (Shardul et al, 2004)..

Table (1): Potential loss of areas, population and land use due to Sea Level Rise (SLR) over Alexandria Governorate (by percentage)

Elevation	SLR 0.5 m	SLR 1.0 m	SLR 2.0 m
Area	51	62	76
Population	50	64	79
Agriculture	93	95	100
Industry	65	70	90
Residential	45	50	75
Municipal Services	30	50	70
Commercial Areas	20	25	35
Community Facility	15	20	30
Archeological Sites	48	55	70

Source: United Nations Development Programme (UNDP), (2013). “Potential Impacts of Climate Change on the Egyptian Economy

Disruption to the Egyptian tourism sector could have broader societal implications, as 20% of Egypt’s foreign currency earnings are from tourism, 12.6% of the workforce depends upon the tourism industry (Yeranian, 2009). The dangers climate change poses to Egypt’s tourism sector and economy, as a whole should not be underestimated (Knickmeyer, 2008).

International conflicts could arise over rights to shared Nile River as a result of climate change, population growth and development pressures (Gleick, 1993). There are already disputes between Egypt, Sudan and Ethiopia over the Nile. Existing regional agreements will become more strained, if water availability declines or as demand increases as a result of climate change and/or population growth and regional developments.

Table (2): The expected size of displaced population and loss of employment persons due to Seas Level Rise (SLR) in Alexandria Governorate

(in Thousands)

Year	2000 (SLR=5cm)	2010 (SLR=18cm)	2030 (SLR=30cm)	2050 (SLR=50cm)
-Area at risk (km2)	32	144	190	317
-Population to be displaced	57	252	545	1,512
-Loss of Employment:				
a- agriculture	0,336	1,370	3,205	8,812
b- tourism	1,359	5,737	12,323	33,919
c- industry	5,754	25,400	54,936	151,200
-Total loss of employment	7,449	32,509	70,465	195,443

Source: United Nations Development Programme (UNDP), (2013). “Potential Impacts of Climate Change on the Egyptian Economy
SLR: Sea Level Raise.

IV. Conclusion and policy implication:

We can conclude that Egypt is more likely to be faced with unbalanced economic situation represents in decrease in supply side (as a result of severe climate changes) and increase in demand side (as a result of increasing of the population size). Population distribution, agriculture sector will be the mostly severely impacted followed by the industrial sector and tourism sector. Fisheries and tourism are likely to be the most impacted jobs by climate change.

The government of Egypt tries to confront the problem through building concrete sea walls to protect the beaches along the Mediterranean. Other policies to reduce the population growth rate to the replacement level of 2.1 by 2019 are applied. Increasing the inhabited area of Egypt through establishing new cities in desert with a comprehensive infrastructure and facilities represents one of Egypt's policies to meet the demand of new generations on housing and to face the potential impact of climate change. To face the problem of heat emissions, Egypt has a goal of producing 20% of total energy from renewable and clean sources by the 2020.

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