CLIMATE CHANGE AND ITS IMPACTS ON EGYPTIAN AGRICULTURAL PLANT SECTOR

A State of Art

By

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٢٠١٦

THE DEFINITION OF THE BOOK

Name of the book

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The edition

The first, October 2016

Publisher

Agricultural Economy Dep., Faculty of Agriculture,

Kafr El-Sheikh University

No. placement in the Egyptian book House

21951 / 2016

التعريف بالكتاب باللغة العربية

اسم الكتاب:

التغير المناخي وتأثيراته على القطاع الزراعي النباتي المصري

المؤلفين:

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د/ سرحان احمد سليمان... الباحث بمعهد بحوث الاقتصاد الزراعي، مركز البحوث الزراعية.

الطبعة:

الاولى، اكتوبر ٢٠١٦

الناشر:

قسم الاقتصاد الزراعي، كلية الزراعة، جامعة كفر الشيخ

رقم الإيداع بدار الكتب المصرية: ٢١٩٥١ / ٢٠١٦

EDITORIAL WRITERS

The phenomenon of climate change has become a fact confirmed by scientific studies, where the world witnessed changes in temperature and precipitation, in addition to other sudden changes such as the floods in the regions of the world and drought in other regions. Of course the continuation of these changes will have economic effects variety from state to other. Egypt is considered one of the first states that will be affected by climatic changes, especially the Egyptian agricultural sector which will have negative impacts on the availability of agricultural goods and thus will affect food security in Egypt.

From this standpoint, considered the study of climate change and its effects and to various economic sectors is the importance, for the prospects of how to reduce or avoid, still reality confirms the scarcity of studies on the subject, therefore of the utmost importance that this book attempt to know the phenomenon future prospects and its effects and the ways in which they can reduce them.

This book is the contains of the work of the two researchers in the field of climate change, where this book includes research work previously published in this field, printed in a book for researchers and a reference paper included many useful results which can be built upon, or take advantage of them.

Pro.Dr. Mahmoud Mohamed Fawaz
Dr.Sarhan Ahmed Soliman

liberation in October 2016

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Introduction

The phenomenon of climate change has become one of the issues, which has always been at the global level, in the light of the possible consequences of serious changes that threaten the future of the land. It was pointed out by one of the studies published by the International Organization (WMO) to the rise in average global temperatures of about 4 C° by the year 2060, presumably to result in the rapid rise to threaten the stability of the world through the disruption of supplies of food and water in many parts of the world, particular in the continent of Africa, the negotiations that take place under care of the United Nations Framework Convention on Climate Change an important turning point global agreement on climate change after the year 2020, Which was held in Paris in December 2015 [**Fawaz, and Soliman, 2015].**

Change in the global climate resulting from human activity has already begun, and the continuation of this change and the prospects for the response of the international community, will not be quick, which makes the climate change more serious in the future than is the estimated now, with predicted more floods, hurricanes, and strong sea level rise up to about 59 centimeters during the current century **[El-Raey. 2000, IPCC, 2007]**.

Also, it is expected that about 33 cities in the world which have nearly 8 million people, will be threatened because of the rising sea level, of which 21 cities are the most vulnerable to the risk of sea-level rise, and Alexandria in Egypt is one of those cities, although Egypt has been classified as one of the five countries in the world are vulnerable to the negative impacts of climate change, such as rising sea level or sinking parts of Delta and reflected in all social and economic harm, the issue of climate change was not taken seriously in Egypt **[F.A.O, 2015]**.

On the other hand, climate change is likely to involve changes in safe conditions of food and territorial integrity with increasing pressure incoming sexually transmitted diseases through incubators, and water, as well as airborne by the food itself. The implications of this significant decline in agricultural productivity, and in labor productivity, lead to the aggravation of poverty and increasing rates of mortality. Climatic changes that occur in the time are serious drought.

Also, "the Institute for control of the world “Worldwatch Institute” is expected to be in its report in year 2007 that about 33 cities in the world peopled rates of up to nearly 8 million people, will be threatened because of rising sea levels, in the year 2015, of which 21 are the most vulnerable to the risk of sea-level rise, Alexandria in Egypt is between of those cities, despite that Egypt has been classified as one of the five countries in the world are the most vulnerable to the negative impacts of climate change, rising sea level or sinking parts of Delta and reflected in all social and economic harm, the issue of climate change was not taken seriously in Egypt **[worldwatch, 2007]**, which hits some areas of the world, while rainfall causes devastating floods and torrential rains in other areas. Large emissions occurred since the beginning of the industrial revolution in Europe, leading to the emergence of the phenomenon of global warming.

Thus, the most features of the global climate changes are the increase in the melting of the snow in the North and South poles, increasing the water levels in the seas and oceans and involving the risk of sinking parts of the world, especially low-lying areas. Egypt is not so long ago, and such climatic changes will affect the available natural resources, especially the relative scarcity of suppliers’ feature foundations, namely, land and water resource, which will lead to direct and farreaching impact on the agricultural sector and will affect those climatic changes on the food in the world, leading to the rise of world food prices and an increase in Egyptian food invoice. Thus the pressure on the Egyptian general budget, where Egypt is a net importer of food **[W.C.E.D. ,2009]**

On the other hand, climate change is likely to involve changes in safe conditions of food and territorial integrity with increasing pressure incoming sexually transmitted diseases through incubators, and water, as well as airborne by the food itself. The implications of this significant decline in agricultural productivity, and in labor productivity, lead to the aggravation of poverty and increasing rates of mortality.

Climatic changes that occur in the time being serious drought, which hits some areas of the world, rainfall causing devastating floods and torrential rains in other areas. pathogenic main changes in emissions are large, which had been taking place, which began with the onset of the industrial revolution in Europe and continuing until now, which has led to the emergence of the phenomenon of global warming. thus, the global climate changes, which are the most important features is the increase in the melting of the snow in the North and South poles and thus increase the water levels in the seas and oceans, which involves the risk of sinking parts of the world, especially low-lying areas, and Egypt is not so long ago, such climatic changes will affect the available natural resources, especially the suppliers feature foundations relative scarcity in Egypt, namely, land and water resource, which will lead to direct and far-reaching impact on the agricultural sector.

Will affect those climatic changes on the food in the world, leading to the rise of world food prices, and would lead to an increase in Egyptian food invoice. Thus increasing the pressure on the general budget of the State, sooner or later food Egypt foreign exposure, where Egypt is a net importer of food. Since the launch in 2008 of the United Nations' Green Economy Initiative (GEI), one of nine joint crisis initiatives, there has been a proliferation of interpretations and definitions **[UNEP, 2011].**

A number of other terms, including ' green growth' and 'greening the economy', have also been widely adopted and used interchangeably in connection with an ever-increasing number of economic sectors, such as energy and water; topics, for example, mobility and consumption; and concepts such as the polluter pays principle and life cycle analysis. The concept of a 'green economy' does not replace sustainable development, but there is a growing recognition that achieving sustainability rests almost entirely on getting the economy right. Decades of creating new wealth through a ' brown economy' model based on fossil fuels have not substantially addressed social marginalization, environmental degradation, and resource depletion. In addition, the world is still far from delivering on the Millennium Development Goals by 2015

A green economy can refer to sectors (e.g. energy), topics (e.g. pollution), principles (e.g. polluter pays) or policies (e.g. economic instruments). It can also describe an underpinning strategy, such as the mainstreaming of environmental policies or a supportive economic structure. Resource efficiency is a closely related concept since the transition to a green economy depends on meeting the twin challenges of maintaining the structure and functions of ecosystems (ecosystem resilience) and finding ways to cut resource use in production and consumption activities and their environmental impacts (resource efficiency). Whatever the underlying approach of green economy is, it stresses the importance of integrating economic and environmental policies in a way that highlights the opportunities for new sources of economic growth while avoiding unsustainable pressure on the quality and quantity of the natural assets. This involves a mixture of measures ranging from economic instruments such as taxes, subsidies, and trading schemes, through regulatory policies, including the setting of standards, to non-economic measures such as voluntary approaches and information provision.

However, far fewer cover other important (often newer) aspects of green economy, including futures and scenarios, environmental impact assessment/strategic impact assessment (EIA/SIA), corporate social responsibility (CSR), life-cycle analysis (LCA), and finance, trade and tourism. Assessments are overwhelmingly focused on the state of different priorities, and this is particularly the case for the more well-established or traditional themes. Other aspects of the DPSIR framework (drivers, pressures, state, impacts and responses) are discussed much less frequently. Most assessments cover well-established themes, such as energy, industry, and governance (green economy), and use of natural capital (resource efficiency).

Generally, the book tries to answer the following questions:

1. What are the climatic changes that have occurred in temperature and rainfall in Egypt?
2. What are the changes which have occurred carbon dioxide emissions? The extent of the change in the average per capita in Egypt, as well as changes in the methane and nitrous gasses and the relationship between these emissions and economic activity in Egypt?
3. What is the role of the agriculture sector in the climatic changes, the emissions of these changes? And what is its role in an attempt to be eased or reduce them?
4. What are the annual rates of energy production and consumption in Egypt? The proportion of clean and renewable energy? Their relationship to climatic changes?
5. What is the impact of climate change on cultivated and crop area, productivity and consumption of water of the Egyptian major agricultural crops? And What is the impact of climate change on Egyptian water balance?
6. Is there an impact of climate change on agricultural employment and productivity agricultural labor?
7. What are the expected scenarios for impacts of climate change on the Egyptian agricultural production?
8. What is the role of agriculture to overcome climate change? And what are the ways in which they can overcome or mitigate the effects of climate change on the productivity of the major crops cultivated to reduce the impacts of climate change?

9. What are the Egyptian efforts to mitigating the impacts of climate change?
10. What is the green economy, and what is its role in alleviating or reducing the climatic changes in Egypt? And What is the Challenges and Gains of the Egyptian economy heading toward the green economy?

Mainly, this book aims to study and analysis the climate change in Egypt, and the expected impacts of climate change on the Egyptian agricultural production, by valuation the impacts of climate change on the impact of climate change on cultivated and crop area, productivity and consumption of water of the Egyptian major agricultural crops, also the impact of climate change on Egyptian water balance, as well as targeting access to the best scenario possible expectations of the impact of climate change on the cultivated and crop area in Egypt by year 2030, to know the dangers that will befall the Egyptian agriculture production, and then the means that can overcome or mitigate such effects. In addition to, the role of the green economy to limit or reduce the impact of climate change on the Egyptian economy.

So, this book to achieve the main objective seeks to achieve the following sub-objectives:

1- Stand on the trend of climate variables in Egypt: include study the trend of Temperature, rainfall and greenhouse gases emissions.

2- Study and analysis of the evolution of the carbon dioxide emissions as the most emissions of these changes and the average per capita, as well as the evolution of emissions of methane and nitrous gases, also, the extent of the contribution of the agriculture sector in such emissions, to determine the role of agriculture in the climate change and can therefore develop policies and methods to reduce them, since agriculture can ease the climate change by reducing the contribution of emissions.

3- Study and analysis of indicators of Egyptian economic activity: include the study of the evolution of the agricultural gross production value, GDP value, and the average per capita of GDP, as well as the ratio of the contribution of the agricultural sector in the gross domestic product (GDP).
4- Determination the relationship between the Egyptian economic activity, represented by the value of the gross domestic product (GDP), and carbon dioxide emissions, as the most components of the greenhouse gasses emissions.
5- Stand on indicators of the production and consumption of energy in Egypt: include the study of the trend of the production and consumption of energy in Egypt and the average per capita share of each of them, as well as Egypt's consumption of renewable and alternative sources of energy and attribution in total energy consumption.
6- Definition of the green economy and its role in the reduction or limitation of the climate change in Egypt and determination the Challenges and Gains of the Egyptian economy heading toward the green economy: include studying the difficulties and the benefits that can be derived from the Egyptian attitude toward the path of the green economy in the major economic sectors, the most important of the agriculture, water, energy, and waste.
7- Stand on the impacts of climate change on the production of the most agricultural crops, and water resources in Egypt.
8- Stand on the expected scenarios to the impacts of climate changes on the cultivated and crop area in Egypt.
9- Stand on the proposed working methods to reduce or overcome the effects of climate change on some aspects of the agricultural sector such as productivity of the major agricultural crops, as well as to the role of agriculture in overcoming the phenomenon in Egypt.
10- Stand on the Egyptian efforts to mitigating the impacts of climate change.

This book depends on a descriptive and quantitative analytical method to assess study and analysis of climate variables in Egypt and its impact on the Egyptian economy, as well as analysis of the Egyptian economic activity and its relationship to the carbon emissions, also, study of the indicators of the production and consumption of energy in Egypt and its relationship to climate change, in addition to examine the role of agriculture in greenhouse emissions evolve over time to stand on the evolution of the study variables and the extent of the complexity of the relationship with each other to achieve the objective of the study to know the evolution of the impact of climate change on the Egyptian economy, generally, and agricultural sectors practically. in addition to its effects on agriculture, as well as stand on some scenarios to assess climate change impacts on the cultivated area and productivity of the most important agricultural crops. as well as water resources in Egypt, will be in the year 2030 by drawing on the various possibilities of the impact of climate change on the productivity of the most agricultural crops, land and water resources, and other aspects of the agricultural sector in Egypt.

The book was adopted on data, statistics and reports of several worldly and Egyptian intergovernmental organizations, which is the data from the Ministry of Agriculture and Land Reclamation, reports issued by the Central Agency for Public Mobilization and Statistics, the Food and Agriculture Organization of the United Nations (FAO), the World Bank, and Economic Affairs of the Ministry of Agriculture, the dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA), World Bank national accounts data, and OECD National Accounts data files, International Energy Agency, United Nations, Eurostat, OPEC, U.S. Energy Information Administration, IEA Statistic, OECD/IEA, electronic files and web site.as well as some previous studies on the subject, in addition to data and statistics published by some on the international information network.

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Chapter: ①

Climate Change and its Relation of the Economic Activity in Egypt

Contents:

Chapter: ①

Climatic Changes and its Relation of the Economic Activity in Egypt

PREFACE

The Egyptian agricultural sector vulnerabilities by climate change which would have an impact on agricultural production, food security and the sustainable development in the agricultural sector. Therefore, important to study the current situation of climate change, the most reasons for emissions causing this phenomenon, and the role of the agriculture sector in greenhouse gasses emissions, and the relationship of the Egyptian economic activity and these emissions.

[1] Climatic variables in Egypt

1.1. Changes in temperature degree in Egypt

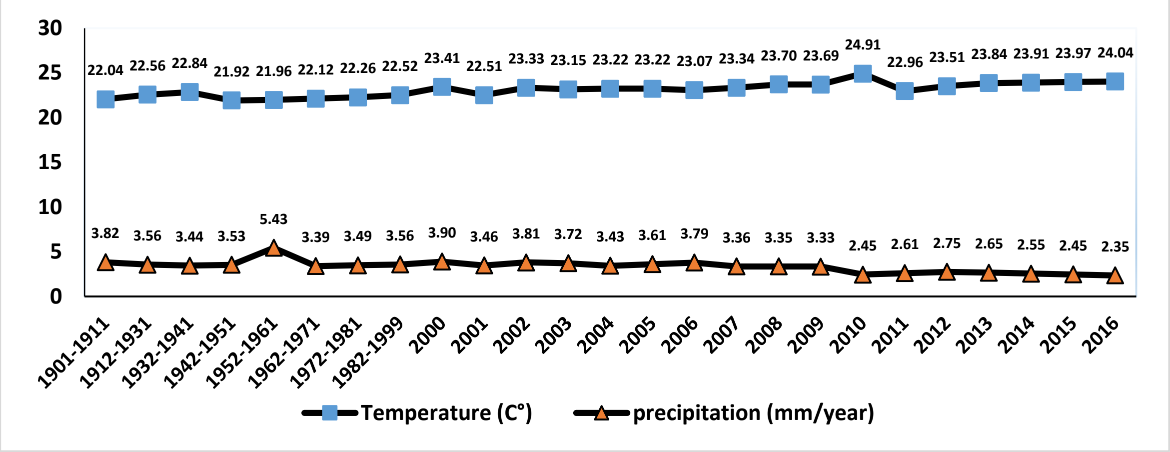
The data in the figure no. (1-1) shows that the annual average of temperature in Egypt during the period (1901- 2012) mounted to 22.96 C°, with significantly increased an annual average growth of 0.39%. while the annual average of temperature in Egypt during the period (2000- 2012) mounted to 23.39 C°, with significantly increased an annual average growth of 0.28%. The maximum growth of temperature in Egypt from 2000 to 2014 recorded in 2010: 5.16%, while the maximum fall minimum growth was in 2011: 7.84%. The temperature in Egypt from 2000 to 2014 reaching high of 24.91 C° in 2010.

1.2. Changes in precipitation in Egypt

The data in the figure no. (1-1) shows that the annual average precipitation in Egypt during the period (1901- 2012) mounted to 3.51 (mm/year), with significantly decreased an annual average growth of 1.51%. while the annual average precipitation in Egypt during the period (2000- 2012) mounted 3.35 (mm/year), with significantly decreased an annual average growth of 3.07%. The maximum growth of precipitation in Egypt from 2000 to 2014 recorded in 2002: 10.32%, while the maximum fall minimum growth was in 2010: 26.55%. precipitation in

Egypt from 2000 to 2014 reaching high of 3.9 (mm/year) in 2010, and reaching fall of 2.45 (mm/year) in 2010.

Figure no. (1-1): Temperature and precipitation in Egypt in the period (1901-٢٠١٦).



- **Volumes (2013- 2016) are estimated values, expected calculated by the researcher in the absence of the statement.**

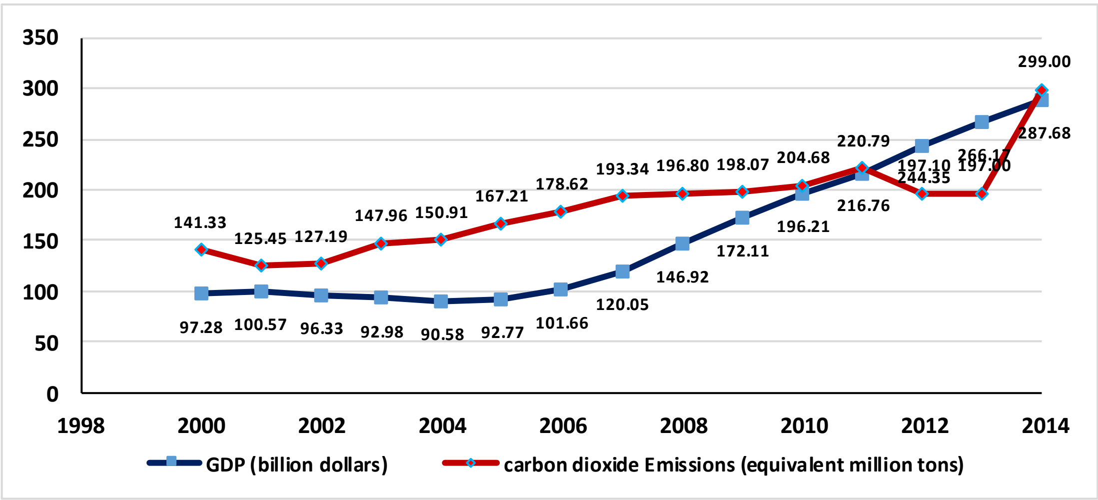
<u>Source</u>: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

Accordance with the trend of the timetable of temperature and precipitation during the period (1901- 2012), the expected rise in temperature in 2016 where it reaches 24.04 C° and an average temperature in the period (1901- 2016) about 13.12 C°, with an annual increase of statistically moral amounting to about 0.08 C°, or equivalent to an annual rate of about 0.34% of the annual average for the period., and is expected to reach precipitation in 2016 mounted of 2.35 mm, and an average precipitation during the period (1901- 2016) mounted of 3.35 (mm/year), with decrease statistically moral reached about 0.06 (mm/year), or the equivalent of the rate of decrease in reached about 1.7% of the annual average for the period.

1.3. Changes in carbon dioxide emissions in Egypt

The data in the figure no. (1-2) shows that CO_2 emission (Mt CO_2) in Egypt during the period (2000- 2014) totaled about 299 Mt CO_2 in 2014 (Mt = million tons), compared to 141.33 Mt CO_2 in 2013, with the growth rate was equal to 51.78%. CO_2 emissions increased by 157.7 Mt CO_2 from 2000 to 2014, equal about 11.57% of CO_2 emissions in 2000, and the average value amounted to 183.03 Mt CO_2, as equal 0.57% of the average value in the world during the same period. The average annual growth rate of CO_2 emissions in Egypt over that period was at about 4.71%, while the average annual growth rate of CO_2 emissions in the world at about 3.06%. The annual maximum growth rate of CO_2 emissions in Egypt from ٢٠٠٠ to 2014 recorded in 2014: 51.78% and the annual maximum fall minimum growth rate was in 2001: -11.23%. CO_2 emissions in Egypt of total CO_2 emissions in the world from 2000 to 2014 have been significantly increased with an annual growth rate at about 0.005%.

Figure no. (1-2): Egyptian GDP and co_2 emissions during the period (2000- 2014).



Source: **The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).**

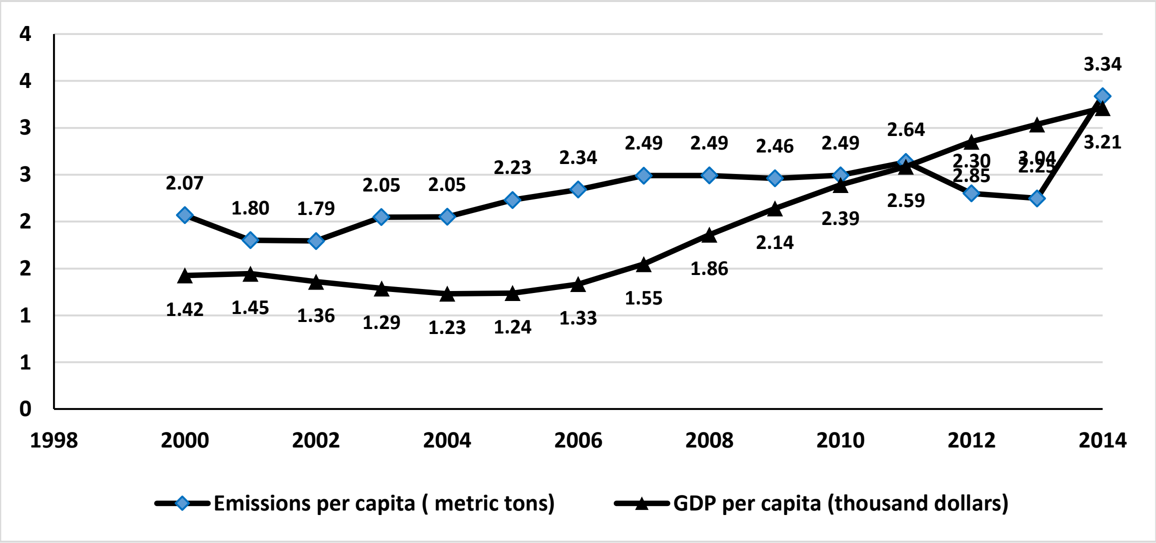
An average temperature in Egypt during the period (1901- 2012) was at about 22.96 C°, with an annual, statistically increase reached about 0.089 C°, and an average temperature during the period (2000- 2014) was at about 23.39 C°, with an annual statistically increase reached about 0,065 C°. While an average precipitation during the period (1901- 2012) was at about 3.51 mm/year, with an annual, statistically decline reached about 0.053 mm/year, and an average precipitation during the period (2000- 2014) was at about 3.35 mm/year, with an annual statistically decline reached at about 0.1 mm/year, as well as an average emissions of carbon dioxide emissions in the period (1990- 2012) was at about 129.59 million tons, with an annual statistical increase reached about 4.995 million tons, while an average emissions of carbon dioxide in the period (2000 - 2014) to about 173 million tons, with an annual statistical increase, reached about 7.69 million tons. These results confirm that the previous increase of the

temperature, decreased precipitation and increased carbon dioxide emissions during the period (1901- 2014), especially during the period (20000- 2014), underlines the fact climatic changes which are affected by Egypt, as Egypt is considered one of the countries most affected by climatic changes.

1.4. Changes Emissions of carbon dioxide per capita in Egypt

The data in the figure no. (1-3) shows that CO_2 emissions per capita in Egypt totaled 3.34 metric tons CO_2 in 2014, compared with 2.25 metric tons CO_2 in 2013. The growth rate was equal to 48.45% compared to the previous year. CO_2 emissions per capita increased by 1.26 metric tons CO_2 from 2000 to 2014, equal to 61.39% of CO_2 emissions per capita in 2000, and the average value amounted to 2.32 metric tons CO_2, equal ٥١.٥٣% of the average value in the world during the same period. The average annual growth rate of CO_2 emissions per capita in Egypt over that period was at about ٢.٨٤%, while the average annual growth rate of CO_2 emissions per capita in the world at about ١.٨٤%. The annual maximum growth rate of CO_2 emissions per capita in Egypt from ٢٠٠٠ to 2014 recorded in 2014: ٤٨.٤٥%, the annual maximum fall minimum growth rate was in ٢٠١٢: -١٢.٨٥%.

Figure no. (1-3): Egyptian GDP per capita and emissions of co_2 per capita during the period (2000- 2014).



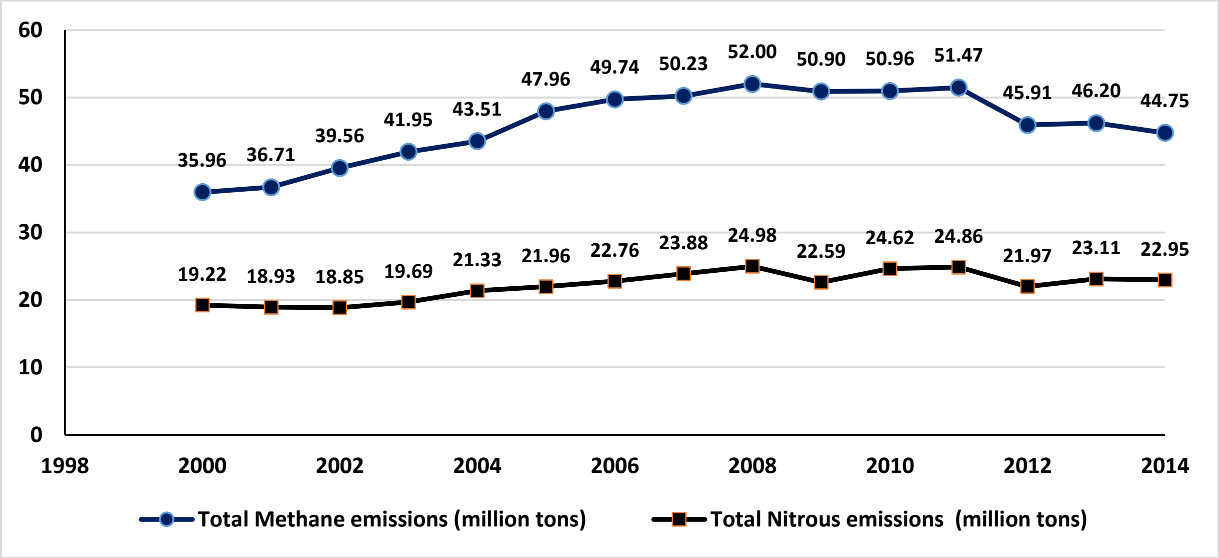
Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

1.5. Total emissions of methane and nitrous in Egypt

Total methane emissions in Egypt totaled 51.47 Mt in 2011, compared with 50.96 Mt in 2010, with a growth rate was equal to 1% compared to the previous year. total methane emissions increased by 15.51 Mt from 2000 to 2011, equal about 43.14% of total methane emissions in 2000, and the average value amounted to 45.91 Mt, with an average annual growth rate over that period was at about 2.69%. The annual maximum growth rate of total methane emissions in Egypt from ٢٠٠٠ to 2011 recorded in 2005: 10.22%, the annual maximum fall minimum growth rate was in 2009: -2.13%. figure no. (1-4)

Also, the data in the table no. (1-4) shows that total nitrous emissions in Egypt totaled ٢٤.٨٦ Mt in 2011, compared with ٢٤.٦٢ Mt in 2010, with a growth rate, was equal to 1% compared to the previous year. total nitrous emissions increased by ٥.٦٤ Mt from 2000 to 2011, equal to ٢٩.٣٧% of total nitrous emissions in 2000, and the average value amounted to ٢١.٤٧ Mt, with an average annual growth rate over that period was at about 2.١٨%. The annual maximum growth rate of total nitrous emissions in Egypt from ٢٠٠٠ to 2011 recorded in ٢٠٠٤: ٨.٩٦%, the annual maximum fall minimum growth rate was in 2009: -٩.٥٤%.

Figure no. (1-4): Total emissions of methane and nitrous in Egypt during the period (2000- 2014).



- **Volumes 2013, 2014 are estimated values, expected calculated by the researcher in the absence of the statement.**

<u>Source</u>: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

Accordance to the trend of the timetable of total emissions of methane and nitrous in Egypt during the period (2000- 2012) of the expected rise in total emissions of methane in 2014 where it reaches 44.75 Mt and the average total emissions of methane in the period (2000- 2014) about 45.4 Mt, an annual increase of statistically moral amounting to about 0.781 Mt or equivalent to an annual rate of about 0.36% of the annual average for the period., and is expected to reach total emissions of nitrous in 2014 about 22.95 Mt, and average total emissions of nitrous during the period (2000- 2014) about 22.1 Mt, decrease statistically moral reached about 0.36 Mt, or the equivalent of the rate of decrease in reached about 1.63% of the annual average for the period. The results indicate that the increasing methane and Nitrous emissions in Egypt, but rates increasing nitrous oxide emissions more than methane emissions, due to the sources of pollution to the respective.

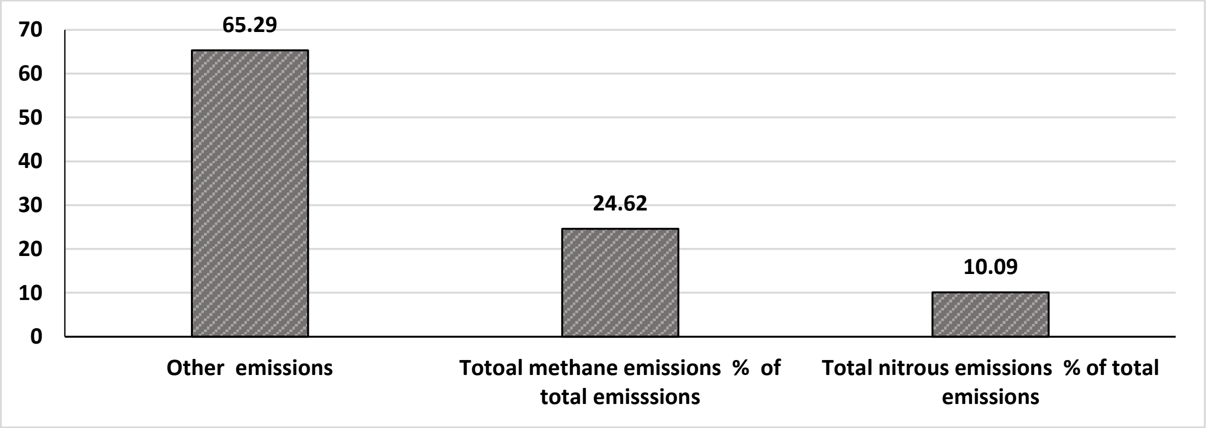
1.6. Relative the total emissions of methane and nitrous of the total emissions in Egypt

The data in the figures no. (1-5, 1-6) show that the total emissions of methane % of the total emissions in Egypt during the period (2000- 2014) varied from a minimum value of 22.85% in 2011, to a maximum value of 26.44% in 2002. Relative the total emissions of methane of the total emissions in Egypt have been significantly decreased with an annual average growth of 0.33%, with an annual average totaled of 27.14% during the same period. While an annual average of the total emissions of methane % of the total emissions in the world totaled of 24.72% and have been significantly decreased with an annual average growth of 0.22% during the same period.

Also, the data in the figures no. (1-5, 1-6) show that the total emissions of nitrous % of the total emissions in Egypt during the period (2000- 2014) varied from a minimum value of 8.44% in 2011, to a maximum value of 11.36% in 2000. Relative the total emissions of nitrous of the total emissions in Egypt have been significantly decreased with an annual average growth of 0.24%. The annual average of the total emissions of nitrous % of the total emissions in Egypt totaled of 13.04% during the same period. While an annual average of the total emissions of nitrous

% of the total emissions in the world totaled of 10.13% and have been significantly decreased with an annual average growth of 0.2% during the same period.

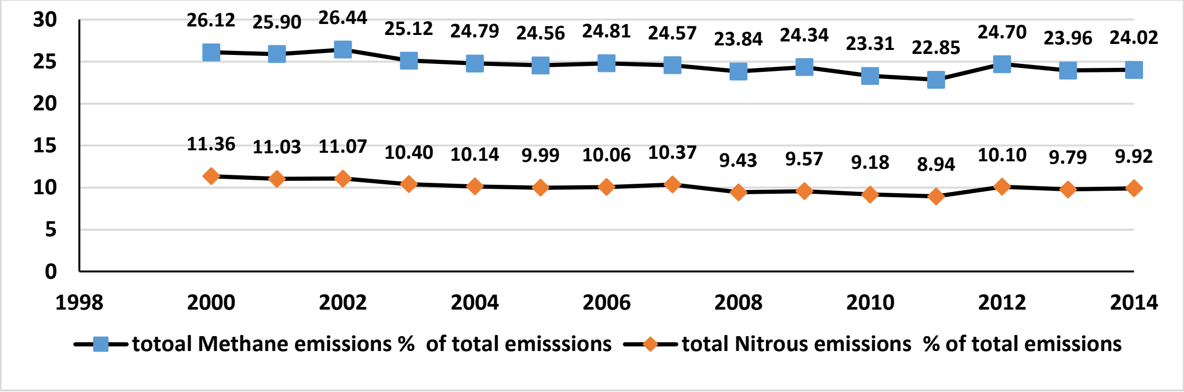
Figure no. (1-5): Total emissions of methane and nitrous of total emissions in Egypt during the period (2000- 2014).



- Volumes 2013, 2014 are estimated values, expected calculated by the researcher in the absence of the statement.

Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

Figure no. (1-6): Development total emissions of methane and nitrous of total emissions in Egypt during the period (2000- 2014).



- Volumes 2013, 2014 are estimated values, expected calculated by the researcher in the absence of the statement.

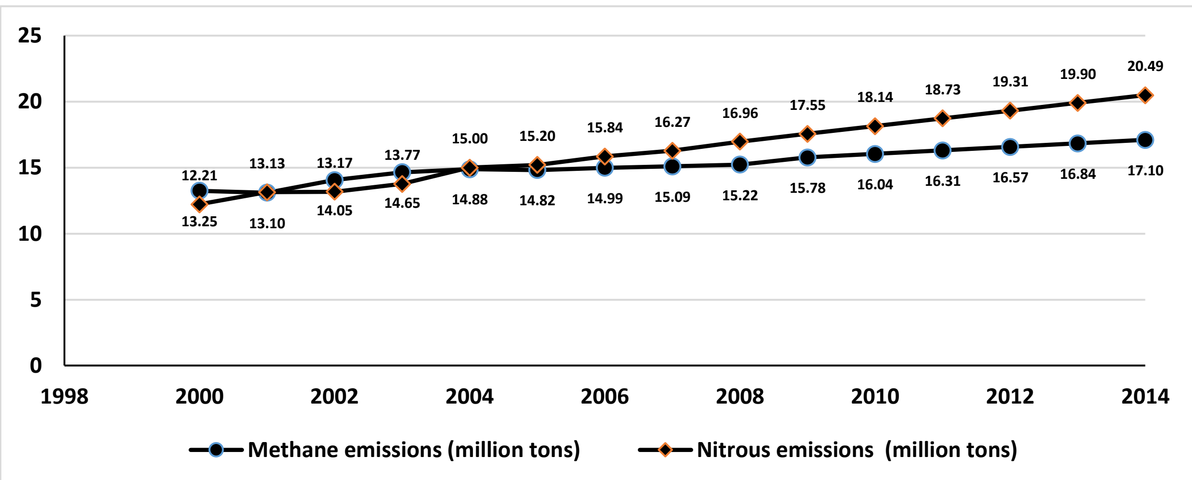
Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

1.7. Agricultural emissions of methane and nitrous in Egypt

Accordance data in the figure no. (1-7) shows that agricultural emissions of methane in Egypt during the period (2000- 2014) varied from a minimum value of 13.1 Mt in 2001, to a maximum value of 17.1 Mt in 2014. Agricultural emissions of methane in Egypt have been significantly increased with an annual average growth of 1.73%. The annual average of agricultural emissions of methane in Egypt totaled of 15.45 Mt during the same period. The annual maximum growth rate of agricultural emissions of methane in Egypt from ٢٠٠٠ to 2014 recorded in 2002: 7.25%, while the annual maximum fall minimum growth rate was in 2001: -1.13%.

Agricultural emissions of nitrous in Egypt during the period (2000- 2014) varied from a minimum value of 12.21 Mt in 2000, to a maximum value of 20.49 Mt in 2014. Agricultural emissions of nitrous in Egypt have been significantly increased with an annual average growth of 2.66%. The annual average of agricultural emissions of nitrous in Egypt totaled of 16.22 Mt during the same period. The annual maximum growth rate of agricultural emissions of nitrous in Egypt from ٢٠٠٠ to 2014 recorded in 2009: 20.01%, while the annual maximum fall minimum growth rate was in 2008: -10.12%.

Figure no. (1-7): Emissions of agricultural emissions of methane and nitrous during the period (2000- 2014).



- **The period (2009- 2014) is estimated values, expected calculated by the researcher in the absence of the statement.**

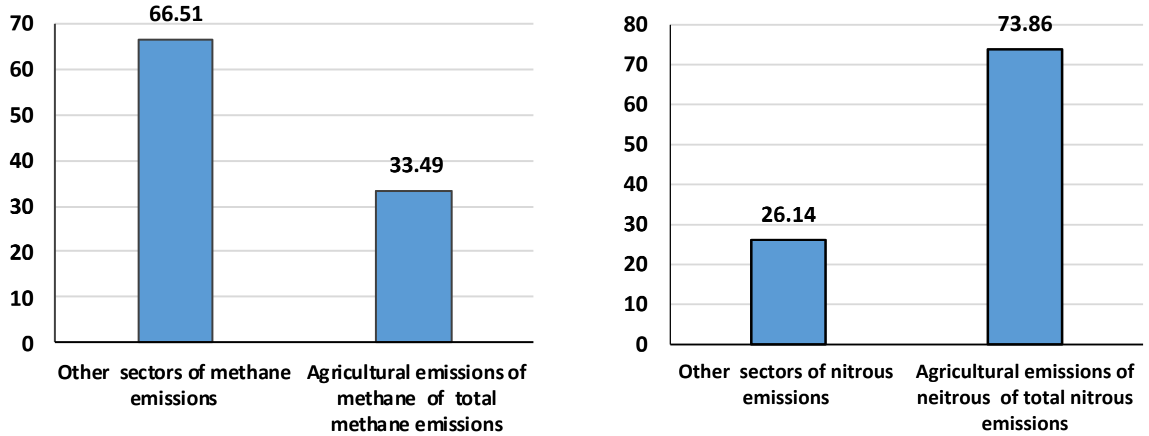
<u>Source</u>: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

1.8. Relative the agricultural emissions of methane of the total methane emissions in Egypt

The data in the figure no. (1-8) shows that relative the agricultural emissions of methane of the total methane emissions in Egypt during the study period varied from a minimum value of 29.27% in 2008, to a maximum value of 38.21% in 2014. Relative the agricultural emissions of methane of the total methane emissions in Egypt have been significantly decreased with an annual average growth of 1.03%. Relative the agricultural emissions of methane of the total methane emissions in

Egypt totaled of 33.49% during the same period. The annual maximum growth rate relative the agricultural emissions of methane of the total methane emissions in Egypt from ٢٠٠٠ to 2014 recorded in 2012: 4.41%, the annual maximum fall minimum growth rate was in 2005: -3.3%. Relative the agricultural emissions of methane of the total methane emissions in Egypt increased by 1.36% from 2000 to 2014.

Figure no. (1-8): Relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt during the period (2000- 2014).



Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

1.9. Relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt

The data in the figure no. (1-8) shows that relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt during the study period varied from a minimum value of 63.54% in 2000, to a maximum value of 89.28% in 2014. Relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt have been significantly increased with an annual average growth of 0.17%. Relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt totaled of 73.86% during the same period. The annual maximum growth rate relative the agricultural emissions of nitrous of the total nitrous emissions in Egypt from 2000 to 2014 recorded in 2012: 12.58%, the annual maximum fall minimum growth rate was in 2010: -4%. Relative the agricultural emissions of nitrous of the total methane emissions in Egypt increased by 25.74% over the study period.

During the study period, the total methane emissions have been increased statistically with an annual rate of 0.36%, methane emissions have been increased statistically with an annual rate from the agriculture reached about 1.74%, thus the proportion of methane emissions from the agriculture sector in total methane emissions decreased annually by about 1.03%, it is also clear that total nitrous oxide emissions have been growing at an annual average rate statistically reached about 1.63%, nitrous oxide emissions from the agriculture sector have been increased by annual rate statistically reached about 2.66%, consequently proportion of nitrous oxide emissions from the agriculture sector in total nitrous oxide emissions decreasing annually by about 0.17%. Which illustrates the importance of reducing the emissions of the agriculture sector, which has proved to be increasing annual rates, especially nitrous oxide emissions from the agriculture sector, where the study proved increasing their contributions to the total emissions of greenhouse gases, which is a major cause of the climatic changes to Egypt which appeared clearly in recent years. Agriculture activities emissions in Egypt were about 13% of the annual GHG emissions that are related to all human activities [Olivier et al., 2005 and Harada et al., 2007]. Agricultural activities are responsible for approximately 50% of the anthropogenic emissions of CH_4, with rice paddies contributing over 10% [Scheehle and Kruger, 2006; USEPA, 2006].

[2] Economic activity in Egypt

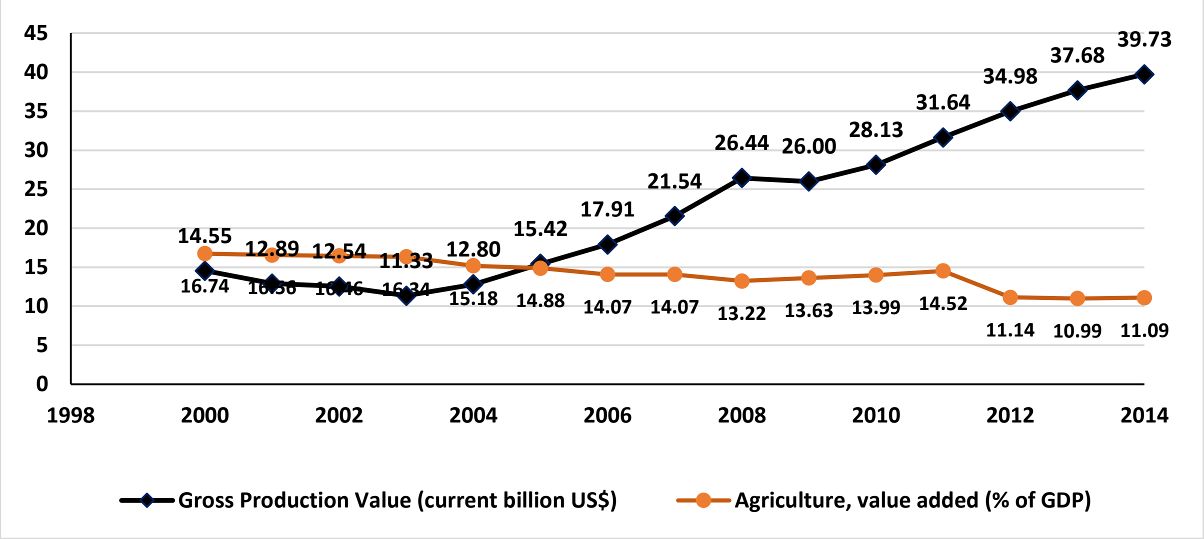
2.1. Egyptian agricultural gross production value

The data in the figure no. (1-9) shows that Egyptian agricultural gross production value (current US$) in Egypt totaled ٣٩.٧٣ billion dollars in 2014, compared with ٣٧.٦٨ billion dollars in 2013, with the change rate was equal to ٥.٧%, and increased by ٢٥.١٨ billion dollars from 2000 to 2014, with an average value amounted to 23.5 billion dollars. An average annual growth rate of Egyptian agricultural gross production value in Egypt over that period was at about 9.03 %. The maximum growth of Egyptian agricultural gross production value in Egypt from 2000 to 2014 recorded in 2008: 22.75%, and the maximum fall minimum growth was in 2001: -11.39%. Gross production value in Egypt from 2000 to 2014 reaching high of 39.73 billion dollars in 2014.

2.2. Egyptian agricultural value added (% of GDP)

The data in the figure no. (1-9) shows that Egyptian agricultural value added (% of GDP) totaled 11.09% in 2014, compared with 10.99% in 2013, with the change rate was equal to 0.89%. Egyptian agricultural value added decreased by 5.65% from 2000 to 2014, with an average value amounted to 14.06%. The average annual growth value of Egyptian agricultural value added over that period was at about -0.41 %. The maximum growth of from 2000 to 2014 recorded in 2011: 3.77% and the maximum fall minimum growth was in 2013: 23.28%. Egyptian agricultural value added (% of GDP) from 2000 to 2014 reaching high of 16.73% in 2003.

Figure no. (1-9): Egyptian agricultural gross production value and agricultural value added (% of GDP) in the period (2000- 2014).



Source: World Bank national accounts data, and OECD National Accounts data files.

2.3. GDP value in Egypt

The Egyptian GDP value totaled 287.68 billion dollars in 2014, compared to 266.17 billion dollars in 2013, with the change rate was equal to 8%. Egyptian GDP value increased by 190.41 billion dollars from 2000 to 2014, and the average value amounted to 154.83 billion dollars. The average annual growth rate of Egyptian GDP value over that period was at about 9.42 %. The maximum growth of Egyptian

GDP value from 2000 to 2014 recorded in 2008: 22.39%, the maximum fall minimum growth was in 2002: -4.22%, The figure no. (1-2).

2.4. GDP value per capita in Egypt

The data in the figure no. (1-3) shows that Egyptian GDP value per capita totaled ٣٢١١.٤٧ dollars in 2014, compared with ٣٠٣٨.٠١ dollars in 2013, with the change rate was equal to 3.21%. Egyptian GDP value per capita increased by 1787.96 dollars from 2000 to 2014, and the average value amounted to 1929.54 dollars. The average annual growth rate of Egyptian GDP value per capita over that period was at about 7.51 %. The maximum growth of Egyptian GDP value per capita from 2000 to 2014 recorded in 2008: 20.26%, the maximum fall minimum growth was in 2002: -5.99%.

[3] Energy in Egypt

3.1. Total Egyptian Energy Production

The data in the figure no. (1-10) shows that total energy primary production in Egypt totaled 73.01 Mt of oil equivalent in 2014, compared with 78.01 Mt of oil equivalent in 2013, with the change rate was equal to -6.58%. Total energy primary production increased by 19.91 Mt of oil equivalent from 2000 to 2014, with the average value amounted to 74.42 Mt of oil equivalent. The average annual growth rate of total energy primary production in Egypt over that period was at about 2.7%. The maximum growth of total energy primary production in Egypt from 2000 to 2014 recorded in 2005: 25.15% and the maximum fall minimum growth was in 2014: -6.58%. Total energy primary production in Egypt over the study period reaching a high of 89.14 Mt of oil equivalent in 2008.

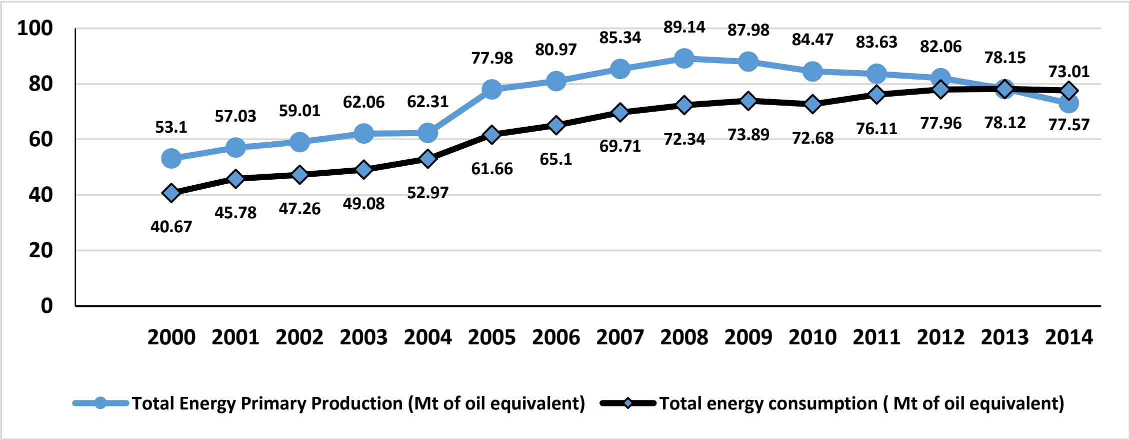
3.2. Total Egyptian energy consumption

The data in the figure no. (1-10) shows that total energy consumption in Egypt totaled 77.57 Mt of oil equivalent in 2014, compared with 78.12 Mt of oil equivalent in 2013, or as the growth rate was equal to -0.708%. Total energy consumption increased by 36.9 Mt of oil equivalent from 2000 to 2014, and the average value amounted to 64.06 Mt of oil equivalent. The average annual growth rate of total energy consumption in Egypt over that period was at about 4.49%. The maximum growth of total energy consumption in Egypt over the study period recorded in 2005: 16.41% and the maximum fall minimum growth was in 2010: -1.64%. as well as total energy consumption in Egypt from 2000 to 2014 reaching high of 78.12 Mt of oil equivalent in 2013.

3.3. Egyptian energy use (kg of oil equivalent) per $1,000 GDP

Energy use (kg of oil equivalent) per $1,000 GDP in Egypt in the study period, as in the figure no. (1-11), shows totaled 77.05 kg of oil equivalent in 2014, compared with 79.36 kg of oil equivalent in 2013, as the growth rate was equal to -2.91%. Energy use (kg of oil equivalent) per $1,000 GDP increased by 1.1 kg of oil equivalent from 2000 to 2014, and the average value amounted to 81.23 kg of oil equivalent. The average annual growth rate of energy use (kg of oil equivalent) per $1,000 GDP in Egypt over that period was at about 0.79%. The maximum growth of Energy use (kg of oil equivalent) per $1,000 GDP in Egypt from 2000 to 2014 recorded in 2006: 11.5%, while the maximum fall minimum growth was in 2012: -9.82%. Energy use (kg of oil equivalent) per $1,000 GDP in Egypt reaching a high of 93.24 kg of oil equivalent in 2010.

Figure no. (1-10): total production and total consumption of energy in Egypt in the period (2000- 2014).



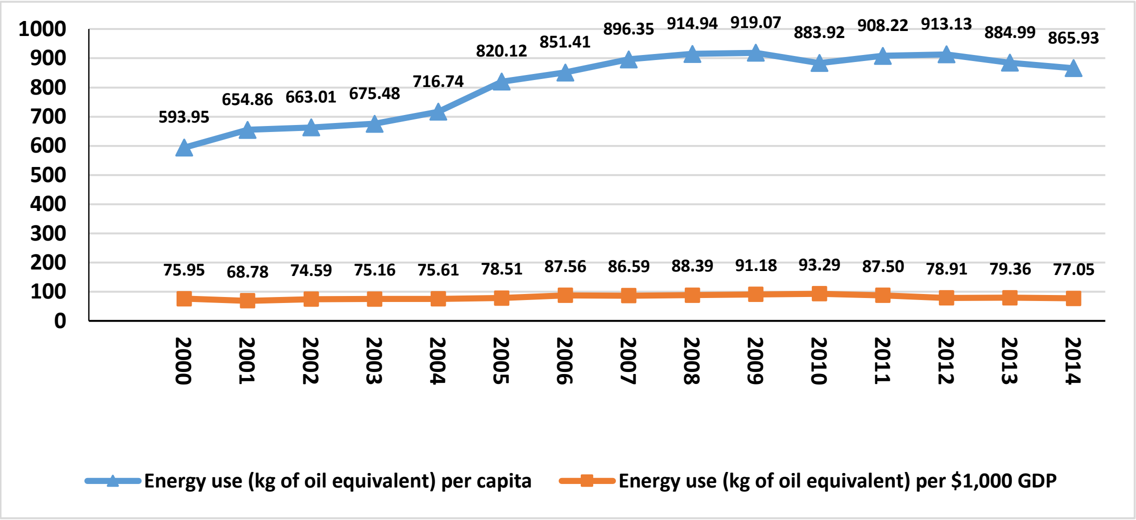
Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

3.4. Egyptian energy use (kg of oil equivalent per capita)

Energy use (kg of oil equivalent per capita) in Egypt, as in the figure no. (1-11), shows totaled 885.93 kg of oil equivalent per capita in 2014, compared with

889.99 kg of oil equivalent per capita in 2013, as the growth rate was equal to -2.15%. energy use (kg of oil equivalent per capita) increased by 271.98 kg of oil equivalent per capita from 2000 to 2013, and the average value amounted to 810.81 kg of oil equivalent per capita. The average annual growth rate of energy use (kg of oil equivalent per capita) in Egypt over that period was at about 2.74%. The maximum growth of energy use (kg of oil equivalent per capita) in Egypt from 2000 to 2014 recorded in 2005: 14.42%, the maximum fall minimum growth was in 2013: -3.82%. Energy use (kg of oil equivalent per capita) in Egypt from 2000 to 2014 reaching high of 919.07 kg of oil equivalent per capita in 2009.

Figure no. (1-11): energy use per capita and per 1000 dollar in Egypt in the period (2000- 2014).



Source: The dataset was produced by the Climatic Research Unit (CRU) of University of East Anglia (UEA).

3.5. Egyptian renewable energy consumption

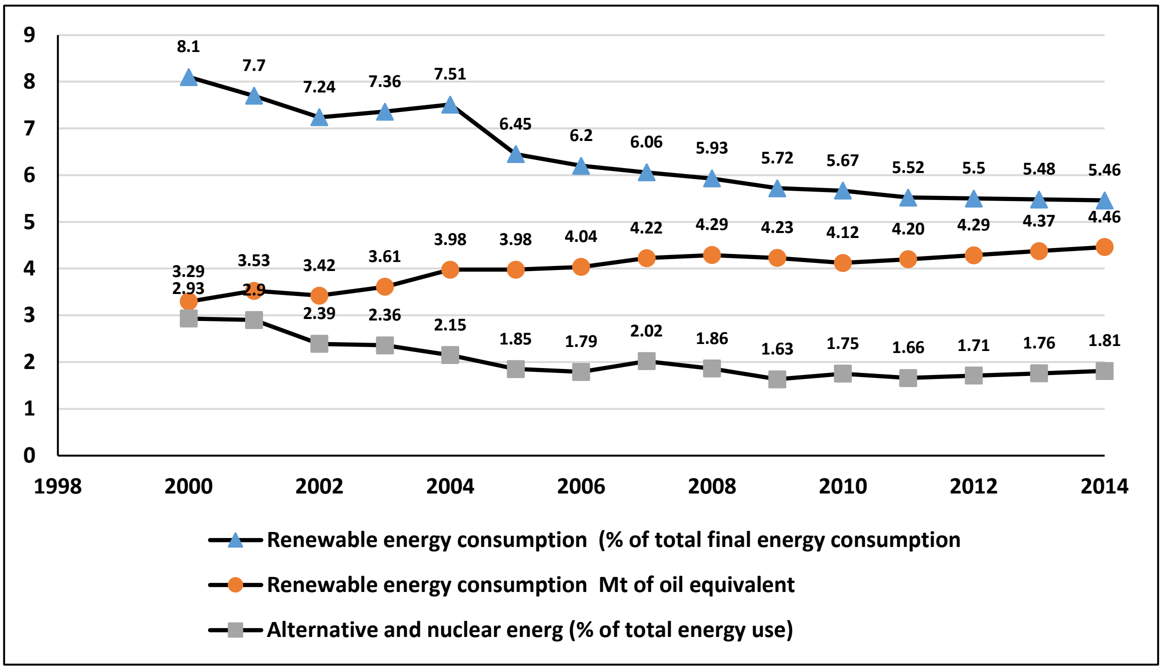
The data in the figure no. (1-12) shows that renewable energy consumption in Egypt totaled 4.46 Mt in 2014, compared to 4.37 Mt in 2013. The growth rate was equal to 1.98% compared to the previous year. Renewable energy consumption increased by 1.17 Mt of oil equivalent from 2000 to 2014, and the average value amounted to 4 Mt. The average annual growth rate of renewable energy consumption in Egypt over that period was at about 2.08%. The maximum growth of renewable energy consumption in Egypt from 2000 to 2014 recorded in 2004:

10.13% and the maximum fall minimum growth was in 2002: -2.93%. Renewable energy consumption in Egypt from 2000 to 2014 reaching high of 4.46 Mt in 2014.

3.6. Egyptian renewable energy consumption (% of total final energy consumption)

The data in the figure no. (1-12) shows that renewable energy consumption (% of total final energy consumption) in Egypt totaled 5.46 % in 2014, compared with 5.48 % in 2013, with the growth rate was equal to -2.64%. Renewable energy consumption (% of total final energy consumption) decreased by 2.64 % from 2000 to 2014, and the average value amounted to 6.39 %. The average annual growth rate of renewable energy consumption (% of total final energy consumption) in Egypt over that period was at about -0.23%. The maximum growth of renewable energy consumption (% of total final energy consumption) in Egypt from 2000 to 2014 recorded in 2012: 3.01 %, while the maximum fall minimum growth was in 2002: -0.51 %. Renewable energy consumption (% of total final energy consumption) in Egypt from 2000 to 2014 reaching high of 8.1 % in 2014.

Figure no. (1-12): Renewable energy consumption in Egypt in the period (2000-2014).



- Volumes 2013, 2014 are estimated values, expected calculated by the researcher in the absence of the statement.

Source:

1- World Bank, International Energy Agency, United Nations, Eurostat, OPEC, U.S. Energy Information Administration,
2- IEA Statistic, OECD/IEA 2014 (http://www.iea.org/stats/index.asp), subject to (https://www.iea.org/t&c/termsandconditions).
3- Food and Agriculture Organization, electronic files and web site.

3.7. Egyptian alternative and nuclear energy (% of total energy use)

The data in the figure no. (1-12) shows that Alternative and nuclear energy (% of total energy use) in Egypt totaled 1.81 % of the total in 2014, compared with ١.76 % of total in 2013, with the growth rate was equal to 2.84%. Alternative and nuclear energy (% of total energy use) decreased by ١.12 % of total from ٢٠٠٠ to 2014, and the average value amounted to ٢.04 % of the total. The average annual growth rate of alternative and nuclear energy (% of total energy use) in Egypt over that period was at about -0.١٠٣%. The maximum growth of alternative and nuclear energy (% of total energy use) in Egypt from ٢٠٠٠ to 2014 recorded in 2012: 3.01 % of the total, while the maximum fall minimum growth was in ٢٠٠٢: -0.٥١ % of total. Alternative and nuclear energy (% of total energy use) in Egypt from ٢٠٠٠ to 2014 reaching high of 2.93 % of total in 2000.

During the period (2000- 2014), the average production of energy in Egypt of 74.42 Mt, with increased by significant statistically an annual rate of 2.7%. While the average consumption of energy in Egypt of 64.06 Mt, with increased by significant statistically significant an annual rate of 4.49%. But in 2014, consumption of Egypt increased to energy produced of 6.28%, as a result of high demand for energy because of an increase in the number of population, the rate of per capita consumption of energy, and energy needs in order to increase GDP.

Despite the increase in the use of clean energy by significant statistically an annual rate annually reached about 2.08%, but the proportion of clean energy and renewable energy of the total consumption of energy have been reduced by a rate annually significant statistically reached about 0.23%, as a result of the rise of the invasions of Egypt's growing energy in the recent years, and lack of capacity to provide a significant contribution to clean energy in total energy uses, where requires increasing the produced quantities of clean energy quantities and rates of more current, with increasing rates of consumption of Egypt from energy. Egypt's production of nuclear energy, energy and non-conventional increased by

an annual rate of significant statistically reached about 2.08%, but that the quantity produced from this energy is a small percentage of the total energy produced. On the basis of the foregoing, the increase in the consumption of energy and the increase in the average per capita consumption of energy in Egypt is considered one of the most important reasons that automatically lead to an increase in emissions of greenhouse gases, especially carbon dioxide, which confirms the importance of the trend toward clean energy production, orientation toward the green economy and green growth which will lead to the reduction of emissions of carbon dioxide with increasing power consumption and increase the gross domestic product (GDP).

[4] The relationship between economic activity and co_2 emissions in Egypt

During the period (2000 -2014), Egypt's GDP value have been significantly increased with an annual average growth of 9.41%, and carbon emissions in Egypt have been significantly increased with an annual average growth of 4.17%. The average per capita of GDP in Egypt has been significantly increased with an annual average growth of 7.51%, while the average per capita of Egyptian carbon emissions has been significantly increased with an annual average growth of 2.84%. An average per capita of carbon emission in Egypt less than an average per capita of carbon emission in the world, where an average per capita of carbon emission in Egypt about 2.32 metric tons, while an average per capita carbon emission in the world toward 4.5 metric tons.

To examine the ***relationship between economic activity and Emissions of carbon dioxide in Egypt*** in the period (2000 – 2014), estimated the relationship between Egyptian GDP value and Emissions of carbon dioxide, as following as:

$$\text{Log}(Y_1) = 3.018 + 0.437 \log(X_1) \quad \ldots\ldots(1)$$

$$(6.214)^{*} \qquad (5.163)^{*}$$

$$R = 0.82 \qquad R^2 = 0.672 \qquad F = (26.657)^{*}$$

Where:

(Y_1) = Egyptian emissions of carbon dioxide by million tons.

(X_1) = Egyptian GDP value by billion dollars.

According to the equation no. (1), the results show that the GDP value has positive coefficient at significance level 0.01, and increase by about 1% of Egyptian GDP value lead to increase in Egyptian emissions of carbon dioxide by about 0.437%. These results agreed with its previous findings to estimate the annual growth rates of each Egyptian GDP value and emissions of carbon dioxide. Finally, increase in Egyptian GDP value by about $1 billion, lead to an increase of carbon emissions by about 0.516 million tons.

Also, to examine ***the relationship between GDP per capita and emissions of carbon dioxide per capita in Egypt*** during the same period, estimated the following equation as following as:

$$\text{Log}(Y_2) = \underset{(-2.011)^{**}}{-1.382} + \underset{(3.221)^{*}}{0.295} \log(X_2) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$R = 0.666 \qquad R^2 = 0.444 \qquad F = (10.375)^{*}$$

Where:

(Y_2) = Egyptian emissions of carbon dioxide per capita by metric tons.

(X_2) = Egyptian GDP per capita by a dollar.

According to the equation no. (2), the results show that the GDP per capita has positive coefficient at significance level 0.01, therefore 10% increase of Egyptian GDP per capita lead to increase in Egyptian emissions of carbon dioxide per capita by 2.95%. These results agreed with its previous findings to estimate the annual growth rates of each Egyptian GDP per capita and emissions of carbon dioxide per capita. Finally, increase in Egyptian GDP per capita by about 100 dollars, lead to an increase in carbon emissions per capita by about 0.04 metric tons.

As well as, to examine ***the relationship between GDP and total energy consumption in Egypt*** during the same period, estimated the following equation as following as:

$$\text{Log}(Y_{٣}) = \underset{(4.846)^{*}}{2.041} + \underset{(4.994)^{*}}{0.423} \log(X_{٣}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(٣)$$

$$R = 0.٨٨١ \qquad R^2 = 0.٦٥٧ \qquad F = (٢٤.٩٤٤)^{*}$$

Where:

$(Y_{٣})$ = Total energy consumption by Mt of oil equivalent.

(X_3) = Egyptian GDP by billion dollars.

The equation no. (٣), show that the GDP has positive coefficient at significance level 0.01, therefore 1% increase of Egyptian GDP lead to increase in total Egyptian energy consumption by 0.423%. These results agreed with its previous findings to estimate the annual growth rates of each Egyptian GDP and total Egyptian energy consumption. Finally, increase in Egyptian GDP by about billion dollars, lead to an increase of total Egyptian energy consumption by about 0.176 Mt.

1n addition to, to examine ***the relationship between Total energy consumption and total Emissions of carbon dioxide in Egypt*** during the same period, estimated the following equation as following as:

$$\text{Log}(Y_4) = \underset{(2.676)^{**}}{1.5} + \underset{(6.583)^{*}}{0.891}\log(X_4) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

$$R = 0.877 \qquad R^2 = 0.769 \qquad F = (43.329)^{*}$$

Where:

(Y_4) = Total energy consumption by Mt of oil equivalent.

(X_4) = Egyptian emissions of carbon dioxide by Mt.

According to the equation no. (4), the results show that total energy consumption has positive coefficient at significance level 0.01, therefore 1% increase of total energy consumption lead to increase in total Egyptian emissions of carbon dioxide by 0.891%. These results agreed with its previous findings to estimate the annual growth rates of each total energy consumption and total Egyptian emissions of carbon dioxide. Finally, increase in total Egyptian energy consumption by about million tons, lead to an increase of total Egyptian emissions of carbon dioxide by about 2.86 Mt.

According to the previous findings to during the period (2000- 2014), that an increase in Egyptian GDP by about billion dollars, lead to an increase of total Egyptian energy consumption by about 0.176 Mt., with an increase of total Egyptian emissions of carbon dioxide by about 0.5 Mt.

<u>Abstract</u>

Increase the temperature, decreased precipitation and increased carbon dioxide

emission , underlines the fact climatic changes which are affected by Egypt, as Egypt is considered one of the countries most affected by climatic changes, Agriculture is one target of such activity as emission levels are about 13% of the annual GHG emissions that are related to all human activities, high demand for energy because of an increase in the number of population, the rate of per capita consumption of energy, and energy needs in order to increase production. Also, the average per capita energy consumption in Egypt have been increased by significant statistically an annual rate of 2.74%, consumption of 1.000 dollars of gross national product of energy have been increased by significant statistically an annual of 0.79%. Despite the increase in the use of clean energy by significant statistically an annual rate annually reached about 2.08%, but the proportion of clean energy and renewable energy of the total consumption of energy have been reduced by a rate annually significant statistically reached about 0.23%, the green economy and green growth which will lead to the reduction of emissions of carbon dioxide with increasing power consumption and increase the gross domestic product. an increase in Egyptian GDP by about billion dollars, lead to an increase of total Egyptian energy consumption by about 0.176 Mt., with an increase of total Egyptian emissions of carbon dioxide by about 0.5 Mt.

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Chapter: ②

Effects of Climate Change on Sustainable Agricultural Development in Egypt

Contents:

Chapter: ②

Effects of Climate Change on Sustainable Agricultural Development in Egypt

PREFACE

It is expected that about 33 cities in the world which have nearly 8 million people, will be threatened because of the rising sea level, of which 21 cities are the most vulnerable to the risk of sea-level rise. Alexandria in Egypt is one of those cities, although Egypt has been classified as one of the five countries in the world vulnerable to the negative impacts of climate change, such as rising sea level or sinking parts of Delta, reflected in all social and economic harm **[IPCC, 1991]**. Also, it is expected that Egypt would be one of the most countries affected by the impacts of climate change. The expected impacts of climate change on all of the most agricultural land, productive agricultural crops, and water resources. So we try access to the best scenario possible expectations of the impact of climate change on the cultivated and crop area in Egypt in year 2030, to know the dangers that will befall Egyptian agriculture, as well as Egyptian food security, and then the means that can overcome or mitigate such effects.

[1] Impacts of climate change on the agricultural production in Egypt

The organization governmental climate change (IPCC) evaluated the current knowledge on climate change and its impacts, and how to mitigate or reduce emissions of greenhouse gasses, through data on the global climate data distribution center of (IPCC). The expected scenarios, as in the table no. (2-1), as follows:

1.1. Impact of climate change on agricultural land

The studies at the University of Alexandria estimated that between (12% to 15%) of the area of high-quality agricultural land in production in the delta region will lose as a result of sinking or salinity with sea level rise by about half a meter only. If to consider the climatic effects of rising sea in Egypt, will consider that there is an increase in sea-level rise about one meter during the current century, given that the north coast of Egypt -and more areas of Egypt declined- find that the areas that must be taken into account in covering an area ranging between (10% -15%) of Delta, this in addition to the vulnerability of cultivated land in these areas and adjacent to surface water level rise increased salt in water and soil.

Table no. (2-1): Expectations of the effects of climate change resulting from the increased concentration of greenhouse gasses with the degree of its certainty.

climate changing	Change	The degree of certainty
Sea-level rise	Acceleration in average sea-level rise is expected to rise at a rate of 0.1-0.9 meters in the year 2100.	Almost Certain
The temperature rises	It is expected to increase by about 1.4-5.8 C° in the year 2100, but the increase varies from one region to another, and areas at high latitudes and far from the seas more affected	Possible
Change to rain	The trend is uncertain in general, may increase precipitation at high latitudes The Equator, the region is witnessing the Mediterranean a decline" in it. - Changes in other areas are uncertain.	sure low
The intensity of the peak of the precipitation rain	Increase in the rate, but this does not mean that all incidents of precipitation will be more severe than ever.	very Possible
Drought	Will increase drought in most of the areas within continents or center in summer.	Possible
The intensity of floods	Will grow in most areas.	Possible
Tropical Storm winds	Will increase in some areas.	Possible

Source: Compiled and calculated from:

1- Intergovernmental Panel on Climate Change (IPCC): "new assessment methods and the characterisation of future conditions ", Fourth Assessment Report, chapter draft IPCC, Fourth Assessment Report. CHAPTER draft, 2007.

2- Intergovernmental Panel on Climate Change (IPCC) ("the seven steps of the assessment of the vulnerability of coastal areas to sea level rise - a common methodology "intergovernmental Panel on Climate Change, Response Strategies Working Group. Advisory Group on assessing vulnerability to sea level rise and coastal zone management, September 1991, Revision No. 1.

As well as the United Nations Environment Program (UNEP) general study of the impact of sea-level rise (expected) on the Egyptian coast and identify the area's most likely danger of drowning in the case of sea-level rise by about 0.5 meter, where it was clear that half-meter rise in sea level will lead to the sinking of a large coastal land river delta the Nile if did not take precautions for protection. And the most affected areas are the governorates of Alexandria and the lake and South Al-Barolos South downloaded on the Mediterranean Sea.

It is clear from the studies topographic coastal areas on the Red Sea, the areas of a few non-agricultural land will also be affected on the Red Sea as a result of sea-level rise. Especially in the Bitter Lakes region and Suez. Consequently, will cause climate change sea level rise which would result in sinking part of the fertile agricultural land in the northern Delta, and high water level ground floor so large in another part. As well as to salting third part, this will negatively effect on the total agricultural area.

The initial expectations that the number of the population in Egypt will increase at a rate of about 1.9% annually over the next two decades, to arrive in the year 2030 to about 111 million people, while agricultural land is expected to be about 11.5 million acres in Egypt by 2030. the old land area is expected to reach about 8.4 million acres. and according to the strategy of the Egyptian Ministry of Agriculture, the target of the lately reclaimed lands will reach 3.1 million acres, so the total cultivable area will reach about 11.5 million acres, and thus the average per capita from available resources cultivated agricultural land will decrease by about 3.2% in the year 2030 from that in the year 2011, as in the table no. (2-2).

It is clear from table no. (2-2), and figure no. (2-2), which shows the evolution of annual change in the average per capita from cultivated land in Egypt that this average decreasing every year, and this decline is down, where decreased by 0.4% in the (2011 -2012), decreasing risen in (2012- 2013) which amounted to about 0.91%. It is expected to decline to about 3.2% in the year 2030, compared to his counterpart in the year 2011, or about 1.92% compared to the year 2013. Due most important reasons for this to the increasing number of residents Egypt, the largest rate of increase in the cultivated area rates in the comparative periods, in addition to the impact of climate change, which affects the ability to maintain the same average per capita level of agricultural land in the year 2030, equivalent counterpart in the year 2013.

It is expected that more than farmland about 11.5 million acres, the total agricultural land area of arable land in Egypt, as in the table No. (2-3), that by 2030, the old town area of land is expected to reach about 8.4 million acres, since that a strategy of the Ministry of Agriculture to the New Territories target added estimated that up to about 3.1 million acres, the total acreage will be up to about 11.5 million acres, and thus average per capita agricultural land resources in Egypt by about 3.7% in the year 2030, compared with that in 2011.

Table no. (2-2): Available cultivated land resources in old and new lands by million acres in Egypt, now and in the future by the year 2030.

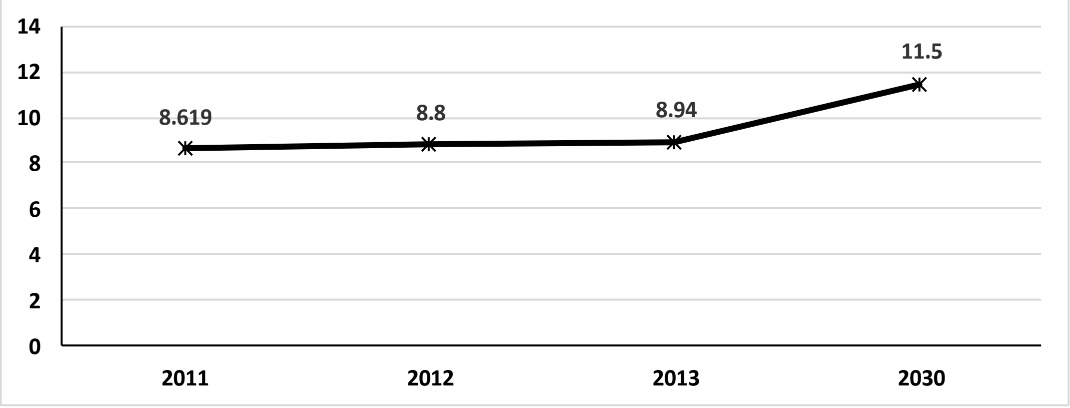
Cultivated land resources	2011	2012	Change (2011- 2012)%	2013	Change (2012- 2013)%	2030	Change (2011- 2030)%	Change (2013- 2030)%
Total Cultivated land resources by million acres	8.619	8.8	2.1	8.94	1.6	11.5	33.43	28.64
The population by million People	80.53	82.55	2.51	84.63	2.52	111	37.84	31.16
Average per capita from cultivated land resources by acre	0.107	0.1066	(0.4)	0.1056	(0.91)	0.1036	(3.2)	(1.92)

Volumes in brackets are negative.

Source: Compiled and calculated:

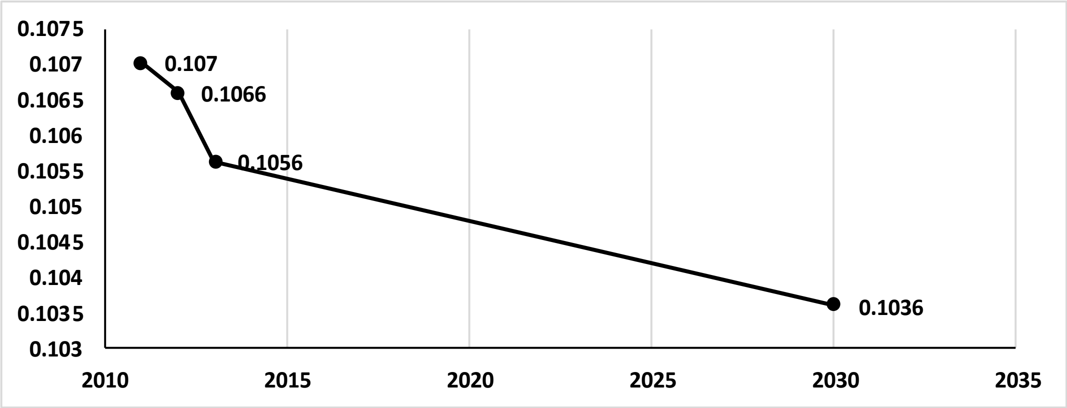
1- The Ministry of Agriculture and Land Reclamation, Agricultural Economics Central Department bulletin, agricultural economy, 2013.
2- Sustainable agricultural development strategy until 2030, Cairo, 2009.
3- World Bank, World Development Indicators, data, separate periods.

Figure no. (2-1): Total Cultivated land by million acres



Source: Compiled and calculated from table no. (2-2).

Figure no. (2-2): Average per capita from cultivated land by acre



Source: Compiled and calculated from table no. (2-2).

Table no. (2-3): Available cultivated land resources in old and new lands by million acres in Egypt, now and in the future until year 20130.

Cultivated land resources	2011	2030	Change %
Old Cultivated land	**6.071**	**8.4**	**4.47**
New Cultivated land	**2.548**	**3.1**	**21.66**
Total Cultivated land	**8.619**	**11.5**	**33.43**
The population (by Million People)	**80.53**	**111**	**-**
Average per capita from cultivated land resources by the user	**0.107**	**0.103**	**(3.7)**

The volumes in brackets are negative.

Source: Compiled and calculated:

1- The Ministry of Agriculture and Land Reclamation, Agricultural Economics Central Department bulletin, agricultural economy, 2013.
2- Sustainable agricultural development strategy until 2030, Cairo, 2009.
3- World Bank, World Development Indicators, data, separate periods.

1.2. Impact of climate change on productivity of the major crops

Experiments conducted the unity of the Agricultural Meteorology Research and the change in the Institute for land, water, and Environment Research Agricultural Research Center of climate experiments, it was possible that the high degree of temperature about normal rates will affect the production of the most agricultural crops in Egypt, where he conducted experiments on the effect of high heat between

(1.5 to 3.5 C°) on the production per acre, where the climate change and caused by the rise in temperature of the Earth's surface will have a negative impact on the productivity of many crops in Egypt, causing severe shortages in the productivity of most major food crops in Egypt. This Experiments Included [10] of the most crops in Egypt, which each of Wheat, Barley, Corn, Sorghum, Rice, Soybeans, Sunflower, Tomatoes, Sugarcane, and Cotton, representing, a total cultivated area of these crops reached to about 8.483 million acres, representing about 54.9% of the total crop area by the year 2013 in Egypt. Refer to the impact of climate change on productivity and produce significant and influential role in plant production in Egypt and the self-sufficiency rate of these crops, also the impact of the Egyptian food balance. can view the results of these Experiments for assessing the impact of climate change, and know the future scenarios, as shown in the table no. (2-4), and the figure no. (2-3), are as follows:

[1] The productivity of wheat harvest will be less than 9% if the temperature rose by about 2 C°, and will decrease by about 18% if the temperature rose 3.5 C°.

[2] Barley crop productivity will decline by about 18% (in the year 2050).

[3] Corn crop productivity will be lower by about 18% in the middle of this century (when the temperature rises 3.5 C°), compared to productivity under current conditions.

[4] Maize crop productivity high will decrease by about 19%.

[5] Rice crop productivity will decline by about 11%.

[6] Soybean crop productivity will be affected adversely under conditions of climatic changes will be the average rate of decrease in the level of the Republic in the middle of this century by about 28%.

[7] The Sunflower productivity will decline by about 27%.

[8] Tomato productivity will decrease their productivity by about 14% if the temperature rose by about 1.5 C° while this shortage will reach 50% if the temperature rose 3.5 C°.

[9] Sugarcane production would fall by about 25%.

[10] Climate change affects a positive impact on the productivity of cotton, and would increase its productivity by about 17% at high temperature by about 2 C°,

will increase the rate of increase in this crop to about 31% when the temperature rises by about 4 C°.

Table no. (2-4): impacts of climate change on productivity, consumption of water of the most important agricultural crops in Egypt by the year 2050

Statement crops	% of the productivity per acre			% of consumption of water	The cultivated area (thousand acres)
	1.5 C°	2 C°	3.5 C°	3.5 C°	
Wheat	-	(9)	(18)	2.5	٣٣٧٨
Barley	-	-	(18)	(2)	٧٨.٧
Corn	-	-	(18)	8	٢١٣٩
Sorghum	-	-	(19)	8	٣٣٥.٢
Rice	-	-	(11)	16	١٤١٩
Soybean	-	-	(28)	15	٢٢.٤
Sunflower	-	-	(27)	8	١٥.٢
tomatoes	(14)	-	(50)	14	٤٨٩
Sugar cane	-	-	(25)	2.5	٣٢٩
Cotton	-	17	29	10	٢٨٧
Total	–	–	–	–	٨٤٩٣

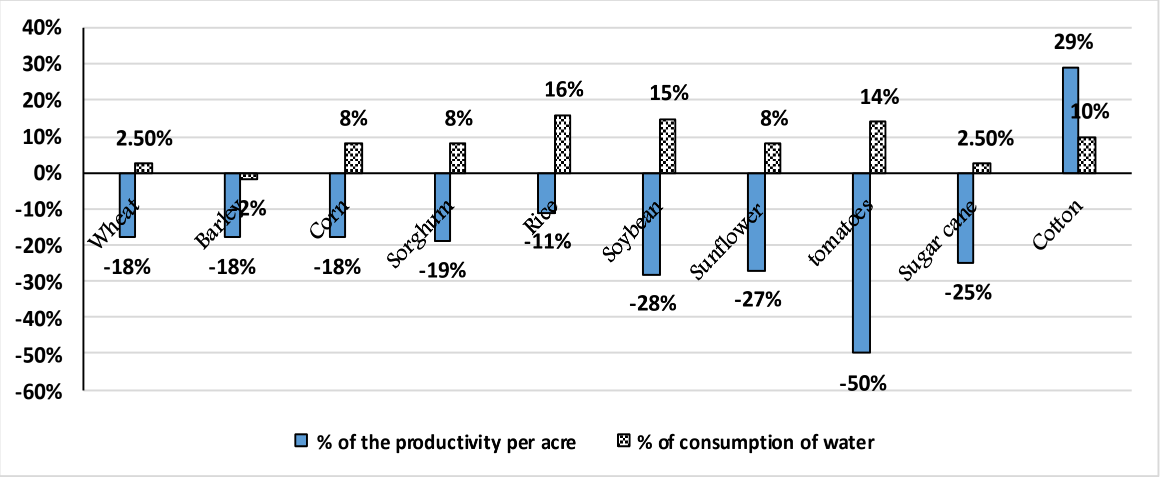
The volumes in brackets are negative.
Source: Compiled and calculated from: The regionalization tests were conducted research unit Agricultural Meteorology climate change research institute of land, water and environment Agricultural Research Center.

1.3. Impact of climate change on water consumption for the major crops

It was possible that the high degree of temperature about normal rates will affect consumption of water for the most agricultural crops in Egypt. Experiments Included (10) of the most crops in Egypt, which each of Wheat, Barley, Corn, Sorghum, Rice, Soybeans, Sunflower, Tomatoes, Sugarcane, and Cotton, as in the table no. (2), and the figure no. (5), where conducted experiments on the effect of high heat between (3.5 C°) on consumption of water per acre, compared to water consumption under current conditions, as shown in the table no. (2-4), a figure no. (2-3), as follows: consumption of water of Wheat, Corn, Sorghum, Rice, Soybean, Sunflower, Tomato, Sugarcane, and Cotton crops will increase by about 2.5%, 8%, 8%, 16%, 15%, 8%, 14%, 2.5%, 10%, respectively. While consumption of water of Barley crop will be reduced by about 2%.

Previous results indicate refer to that the climate change will negatively affect the productivity and consumption of water for the major crops in Egypt.

Figure no. (2-3): impacts of climate change on productivity, consumption of water of the most important agricultural crops in Egypt by the year 2050



<u>Source</u>: from table no. (2 -4).

Previous results indicate refer to that the climate change will negatively affect the productivity of crops, as well as self-sufficiency ratio, therefore, it is necessary to the cultivation of wheat bear the high temperatures. As well as to resist drought in time with a good distribution of items wheat to the geographical regions, and the expansion of winter crops such as lentils, beans, and other municipal, it is likely that these measures to prevent expected negative effects, or at least mitigate the negative effects (6). That there is a close link between desertification is intended to "low productive capacity of the land in the arid and semiarid land, as a result of climate change or human practices, where the climatic changes lead to a desertification while increasing the desertification necessarily lead to an increase in climatic changes. Egypt is of States that are affected by the phenomenon of desertification as a result of all of the causes of climate changes, or as a result of bad human practices, which could lead to a decline in agricultural productive capacity of the land, and there are in the current situation, referring to the direction of the quality of the land to the deterioration, the indicators of land

degradation in the phenomena of increasing the Land area affected salinization and high level of ground water, other phenomena of desertification, all of which lead to either exit agricultural land from the process of agricultural production finally, or to diminished productivity (10).

1.4. Impact of climate change on desertification and land degradation

Desertification is defined as: "low productive capacity of the land in the arid and semiarid land, as a result of climate change or human practices". There is a strong and direct relationship between desertification and climate change, where the climate change lead to a desertification while increasing the desertification necessarily lead to an increase in climate change.

Egypt is one of the countries that are affected by the phenomenon of desertification as a result of all of the causes of climate change, or as a result of bad human practices, which could lead to a decline in agricultural productive capacity of the land, and there are in the current situation, referring to the direction of the quality of the land to the deterioration, the indicators of land degradation in the phenomena of increasing the Land area affected salinization and high level of ground water, other phenomena of desertification, all of which lead to either exit agricultural land from the process of agricultural production finally, or to diminished productivity **[UNEP/WHO,1999**].

1.5. Impact of climate change on the Egyptian agricultural and food trade balance

show that there is a deficit in the Egyptian agricultural and food trade balance during the study period, as the deficit in the Egyptian balance of agricultural trade about 3.178 billion dollars in the period (2005-2009), while about 10.384 billion dollars in the period (2010-2013), up to 226.73% compared to its counterpart in the period (2005-2009), the rate of coverage of agricultural exports to agricultural imports about 43.28% in the period (2005-2009), declined to about 26.68% in the period (2010-2013), by decrease of about 16.6 %, as in table no. (2-5).

It also shows that the deficit in the balance of trade Egyptian food amounted to 2.87 billion dollars in the period (2005-2009), equivalent to about 93.8% of the deficit in agricultural trade balance for the same period, the trade balance deficit went up Egyptian food to about 6.88 billion dollars in the period (2010-2013), constitutes about 90.2% of the deficit in the balance of agricultural trade in the same period. It is clear that the deficit in the balance of trade Egyptian food rose by 239.96% in the period (2010-2013), comparison to that of the period (2005-2009). The rate of coverage of exports to imports food in the period (2005-2009) about by 43.36 %, decreased about by 16.11% in the period (2010-2013) as compared to the period (2005-2009), which amounted to about 27.25% in the period (2010-2013), as in table no. (2-5).

Table no. (2-5): development of Egyptian food and agricultural trade balance during the period (2005-2013). **(Values by million dollars US).**

statement	average 2005-2009	average 2010-2013	Change	Change%
Agricultural exports	2425.52	3778.59	1353.07	55.78
Agricultural imports	5603.71	14162.62	8558.91	152.74
Agricultural trade balance	(3178.19)	(10384.03)	(7205.84)	(226.73)
Coverage of exports to imports agricultural %	43.28	26.68	(16.60)	-
Food exports	2194.31	3649.85	1455.54	66.33
Food imports	5060.34	13393.26	8332.92	164.67
Food trade balance	(2866.03)	(9743.41)	(6877.38)	(239.96)
Coverage of exports to imports food %	43.36	27.25	(16.11)	-

- Volumes in brackets are negative.

Source: Compiled and calculated from Arab Organization for Agricultural Development, the annual book of Arab agricultural statistics, various issues.

The previous results to the continued and growing deficit in the Egyptian agricultural trade and food balance, which pressure to clear potential Egyptian national economy, and affects the sustainable development targets in Egypt. Perhaps climate change of agricultural production the most important cause of the increase in the deficit of the Egyptian balance of trade agricultural and food, in addition, to affecting change climate on the growth of agricultural production

and its ability to meet the requirements, and its contribution to reducing the deficit in the balance of trade Egyptian food.

1.6. Impact of climate change on the water resources

Egypt depends mainly on the three main sources of water: The River Nile, groundwater, and the rain, where the River Nile is the main source of water. Contributing towards by 55.5 billion m^3 in the year 2013, and the average per capita of water resources in Egypt mounted by about 663 m^3 in the same year, it means is under the water poverty line. It is also expected to about 582 m^3 in the year 2025, uses of the available water resources raised from about 66.6 billion m^3 in the year 2012 to about 74.5 billion m^3 in the year 2003, by an increase mounted about 23.7%. while agricultural water uses, representing about 82.6% of the total actual uses of available water resources, which are estimated at about 74.5 billion m^3 in year 2012, which is expected to be achieved toward to 78.9 billion m^3 in year 2017, and an increase in the quantity of water that is recycled from about 0.9 billion m^3 to 1.3 billion m^3 in year 2012, with an increase of about 44.4% compared to year 2003, and is expected to reach 1.6 billion m^3 in year 2017, and about 15.7 billion m^3 per year, is the average unconscious irrigation networks between Aswan and fields during the period (2003 -2012), lost to evaporation and leakage, which requires costly investments to reduce them, as in the table no. (2-6).

A study of the evolution of the total available water resources in Egypt, according to data in table (2-6), available water resources decreased by about 2.9% during the period (2007 -2011), and expected to these resources are increased by 2030, so arrive about 89.46 million m^3, by an increase mounted by 27.33% than the total available water resources in the year 2011.

As well as, by studying the evolution of the total water uses in Egypt, according to data in table (2-7), indicating that these uses rose by about 5.15% during the period (2007 -2011), and this is expected to increase by 2030, so arrive about 98.3 million m^3, by an increase of about 33.11% than the total water uses in Egypt in the year 2011.

Table no. (2-6): Current and future available water resources in Egypt, according to the source future by the year 2030. **By (billion m^3)**

water source	2007/2008	2008/ 2009	2009/2010	2010/ 2011	2030	Change (2007- 2011)%	Change (2011- 2030)%
The Nile River	**55.5**	**55.5**	**55.5**	**55.5**	**57.5**	**0.00**	**3.60**
Groundwater	**6.2**	**6.2**	**5.6**	**6.3**	**12.9**	**1.61**	**104.76**
Agricultural water recycling and development of irrigation systems	**8**	**8**	**5.8**	**5.8**	**15.5**	**(27.50)**	**167.24**
Sewage recycling	**1.3**	**1.3**	**1.3**	**1.3**	**2**	**0.00**	**53.85**
Rainwater and Torrents	**1.3**	**1.3**	**1.3**	**1.3**	**1.5**	**0.00**	**15.38**
Seawater desalination	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.00**	**0.00**
Total	**72.36**	**72.36**	**69.56**	**70.26**	**89.46**	**(2.90)**	**27.33**

Volumes in brackets are negative.
Source: Compiled and calculated from:
(1) The Ministry of Water Resources and Irrigation, toward development strategy and management of water resources in Egypt during the period (2009 -2017), august 2009.
(2) In accordance with the inventory of greenhouse gasses, which ended in Egypt of its implementation in 1999, which was adopted on the data available for the year 1990-1991.
(3) According to the estimates International Database (World Resources Institute Washington), United States, 2006.
(4) Estimates of the Central Agency for Public Mobilization and Statistics, 2015.

A study of average per capita of the total available water resources and the total water uses in Egypt, as in the tables no. (2-8), and the figures no. (2-4, 2-5), show that the average per capita of the water resource availability in Egypt during the period (2007 -2011) decreased by about 8.4%, as a result low among the total available water resources in this period by about 2.9%, and increasing the population by about 6.01%, thus reflected a reduction of per capita of the total uses in the same period by about 0.81%. Data showed in table no. (2-8), and figures no. (2-4, 2-5), that the Egyptian water balance deficit amounted to about 3.59 billion m^3 in the year 2011, and the deficit is expected to reach about 8.84 billion m^3 in 2030, according to previous rates on the total available water resources, the total water uses, and population growth rates.

Table no. (2-7): Current and future water uses in Egypt by the year 2030. By (billion m^3)

water source	2007/2008	2008/ 2009	2009/2010	2010/ 2011	2030	Change (2007- 2011)%	Change (2011- 2030)%
Agriculture	60	60	60	60.9	81.3	1.50	33.50
Losses by evaporation from canals	2.1	2.1	2.1	2.1	2.1	0.00	0.00
Drinking and Health use	6.6	6.6	8.5	9.55	13.5	44.70	41.36
Industry	1.33	1.33	1.35	1.2	1.3	(9.77)	8.33
Maritime	0.2	0.2	0.1	0.1	0.1	(50)	0.00
Total	70.23	70.23	72.05	73.85	98.3	5.15	33.11

Volumes in brackets are negative values.
Source: Compiled and calculated from:
(1) The Ministry of Water Resources and Irrigation, toward development strategy and management of water resources in Egypt during the period (2009 -2017), august 2009.
(2) In accordance with the inventory of greenhouse gasses, which ended in Egypt of its implementation in 1999, which was adopted on the data available for the year 1990/1991.
(3) According to the estimates International Database (World Resources Institute Washington), United States, 2006.
(4) Estimates of the Central Agency for Public Mobilization and Statistics, 2015.

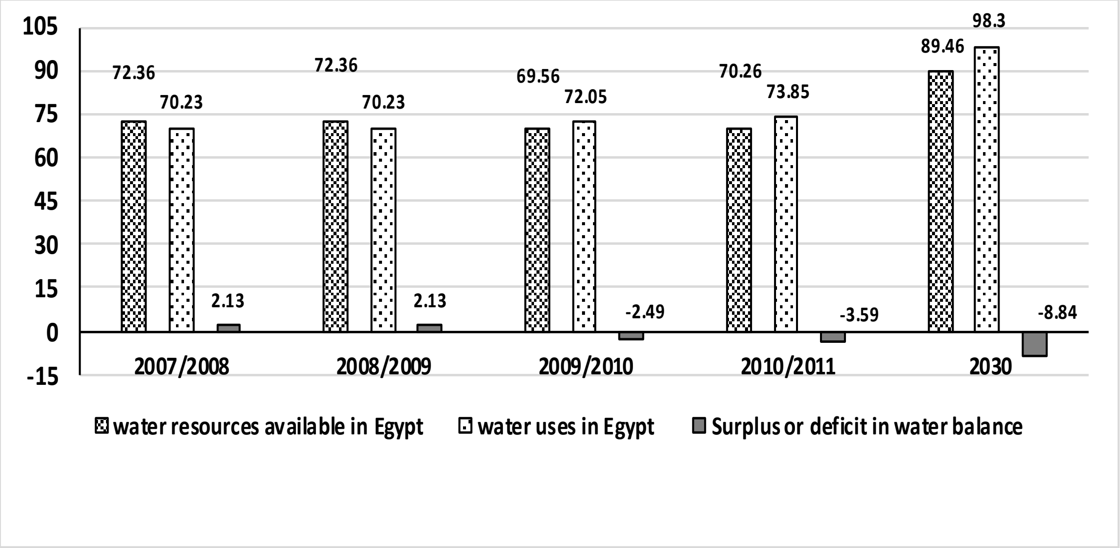
Table no. (2-8): water resources and uses per capita in Egypt by the year 2030.

statement	2007/ 2008	2008/ 2009	2009/2010	2010/ 2011	2030	Change (2007- 2011)%	Change (2011- 2030)%
water resources per capita by (m^3)	0.97	0.96	0.90	0.89	0.81	(8.41)	(9.74)
Water uses per capita by (m^3)	0.95	0.93	0.94	0.94	0.89	(0.81)	(5.64)
Surplus or deficit in water balance by (billion m^3)	2.13	2.13	(2.49)	(3.59)	(8.84)	-	-

Volumes in brackets are negative values.
Source: Compiled and calculated from:
(1) The Ministry of Water Resources and Irrigation, toward development strategy and management of water resources in Egypt during the period (2009-2017), august 2009.
(2) In accordance with the inventory of greenhouse gasses, which ended in Egypt of its implementation in 1999, which was adopted on the data available for the year 1990/1991.
(3) According to the estimates International Database (World Resources Institute Washington), United States, 2006.
(4) Estimates of the Central Agency for Public Mobilization and Statistics, 2015.

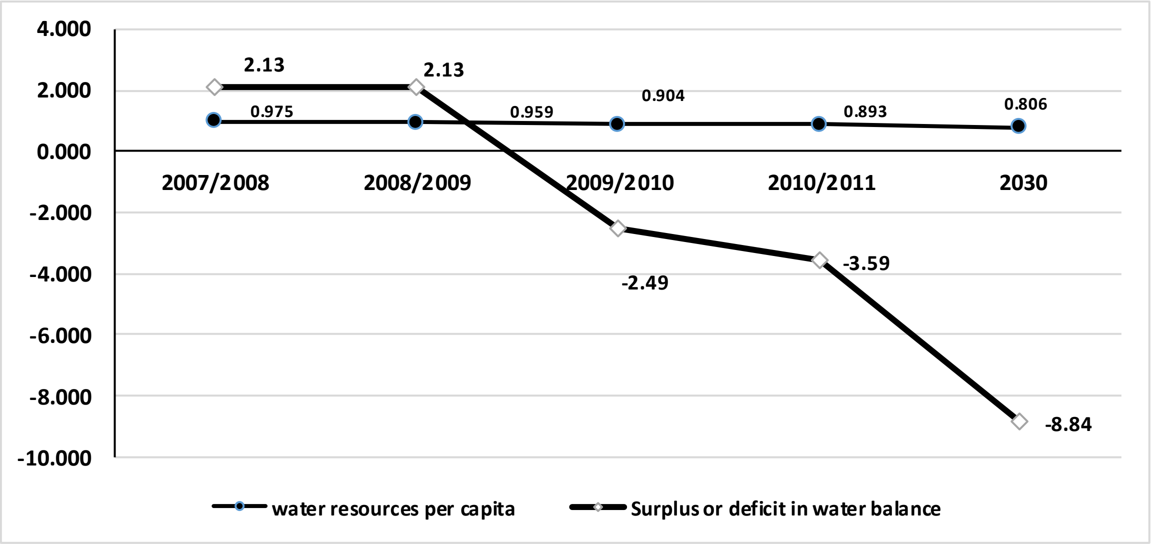
By studying the expected effects of climate change on the Nile River water during the coming years until the year 2030, it is expected, freshwater supplies from the south to the north will be lower as a result of because of high temperatures and increased evaporation rate, which will happen in countries of the Nile sources. As well as the waters of the Mediterranean would invade northern part of the Nile Delta and is moving toward south Delta because of sea level rise. although the impact of climate change on the Nile sources is still uncertain, ranging from an increase in the quantity of rainfall accompanied by floods in Ethiopia, Sudan, and Egypt, followed by a period of drought, or a lack of rainfall with an increase in the rate of evaporation, but the likely scenario is increased rates of steaming with flat amount of rain on the sources of the Nile, which constitute 85% of the Nile water sources, and with increased evaporation rates less than Egypt's share of the Nile water. especially that 20% of the quota to Egypt dissipates in the territory of the South of Sudan before entering the Nile in Egypt for reasons such as large subdivisions and narrow the original, with the increase in the number of the population, and therefore, increase the demand for water for agricultural, and industrial, it means a decline in the per capita share of water in the year 2030.

Figure no. (2-4): The Egyptian water balance by the year 2030.



Water resources, water uses, and Surplus or deficit in water balance by billion m^3
<u>Source</u>: from tables no. (2 -7).

Figure no. (2-5): Water uses per capita by the year 2030.



Surplus or deficit in water balances by billion m^3
Water resources per capita by m^3
Source: from tables no. (2 -8).

Also of the expected impacts of climate change on water resources in Egypt that cause global warming phenomenon in Egypt in accelerating the evaporation of Nile water, and thus, reduce the freshwater resources. Which, in turn, will lead to the aggravation of acute shortage of Egypt in the field of drinking water, irrigation and power generation.

It is expected to be affected by each water resources and demand negatively with climate change as follows:

[1] The high temperature will lead to increased evaporation, and increasing the quantities needed by consumption of agriculture and industry.

[2] The change in patterns of rainfall will lead to a shortage of water in coastal areas.

[3] The increase in the dust industrial pollutants and consumption human consumption also increased salinity in the soil would lead to the deterioration of water quality.

[4] Sea-level rise will increase the penetration of salinity in the soil and leads to the pollution of groundwater sources in coastal areas.

[5] As long as decreased resources of the river, it will withdraw this lack of underground water accumulated in the River Delta was nominated.

[6] As a result of decreased the water of the river, the Desert aquifers are not expected vulnerability to climatic changes, however, in the case of reservoirs to receive feed nominated by the river.

Previous results agreed with the results of studies conducted on the subject, agreed with all of "sentini" [**Sentini, 1991**], and “strzepek" [**Strzepek, Yates, and El Quosy, 1996**] studies about the effects of climate change on the future of the River Nile.

1.7. Impact of climate changes on the agricultural labor

It is expected that approximately about 6 million Egyptian citizen in the northern Delta may be subjected to displacement in the year 2030, due to the floods and high water level in the Mediterranean, where Egypt had been classified as one of the five countries in the world are the most vulnerable to the negative impacts of climate change, rising sea level or sinking parts of Delta and reflected in all of the social and economic harm, As a result, it is expected lost some of the agricultural lands, which would lead some of the millions to leave their areas and migration to new areas, it is estimated that the total number of displaced persons in the case of potential sea level rise ٣٠ cm mounted by about 70.4 thousand jobs of the agricultural labor in the area north of Delta (15), as in the table no. (2-9).

Table no. (2-9): Estimates of losses in the agricultural labor as a result of sea-level rise in Egypt.

The increase in the sea-level	Year	Losses in area	% of the total area	The number of jobs lost (Thousand job)
18 cm	2010	144 km^2	0.0144	32.5
30 cm	2030	190 km^2	0.019	70.4

Source: Compiled and calculated from:
El-raey M. (2000). (ECRP): coastal zone development and climate change drill down of climate change on Egypt.

The high temperature is expected to adversely affect agricultural productivity, and hence affected agricultural production with the loss of a portion of agricultural land, labor shortages as a result of displacement, in addition to the declining productivity of the agricultural worker, and also decrease the productivity of most crops, negatively affects Egypt's total agricultural output and food self-sufficiency ratio as a result of the high degree of motion.

[2] Expected scenarios for impacts of climate change on the agricultural production in Egypt

Assessment and analysis of the expected economic impacts of climate change by 2030, on the main economic variables relating to such cultivated area, crop area and productivity of major crops. Also regarding the possibility of sinking part of the Delta land to about 15% of the total Delta area. In addition, to the expected impacts on water balance in Egypt. With the evolution of each of the variables: population and agricultural intensification, in the end, to estimate the impact of climate change on agricultural production value. So can view the most important variables been taken into account in assessing the impact of climate change on sustainable agricultural development in Egypt as follows:

[1] Cultivated area

[2] Crop area

[3] Population growth rate

[4] An amount of water used for agriculture and other uses.

[5] Water quantity expected from natural sources.

Estimation of the expected impacts of climate change on the agricultural production value, as the final outcome of the anticipated changes in the variables influencing the value of this output. the assessment of expected impacts was limited to plant sector, where agricultural production includes other sectors such as fisheries and livestock, can were estimated for three scenarios:

1. scenario no. (1). the optimistic scenario--with presumably no sinking of the Delta land, and the absence of effects of climate change on the variables in the valuation.

2. scenario no. (2) – pessimistic scenario- where is the estimation of the expected impacts of climate change with probability sank 15% of the Delta land, assuming no changes due to climate change on other variables.

Thus the difference between scenario no. (2) and scenario no. (1), represents the impact probability of sank 15% of the Delta land on the Egyptian agricultural production as the potential impact of climate change.

3. scenario no. (3) – the most pessimistic scenario- has been added to the potential impact of climate change on the productivity of most crops and water consumption.

So the difference between scenario no. (3) and scenario no. (2), represents the effect of the potential impact of climate change on crop productivity, and crop water consumption, in addition to sinking 15% of the Delta land.

The following is an overview of these estimates, with an assumption of a steady crop intensification at 1.99 in all scenarios, as in the tables No. (2-10, 2-11), accordingly, it is expected that:

Table no. (2-10): Expected scenarios for cultivated and crop area with future water resources by the year 2030 in light of the sinking and without sinking 15% of Delta lands by the year 2030.

The statement	2011	2030		Change Between (1), (2)	Change between (1), (2) %	Estimates agricultural development strategy for the year 2030
		Scenario (1) without sank 15% of the Delta lands	Scenario (2) with sank 15% of the Delta lands			
The cultivated (million acres)	8.619	11.549	10.6	(0.949)	(8.22)	11.549
crop intensification	1.806	1.99	1.99	–	–	1.99
Crop Area (by million acres)	15.57	22.5	21.094	(1.406)	(6.25)	22.984
Population (by million person)	78.69	111	111	–	–	111
Water used in agriculture (by billion m3)	60.9	81.3	74.94	(6.36)	(7.82)	–
Water used in drinking and health (by billion m3)	9.55	13.5	13.5	–	–	–
Other used of water (by billion m3)	3.5	3.5	3.5	–	–	–
Total used of water (by billion m3)	65.72	98.3	91.94	(6.36)	(6.47)	–
Water resources (by billion m3)	62.13	89.4	71.52	(17.88)	(20.0)	–
Balance of water (by billion m3)	(3.59)	(8.84)	(2.48)	6.36	(71.95)	–
Value of Agricultural production (by billion dollars)	35.112	84.22	78.03	(6.19)	(7.35)	–

Volumes in brackets are negative.

Source: Compiled and calculated from: Tables no. (2-2), to (2-9).

In the case of potential sank 15% of Delta lands: the cultivated area will be reduced by about 0.949 million Acres, equal about 8.22% of the cultivated area compared by with the case of no sinking part of the delta land, thus reduced crop area about 1.406 million acres, approximately by 6.25% of crop area comparing in the case of no sinking part of the delta land. in addition to surplus in the Egyptian balance water by about 2.48 billion m^3. In this case value of the Egyptian agriculture production will decrease by about 6.19 billion dollars, equal about 6.19% compared by presumably no sinking of the Delta land.

In the case of sinking 15% of Delta lands, with the change of the productivity and water consumption of most crops: the result will be a reduction in the cultivated area of about 0.94 million acres, and thus, decrease the crop area by about 1.39 million acres, with deficit in the Egyptian balance water by about 4.74 billion m^3. Compared this results with scenario no. (1), the cultivated area will decrease by about 8.17%, and the crop area will decrease 6.18%, also the value of the Egyptian agriculture production will decrease by about 12.51%, while Compared this results with scenario no. (2) the cultivated area will increase by about 0.06%, and the crop area will increase by about 0.08%, also the value of the Egyptian agriculture production will decrease by about 5.57%.

In addition, the effects of climate change on each of the most crops productivity as well as an agricultural labor productivity, the expected effects on each of the cultivated and crop area, it will be seen that agricultural production will be negatively affected by these changes, and thus, would be reflected on the adequacy of agricultural production and the ratio of self-sufficiency of different crops, thus on the national economy, generally.

Therefore, the scenarios were expected (scenarios 2, 3), in the year 2030, as a result of the impact of climatic changes, completely different from the Egyptian expectations of agricultural development strategy for the year 2030, where it was did not take into account the change climate effects of expected until the year 2030, have been targeted at key strategic targets sustainable agricultural development in year 2030, it has not, however, take within these objectives the impact of projected climate change, although this aspect is extremely important, and it has a significant impact in accordance with the scenarios is expected to be No. (2, 3).

Table no. (2-11): Expected scenarios for cultivated and crop area with future water resources by the year 2030 in light of the impacts of the climate change.

The statement	2030 Scenario (3) included change climate	Change between (1), (3)	Change between (1), (3)%	Change between (2), (3)	Change between (2), (3)%
The cultivated (million acres)	10.606	(0.94)	(8.17)	0.006	0.06
crop intensification	1.99	–	–	–	–
Crop Area (by million acres)	21.11	(1.39)	(6.18)	0.016	0.08
Population (by million person)	111	–	–	–	–
Water used in agriculture (by billion m^3)	77.19	(4.11)	(5.06)	2.2482	3.00
Water used in drinking and health (by billion m^3)	13.5	–	–	–	–
Other used of water (by billion m3)	3.5	–	–	–	–
Total used of water (by billion m^3)	94.19	(4.11)	(4.18)	2.25	2.45
Water resources (by billion m^3)	89.41	0.01	0.0	17.89	25.0
Balance of water (by billion m^3)	(4.74)	13.58	–	(7.22)	–
Value of Agricultural production (by billion dollars)	73.68	(10.54)	(12.51)	(4.35)	(5.57)

Volumes in brackets are negative.
Source: Compiled and calculated from: Tables no. (2-2), to (2-9).

Previous results that have been evaluated, agreed with many of the studies in the same object, where the negative impacts of climate change and the increase expected population, this would lead to a decline in expected, estimated by about 12% in value agriculture agricultural production by the year 2030, also, an increase of about 16% in the value of the purchase prices loss of job opportunities, which is estimated at 2% of the total current employment, As well as the climate change will reduce the Egypt's GDP by about 10% in the year 2050 [**Fayyad, 2009**].

Abstract

The emissions of greenhouse gasses in Egypt not only about 0.58% of the total emissions of the world in the year 2015, Although Egypt is one of the most countries which affected by the impacts of climate change. By Assessment and analysis of the expected economic impacts of climate change by the year 2030, the

Egyptian cultivated area will be reduced to about 0.949 million Acres, equal about 8.22% of the Egyptian cultivated area compared by with the case of no sinking part of the Delta land, thus reduced crop area in Egypt to about 1.406 million acres, approximately to about 6.25% of crop area comparing in the case of no sinking part of the Delta land. in addition to surplus in the Egyptian balance water to about 2.48 billion m^3. In this case value of the Egyptian agriculture production will decrease to about 6.19 billion dollars, equal about 6.19% compared by presumably no sinking of the Delta land. In the case of sinking 15% of Delta lands, with the change of the productivity and water consumption of most crops, the result will be a reduction in the Egyptian cultivated area to about 0.94 million acres. In addition to decreasing the Egyptian crop area to about 1.39 million acres, with a deficit in the Egyptian balance water to about 4.74 billion m^3 compared to the case of no sinking part of the Delta land, the cultivated area will decrease to about 8.17%, and the crop area will decrease 6.18%. Also, the value of the Egyptian agriculture production will decrease by about 12.51%. while Compared to sinking part of the Delta land to about 15% of the total Delta area without the other impacts of climate change, the cultivated area will increase by about 0.06%, and the crop area will increase by about 0.08%, also, the value of the Egyptian agriculture production will decrease by about 5.57%.

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Chapter: ③

Green Economy and Sustainable Agricultural Development in Egypt

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Green Economy and Sustainable Agricultural Development in Egypt

PREFACE

The concept of a 'green economy' does not replace sustainable development, but there is a growing recognition that achieving sustainability rests almost entirely on getting the economy right. Decades of creating new wealth through a ' brown economy' model based on fossil fuels have not substantially addressed social marginalization, environmental degradation, and resource depletion. In addition, the world is still far from delivering on the Millennium Development Goals by 2015 (UNEP, 2011). Resource efficiency is a closely related concept since the transition to a green economy depends on meeting the twin challenges of maintaining the structure and functions of ecosystems and finding ways to cut resource use in production and consumption activities and their environmental impacts.

[1] Green Economy

1.1. Green Economy definition

The Environmental Program of the United Nations (UNEP) defines green economy as "***one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities***" [**UNEP, 2011**]. Thus, green economies are not based on the demand for sacrifice but on the idea of qualitative growth, where low-carbon and environmentally friendly technologies.

1.2. The reasons for going to the green economy

The reasons for going to adopt the green economy for the following reasons:

- The global financial crisis in 2008 –2009 became multidimensional economic, social and environmental. On the economic level, the effects of the crisis were a reduction of the world GDP and volume of international trade, reducing investment and jobs creation, etc. A side effect of the crisis was a reduction of the level of well-being. People have lost savings, their jobs, in particular, have lost confidence in the financial sector, banking and more generally in the market economy. The scale of this crisis, its global dimension and the lack of early warning signals from a market economy were a shock for the citizens, politicians and even for financiers and bankers. International organizations and countries prepared recovery programs and strategies for the future. A new model of the economy and many actors of political and economic life propose a sustainable development, operationally defined as a green economy concept [**Barbier 2010; Ocampo 2011**]. [**Streeck 2011; Krugman 2009; Roubini, Mihm, 2011**] [**Stiglitz, 2010**].

- It has failed the fragile ecological systems on which we depend for survival. It has failed, spectacularly, in its own terms, to provide economic stability and secure people's livelihoods. Today's world is characterized by the degradation of forests, lakes, and soils, conflicts over land use, water quality, fishing rights and the concentrations of carbon in the global atmosphere. And we face these tasks with an economy that is fundamentally broken, in desperate need of renewal. In these circumstances, a return to business, as usual, is not an option. Prosperity for the few founded on ecological destruction and persistent social injustice is no foundation for a civilized society. The global crisis challenged the dominant economic model to its foundations [Jackson, 2009].

- The new trends in the economy are already a fact. We can see sustainable banking, eco-taxes, green investment funds, green public procurement, eco-innovations in industry, low carbon economy, alternative sources of energy, etc.

- There is a "growing recognition that achieving sustainability rests almost entirely on getting the economy right." It also emphasizes the crucial point that economic growth and environmental stewardship can be complementary strategies. The concept of green economy should be seen as consistent with the broader and older concept of sustainable development, which has been mainstreamed. The specificity of the broader concept is associated with both its holistic character, as it encompasses the three pillars of development – economic, social and environmental – and its particular focus on inter-generational equity [**Ocampo, 2011**].

- The concepts of green economy and green growth is the understanding that the benefits of environmental sustainability outweigh the costs of investing in and protecting the ecosystems, so that it is possible to have a win-win or "double dividend" strategy of growth with environmental sustainability, and even win-win-win or "triple dividend" strategy that also includes poverty eradication and broader improvements in social equity. This is interesting from the point of view of policy makers because they have to deal with many dimensions of the crisis and the idea of sustainable development is offering the path to transforming economy but also to support citizens and environment. [**Ocampo, 2011**].
- Green growth is closely related to the concept of a green economy which UNEP defines as one in which "growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services
- There is a growing debate among scholars about the importance of green economy concept for future development policy. Below the author presents few of them: "The concept of a green economy is crucial for guiding policies for sustainable development since it goes to the heart of the matter: organize economies in ways that fit local and global ecological prerequisites and long-term dynamics"."A 'green economy' concept is an essential step towards the transition to a resilient and sustainable economy. [**Mol, Sonnenfeld, Spaargaren , 2011**].
- However, it does not go far enough as long as it does not address the dilemma of economic growth: every expansion of economic activity implies more stress on the planet's ecosystems" [**Pirgmaier, Fulai et al., 2011**].
- "The 'green economy 'concept is useful to the extent that it engages policymakers, economists, and businesses in critical dialogue with other stakeholders to compare alternative pathways for development. The comparison should then consider economic criteria alongside social, political, cultural and ecological criteria, and how 'business-as-usual' development and more sustainable alternatives trade off. By recognizing that the economy is a subsystem of human society which is itself a subsystem of the environment, the green economy concept helps to pri-

oritize sustainable development and resource management on decision makers' agendas, influencing their thinking and giving them a mandate to ensure that our economic activities do not exceed environmental tipping points [**Polzin, Kostka, Fulai et al., 2011**]. [**Fulai et al., 2011**].

1.3. Green economy principles

The green economy can also be viewed as a set of principles, aims, and actions, which generally include: [ECLAC, 2010; EEA, 2010; UNEP 2011a; and OECD, 2011a]:

- Equity and fairness, both within and between generations;
- Consistency with the principles of sustainable development;
- A precautionary approach to social and environmental impacts;
- An appreciation of natural and social capital, though, for example, the internalization of external costs, green accounting, whole-life costing and improved governance;
- Sustainable and efficient resource use, consumption and production;
- A need to fit with existing macroeconomic goals, through the creation of green jobs, poverty eradication, increased competitiveness and growth in key sectors.

1.4. Resource efficiency in green economy

Resource efficiency in green economy in the following:

- Resource efficiency is implicit in the green economy' s principle of sustainable and efficient resource use, consumption and production. the transition to a green economy depends on meeting the twin challenges of maintaining the structure and functions of ecosystems (ecosystem resilience) and finding ways to cut resource use in production and consumption activities and their environmental impacts (resource efficiency). More specifically, resource efficiency means achieving a desired increased level of output with a reduced level of human, natural or financial inputs. It is a necessary criterion for a green economy, although it may not be sufficient, as it may still allow resource use to increase in absolute terms, which indeed has been the case for most countries in recent decades [**OECD, 2011c**].

- Compared to a green economy, measures of resource efficiency are easier to define **(UNEP, 2010a**). At the macroeconomic level, indicators such as gross domestic product (GDP) per resource use highlight the relationship between resource use and economic output. Nevertheless, differences in interpretation remain, with only a few countries formally defining the term ' resources' in policy. Some include both renewable and non-renewable resources, while others use a narrower term ' raw materials' which includes fossil fuel reserves. Neither a clear definition nor a common understanding of the term ' resource efficiency' appears to be in place [**EEA, 2011**].

Green economy priorities regarding economy and resources efficiency, as following as [21]:

Renewable energy (including hydropower, biofuels, and biomass); (2) Energy efficiency; Mobility (air quality, emissions, and noise); (3) Industry (emissions and waste); (4) Innovation; (5) Environmental Impact Assessment (EIA) and Strategic Impact Assessment (SIA); (6) Governance (including institutional arrangements and multilateral environmental agreements) and environmental performance reviews; (7) Corporate Social Responsibility (CSR) and environmental reporting; (8) Mining . (9) Resource efficiency, use of natural capital (including forestry, agriculture, urbanization linked to the use and degradation of land, soil, water and biodiversity); (10) Water efficiency in industrial, rural and urban areas; (11) Life-cycle analysis; (12) Environmental accounting; (13) Sustainable consumption and production patterns. (14) Tourism.

1.5. green economy transformation financial resources

To summarize: a global green economy transformation will require substantial financial resources [UNEP 2011]:

- Additional investments required will likely be in the range of 1 to 2.5% of global Gross Domestic Product (GDP) per year from 2010 to 2050. A considerable amount of investment will be needed in energy supply and efficiency, particularly in greening the transport and buildings sectors.

- Financial investment, banking, and insurance are the major channels of private financing for a green economy. The financial services and investment sectors control trillions of dollars that could potentially be directed towards a green economy. More importantly, long-term public and private institutional investors, banks and insurance companies are increasingly interested in acquiring portfolios that minimize environmental, social and governance risks, while capitalizing on emerging green technologies.

- The rapid growth and increasingly green orientation of capital markets, the evolution of emerging market instruments such as carbon finance and micro-finance, and the green stimulus funds established in response to the economic slowdown of recent years, are opening up space for large-scale financing for a global green economic transformation.

- The role of the public sector is indispensable in freeing up the flow of private finance towards a green economy. The governments and multilateral financial institutions should use their own resources to leverage financial flows from the private sector and direct them towards green economic opportunities.

- Public finance is important for triggering a green economic transformation, even if public resources are significantly smaller than those of private markets.

- Development finance institutions can allocate significant proportions of their new lending towards financing green economy transition projects.

[2] Agricultural strategic objectives for a green economy

- Greening the Economy with Agriculture refers to increasing food security (availability, access, stability, and utilization) while using fewer natural resources, through improved efficiencies throughout the food value chain. This can be achieved by applying an ecosystem approach to agriculture, forestry and fisheries management in a way that addresses the multiplicity of societal needs and desires, without jeopardizing options for future generations to benefit from all goods and services provided by terrestrial and marine ecosystems [6] [8], [11].

- Information on strategic objectives, targets, and indicators in resource-efficiency assessments shows a large variety of approaches, directions, and level of detail. Strategic objectives for resource efficiency tend to be fairly general in nature, most often referring to ensuring sustainable use of natural resources;

improving energy efficiency; increasing recycling of waste, and waste prevention/decoupling waste and growth. Other fairly common objectives include sustainable management of minerals; improving resource efficiency; reducing energy use; increasing the share of renewable energy; improving water quality; reducing the use of water; and protecting biodiversity.

[3] Green growth

Green growth is growth that is environmentally sustainable. It is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management in preventing physical hazards and excessive commodity price volatility. Green growth is a tool to achieve sustainable development, not a competing paradigm. It offers a development pathway that reconciles the urgent need for sustained growth with the imperative of avoiding lock-in to unsustainable growth patterns and irreversible environmental damage. Green growth is not anti-growth; it represents a change in how we manage economies for sustainability.

The concept of green growth has its origins in the Asia and Pacific Region. At the Fifth Ministerial Conference on Environment and Development (MCED) held in March 2005 in Seoul, 52 Governments and other stakeholders from Asia and the Pacific agreed to move beyond the sustainable development rhetoric and pursue a path of "green growth". To do so, they adopted a Ministerial declaration (the Seoul Initiative Network on Green Growth) and a regional implementation plan for sustainable development [**UNESCAP, 2008**]. This commenced a broader vision of green growth as a regional initiative of UNESCAP, where it is viewed as a key strategy for achieving sustainable development as well as the Millennium Development Goals [**UNESCAP, 2012**].

The green growth approach adopted by the MCED sought to harmonize economic growth with environmental sustainability while improving the eco-efficiency of economic growth and enhancing the synergies between environment and economy. As with the green economy, green growth attracted significant attention as a way out of today's economic doldrums in the aftermath of the 2008 financial crisis [**Green Growth Leaders, 2011**].

The goal of inclusive green growth is to reduce poverty, promote equity, and create opportunities without irreparably harming the environment. In other words, green growth should create a green economy, which the United Nations Environment Program (UNEP) defines as one "that results in improved human well-being and social equity, while significantly reducing environment risks and ecological scarcities." So the two concepts are intimately linked – two sides of the same coin. Importantly, neither are new paradigms. Both are inputs into sustainable development, the ultimate objective of growth, development, and environmental policies. The World Bank's emphasis on growth aims to draw attention to the fact that continued growth in developing countries is necessary – though not sufficient – to deliver on the development agenda.

This common vision of green growth/economy as instruments to achieve sustainable development is being developed further through the Green Growth Knowledge Platform (GGKP), a joint initiative of the Global Green Growth Institute, the Organization for Economic Co-operation and Development, UNEP, and the World Bank. The GGKP, which launched in January 2012, is a global network of researchers and development experts seeking to identify and address major knowledge gaps in green growth theory and practice. Through widespread consultation and world-class research, the GGKP aims to provide practitioners and policy makers with better tools to foster economic growth and implement sustainable development.

[4] Challenges and Gains of the Egyptian economy heading toward the green economy

A shift to a green economy pathway could lead Egypt to achieve annual savings of over US$1.3 billion in the agriculture sector, and about US$1.1 billion in the water sector, as well as a 13% reduction in CO_2 emissions, and a 40% reduction in water consumption, according to a report released by the United Nations Environment Programme (UNEP).

Launched at the African Ministerial Conference on Environment (AMCEN), the Green Economy Scoping Study for Egypt finds that economic and environmental trends such as declining water share per capita of over 30 per cent by 2025, solid waste generation increases of 36 per cent since 2000, and natural resource depletion of around 3.78% annually, can be arrested and reversed through green interventions that can accelerate Egypt's sustainable development. Challenges such as Egypt's rapidly growing population - which could reach 100 million by 2020 – coupled with an ecological footprint almost three times its available bio-capacity, according to the Arab Forum on Environment and Development, are opportunities to implement an inclusive green economy strategy that can revitalize and diversify the economy and achieve social equity while also conserving the environment, and improving health and human welfare." Greening key sectors such as water, agriculture, waste, and energy is an economically and environmentally astute course of action. The savings alone make a strong case for a new policy approach that can decouple environmental degradation from economic development, create jobs, reduce emissions, attract foreign investment and develop new markets, as well as expected benefits and policy approaches for greening Egypt's agricultural, water, energy and solid waste sectors.

4.1. Green Interventions – Agriculture

The agriculture sector currently only contributes about 14% of GDP - compared to 30 %in the 1970s – and as a result of business as usual practices is marred by the loss of agricultural biodiversity, land erosion and loss of soil fertility. Identified green interventions which can reverse these downward trends include investing in organic farming; changing cropping patterns; and shifting to modern irrigation systems. Directing investments to rural areas will also reduce rural to urban migration and the pressure this creates on the physical and social infrastructure and services in urban areas, which contributes to enhancing equity, social cohesion and improved distribution of wealth and opportunities, particularly among the poor and marginalized segments of the Egyptian population.

- Conversion of 20% of the total agricultural land from conventional to sustainable and organic cultivation amounting to about 1.44 million feddan, could result in a saving of approximately 700, 000 tons of chemical fertilizers annually or 1 billion EGP annually.

- The potential of producing compost from agricultural residues could provide more than 22 million tons of organic waste annually or 9 billion EGP annually.
- Reducing the area cultivated for rice (or using early maturing varieties) and sugar cane could lead to water savings of about (4-7) or five billion EGP by 2017.
- It is estimated that using drip irrigation could save up to 40% of water as compared to flood irrigation. This will result in water savings amounting to about 23 billion m^3.

4.2. Green Interventions – Water

Demand for water is increasing at an alarming rate, with water share per capita set to decrease by over 65 %by 2050 as population growth, urbanization, and increased agricultural and industrial activities continue to increase pressure on an already scarce resource. Identified green interventions which can help to reverse this trend include investing in non-conventional water resources development such as desalination and treated wastewater, and the upgrading and expansion of national water use efficiency.

- Investing in household water saving devices for domestic use including residential building is estimated to result in water savings between (10% to 20%) or 1.4 billion m^3 of water savings annually.
- Other benefits of water efficiency approaches include increased land productivity and yields estimated at between 20% to 30%.
- Efficiency in the use and allocation of water resulting from good governance and regulatory framework is expected to result in 10% savings in water consumption estimated at 6.75 billion m^3 annually.

4.3. Green Interventions – Energy

- Since 2007, a gap between energy supply and demand has existed and is expected to continue to increase under the business as usual scenario. Public expenditure on energy subsidies has reached unprecedented levels, representing about 73% of all subsidies and approximately 21% of the country's budget, according to the African Development Bank. Identified green interventions which can help reverse this trend include investing heavily in renewable energy sources such as solar and wind infrastructure to increase the percentage share of renewable energy out of the total energy mix; investing in energy efficient appliances and equipment by households and economic sectors; and investing in human resource development, R&D in energy-saving technologies, practices and measures Investing in renewable energy can be a driver for job creation, with an estimated 75,000 new job opportunities in solar and wind systems design, manufacturing, operational services, and sales.

- Investing in energy efficiency practices such as the installation of efficient lighting equipment lead to significant energy savings especially that 34% of residential energy consumption is for lighting purposes.
- Energy efficiency measures in Egypt are expected to result in about 30% in energy savings estimated at 33 billion kW based on 2012 estimated of energy consumption in Egypt.
- Reduction in oil consumption by 20% is estimated to cut down CO_2 emissions by 18 million tons of CO_2 annually.

4.4. Green Interventions – Waste

It is estimated that annual solid waste generation has increased by more than 36% since 2000, with an estimated increase of 3.4% per annum, according to SWEET Net. It reached about 21 million tons in 2010, nine million tons of which is generated by greater Cairo. The current state of solid waste management is resulting in increased environmental damage and negative impacts on health. Identified green investments which could reverse these trends include investing in waste to organic fertilizers and waste to biofuel facilities; investing in producing refuse-derived fuel for use as an energy source for cement factories and other industrial uses; and investing in human resource development, R&D and innovative recycling technologies and equipment.

[5] The role of agriculture of mitigating the impacts of climate change in Egypt

the Agriculture itself is responsible for 30% of greenhouse gas emissions, the activities for agricultural expansion caused by the carbon dioxide gas in the air, and that more than 40% of the methane gas is generated by the dissolution of organic materials in rice fields flooded , and that agriculture is responsible for 80% of emissions of nitro oxide through analyzing the fertilizers, can be significantly reduce emissions of greenhouse gases resulting from agriculture through many means, the most important of which are:

- *The use of coping mechanisms that resist climate change*, through specific activities such as use of crops resistant to drought or salinity, and use of water resources in the most efficient manner, in addition improvement in the management of pesticides, as well as can include changes in agricultural patterns, reducing the use of fertilizers and develop the production of rice.
- *farming can contribute to a* positive *in reducing emissions of carbon dioxide by absorbed*, where it is estimated that the contribution of the crop land in carbon sink during the twentieth and thirtieth next year ranging from 450 to about 610 million tons of carbon each year, the application of the methods of best in land management as improving fork soil water management and erosion control, conversion of cropland in the industrial countries to permanent forest or grassland or ecological systems, living biomass crops, to plow soil for maintenance, and other farming can have a major role in carbon sink compensatory mechanism on the contribution of agriculture to greenhouse gases.

▪ *It also could be that agriculture plays an in reducing the burning of fossil fuels*, it is possible to replace 20% of fossil fuel consumption in the short term using biomass fuel live Such as herbs, which fast growth, oilseeds agricultural residues provide great potential as alternatives to generate energy.

[6] Ways to face of the climate change phenomenon in Egypt

this is done through the following:

Mitigation: It is meant to reduce the greenhouse gas emissions from different sectors through the use of clean technology, fuel substitution, the use of renewable energies such as the wind, the Sun, tubing, and vitality, and the ***Vulnerability:*** It is intended to place the system or a given environmental risks of returns of climatic changes, such as the threat of sea-level rise, which will lead to the sinking parts inhabited and destroying fertile land, in addition to the threat resulting from the lack of water resources, as well as the spread of diseases. ***<u>Adaptation</u>***: It is intended to respond to comparable climatic changes and coexistence with the conditions resulting from such circumstances such as devising new strains of crops, which bear the high temperature and salinity, optimum use of water resources through the application of the policies of rations and rationalize water consumption.

Also, the magnitude of the effects resulting from climate change requires several measures, perhaps the most important of which are:

- *The formulation of a policy of integrated coastal areas management and development integrated coastal zone management*, taking into account the potential rise in sea level with the monitoring of the implementation of this policy continued monitoring (through remote sensing, for example), the operational ways to modify the route in the case of errors.
- *The severe shortage of available data and information on the negative effects of climate change on different sectors of development in Egypt*, in particular the issue of the internal and external migration, and the establishment of a full database continually occurring, in advance of the study, the promotion of scientific research and technology in all issues related to climate change and develop specific plans and financing is clear.

The regionalization studies of the most important means to reduce the negative impact and further improve the positive impact of this phenomenon, there have been many studies of regionalization in this regard was the result of the possibility to overcome, or at least alleviate the shortage in crops productivity, which adversely affected by this phenomenon, the results of the studies conducted on the regionalization of certain crops to change your wheat cultivation under conditions of climatic changes from 1-15 November to the period from 25 November to 10 December led to an increase in the productivity of wheat by about 4%, and the increase in the rate of nitrogen fertilization of 50 kilograms per acre liquid to 70 kg liquid per acre led to increasing the yield of about 5%, as for tomato crop, under conditions of high temperature about 1.5 C°, it can reduce the shortage the incident in this production per acre by about 4% when you change the date of the first agriculture March to mid-March, and that it can be reduced by about 5% other shortage by increasing the amount of irrigation water 100 mm in the season to the quantity of water of the crop, either under conditions of high temperature by 3.5 C°, the change your agriculture from the first march to 20 February led to relieve the shortage of about 34 %.

There are many of the results of the studies conducted on the regionalization of crops, which has been a study sensitivity under conditions of climatic changes, which could be on the way to ease the shortage the accident, whether in crop productivity or net revenues of farm crop yield per acre or unit of water.

***Generally, the most important results of the regionalization studies proposed the following* (1):**

- To develop new types of high temperature, salinity and drought and the conditions that will prevail under conditions of climate change, and to develop new types of short growth season to reduce water requirements necessary for it, as well as to change the dates for agriculture, including appropriate to weather conditions, as well as cultivation of new items in appropriate areas to the appropriate climate for increasing the yield of crop harvest water for each unit.
- reduce wasteful crop area in water consumption, or at least not to increase the size of (such as rice and sugarcane), and plant alternative crops are given the same purpose and water consumption season and lower growth such as the cultivation of sugar beet, instead of sugar cane (in this strategy should take into account that this crop is a major crop in Upper Egypt, in addition to the factories secondary industries and employment based on this crop).
- Irrigation water at appropriate time's appropriate quantity in each affected in order to preserve every drop of water, which will be in need of it under conditions of climate change.

[7] The Egyptian efforts exerted to face the effects of climatic changes:

Egypt responded with efforts to cope with the challenges of climate change and improve their conditions of life, establish the rules of sustainable development in the world, and where that Egypt is one of the countries that are expected to be affected by the impacts of climate change, especially in the sectors of agriculture, water resources, coasts, and health. Therefore, has focused on the need to activate the State policies of response measures to cope with and mitigation of the consequences of climate change.

Egypt made many efforts and activities to deal with the issue of climate change, including:

- The ratification of the Convention on the United Nations Climate Change and environment law No. 4 in the year 1994, and participation in all international conferences and workshops on Climate Change, to avoid imposing any international obligations on the developing countries, including Egypt, and ratification of the Kyoto Protocol and forming a national committee for the Clean development mechanism (CDM) in the year 2005, includes the Egyptian Office and the Egyptian clean development mechanism, and the report of national reporting in the year 1999 to limit greenhouse gases and national plan of action to climate change.

- The Ministry of Electricity and Energy work of many projects in the field of New and Renewable Sources of Energy (wind-solar-water-biotechnology) and encourage projects to improve energy efficiency, and the Ministry of Water Resources and Irrigation Projects to protect the beaches (the protection of the coast), as well as the establishment of competent research institutes in collaboration with development partners, and the Agricultural Research Center to conduct some research on the impact of climate change on crop production and to devise new types have the ability to take the heat, and the establishment of the Ministry of the environment work Pilot projects to encourage the private sector to invest in clean energy projects, treatment of wastes and the establishment of forest plantations, and the establishment of the Ministry of the environment is currently preparing a report national reporting II to be the basis of the updated national plan of action to climate change, and update inventories of greenhouse of various sectors.

- The restructuring of the national climate change in the year 2007 to coordinate at the national level with regard to the topics of climate change, and the perception of policies and strategies to deal with these issues, and to propose mechanisms for implementation.

- maximizing Egypt's benefit from the mechanisms of the Kyoto Protocol through the implementation of the clean development mechanism projects, where guest approval on a number (36) The draft in the framework of the mechanism, including sectors of New and Renewable Sources of Energy, Industry, waste treatment, afforestation, and improve the efficiency of energy conversion of fuel, natural gas, at a total cost about 1.200 million dollar, represent these projects attractive to foreign investment, and providing new job opportunities, and to contribute to the implementation of the sustainable development plans in the State.

- The plan targets National Climatic changes need to exchange information to reach a real dimensions of the phenomenon of climate change environmental repercussions, and that one of its axes is the cooperation with the international community in maintaining the quality of the environment and reducing the causes of climate change, the plan includes the areas of raising the public awareness of the phenomenon and deal with economic dimensions, capacity-building, and international financial and technical assistance programs, as well as the transfer of technology, and to develop the necessary policies and programs to adapt to climate changes in all sectors, with the participation of non-governmental associations and organizations (18).

[8] The role of agriculture in mitigating the impacts of climate change in Egypt

As regards the future of agriculture under the changing climate, a range of adjustment, measures can be undertaken relating to farming practices, for example, planting, harvesting and watering/fertilizing existing crops, using different varieties, diversifying crops, implementing management practices. Mitigation has the potential to reduce climate change impacts, and adaptation can reduce the damage of those impacts. Together, both approaches can contribute to the development of societies that are more resilient to the threat of climate change.

[1] can significantly reduce emissions of greenhouse gasses resulting from agriculture through many means, the most important of which are:

[2] The use of coping mechanisms that resist climate change, through specific activities such as use of crops resistant to drought or salinity, and use of water resources in the most efficient manner, in addition improvement in the management of pesticides, as well as can include changes in agricultural patterns, reducing the use of fertilizers and develop the production of rice.

[3] Farming can contribute to a positive in reducing emissions of carbon dioxide by absorbed, where it is estimated that the contribution of cropland in carbon sink

during the twentieth and thirtieth next year ranging from 450 to about 610 million tons of carbon each year, the application of the methods of best in land management as improving fork soil water management and erosion control, conversion of cropland in the industrial countries to permanent forest or grassland or ecological systems, living biomass crops, to plow soil for maintenance, and other farming can have a major role in carbon sink compensatory mechanism on the contribution of agriculture to greenhouse gases.

[4] It also could be that agriculture plays an in reducing the burning of fossil fuels, it is possible to replace 20% of fossil fuel consumption in the short term using biomass fuel live Such as herbs, which fast growth, oilseeds agricultural residues provide great potential as alternatives to generate energy.

Abstract

Greening the Economy with Agriculture refers to increasing food security while using fewer natural resources, through improved efficiencies throughout the food value chain. This can be achieved by applying an ecosystem approach to agriculture, forestry and fisheries management in a way that addresses the multiplicity of societal needs and desires, without jeopardizing options for future generations to benefit from all goods and services provided by terrestrial and marine ecosystems. The gains of the Egyptian economy heading toward the green economy: A shift to a green economy pathway could lead Egypt to achieve annual savings of over US$1.3 billion in the agriculture sector, and about US$1.1 billion in the water sector, as well as a 13% reduction in CO_2 emissions, and a 40% reduction in water consumption.

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Chapter: ④

Overview about Climate Change and its Impacts on Egyptian Plant Sector

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Chapter: ④

Overview about Climate Change and its Impacts on Egyptian Agricultural Plant Sector

PREFACE

There is no doubt that Egypt would be exposed to the effects of the phenomenon of climate change, according to the findings of this book, the Egyptian economy to face the problems of many challenges, generally, and the agricultural sector in particular, as it is clear that it was necessary to face these challenges and influenced the means and methods of numerous, the most important of which is to reduce greenhouse gas emissions and transition to a path of green economy, with the following an offer to summarize the most important problems and challenges which are expected to face the Egyptian economy, and the methods of encountered, as follows:

[1] The problems and difficulties that face the Egyptian agricultural plant sector as a result of the phenomenon of climate change

1- An increase of the temperature, decreased precipitation and increased carbon dioxide emissions, underlines the fact climatic changes which are affected by Egypt, as Egypt is considered one of the countries most affected by climatic changes.

2- The proportion of methane emissions from the agriculture sector in total methane emissions equivalent annually about 1.3%, also the proportion of nitrous oxide emissions from the agriculture sector in total nitrous oxide emissions equivalent annually about 0.17%. Which illustrates the importance of reducing the emissions of the agriculture sector.

3- Agriculture is one target of such activity as emission levels are about 13% of the annual GHG emissions that are related to all human activities.

4- The average per capita energy consumption in Egypt have been increased by significant statistically an annual rate of 2.74%, consumption of 1.000 dollars of gross national product of energy has been increased by significant statistically an annual of 0.79%. That automatically lead to an increase in emissions of greenhouse gases, especially carbon dioxide, where during the period (2000- 2014), an increase in Egyptian GDP by about billion dollars, lead to an increase of total Egyptian energy consumption by about 0.176 Mt., with an increase of total Egyptian emissions of carbon dioxide by about 0.5 Mt.

5- There is the possibility of losing about 15% of the area of high-quality agricultural land in the Delta region will lose as a result of sinking or salinity with sea level rise by about half a meter away.

6- It is expected that climate change will have a negative impact on the productivity of field crops.

7- The expected economic impacts of climate change by the year 2030, the cultivated area will be reduced to about 0.949 million acres, equal about 8.22% of the total cultivated areas compared with the case of no sinking part of the delta land, and thus crop area will reduce about 1.406 million acres, equal about 6.25% of the total crop areas in Egypt compared with the case of no sinking part of the delta land.

8- Surplus in the Egyptian balance water by about 2.48 billion m^3.

9- The value of the Egyptian agriculture production will decrease by about 6.19 billion dollars, equal about 6.19% compared with presumably no sinking of the Delta land.

10- In the case of sinking 15% of delta lands, with the change of the productivity and water consumption of most crops, the result will be a reduction in the cultivated area of about 0.94 million acres, and thus the crop area decreases by about 1.39 million acres, with deficit in the Egyptian balance water to about 4.74 billion m^3 compared to the case of no sinking part of the

Delta land. The cultivated area will decrease by about 8.17%; the crop area will decrease 6.18%.

11- The value of the Egyptian agriculture production will decrease by about 12.51%. compared to sinking part of the Delta land to about 15% of the total delta area without the other impacts of climate change, the cultivated area will increase by about 0.06.

[2] Recommendations to overcome the effects of climate change on the Egyptian agricultural plant sector

It is recommended that book several recommendations, as follows:

1- To develop new types of high temperature, salinity and drought conditions that will prevail under conditions of climate change, and to develop new types of short growth season to reduce water needs, as well as to change the dates for agriculture, including appropriate to weather conditions.

2- Cultivation of new crops in the appropriate climate to increase crop yield of water unit for each crop, such as cultivation of wheat bear the high temperatures, drought-resistant, and agriculture in time with good distribution of items on geographical areas, and the expansion of winter crops such as lentils, beans, and other municipal, it is likely that these measures to prevent expected negative effects, or, at least, alleviate the negative effects.

3- Reduce crop area of wasteful water consumption, or at least not to increase the size of such as rice, sugar cane, alternative crops and give the same purpose and water consumption and lower growth such as the cultivation of sugar beet instead of sugar cane.

4- The application of the methods of the best in land management such as improving fork soil water management and erosion control, plow soil for maintenance, and other farming can have a major role in carbon sink compensatory mechanism on the contribution of agriculture to greenhouse gasses.

5- The use of irrigation systems more effectively and provide better protection of coastal areas and farms, in order to mitigate the effects of climate change.

6- The completion of the severe shortage of available data and information on the negative effects of climate change on different sectors of development in Egypt, in particular the issue of the internal and external migration, and the establishment of a full database continuing to occur, in advance of the study, to encourage scientific research and technology in all issues related to climate change and develop specific plans and financing is clear.

7- Attention regionalization studies where can know the ways in which to overcome, or, at least, alleviate the shortage in crop productivity adversely affected by this phenomenon.

8- Greening the Economy with Agriculture refers to increasing food security (availability, access, stability, and utilization) while using fewer natural resources, through improved efficiencies throughout the food value chain. This can be achieved by applying an ecosystem approach to agriculture, forestry and fisheries management in a way that addresses the multiplicity of societal needs and desires, without jeopardizing options for future generations to benefit from all goods and services provided by terrestrial and marine ecosystems

9- Green growth is a tool to achieve sustainable development, not a competing paradigm. It offers a development pathway that reconciles the urgent need for sustained growth with the imperative of avoiding lock-in to unsustainable growth patterns and irreversible environmental damage. Green growth is not anti-growth; it represents a change in how we manage economies for sustainability.

10- The gains of the Egyptian economy heading toward the green economy: A shift to a green economy pathway could lead Egypt to achieve annual savings of over US$1.3 billion in the agriculture sector, and about US$1.1 billion in the water sector, as well as a 13% reduction in CO_2 emissions, and a 40% reduction in water consumption.

[3] Research themes the task related to the subject of climate change

In view of the scarcity of research and studies on climate change and its effects expected accomplishments, it is recommended that this research themes:

1. Impact of climate change on water resources and the River Nile water sources and other.

2. The impact of climate change on animal production, poultry.

3. The impact of climate change on the wealth of fish stocks.

4. The impact of climate change on food security.

5. The impact of climate change on prices and cost of production.

6. The impact of climate change on the resources of agricultural productivity.

7. The cost of climate change

8. Cost face climate change to reduce risk.

9. Carbon fingerprint and its relationship of trade and marketing.

10. The factors that can reduce carbon emissions.

11. The green economy in relation to climate change.

12. The path of green economy and cost and potential achieved.

13. The green marketing opportunities and achieved

14. The study of the regions most affected by climate change and potential of reducing the potential impacts.

15. The impact of climate change on the future prices of food commodities.

16. The strategic planning to address climate change in the agricultural sector.

Indexes

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The United Nations Climate Change conferences

The United Nations Climate Change Conferences

The United Nations Climate Change Conferences are yearly conferences held in the framework of the United Nations Framework Convention on Climate Change (UNFCCC). They serve as the formal meeting of the UNFCCC Parties (Conference of the Parties, COP) to assess progress in dealing with climate change, and beginning in the mid-1990s, to negotiate the Kyoto Protocol to establish legally binding obligations for developed countries to reduce their greenhouse gas emissions.**[1]** From 2005 the Conferences have also served as the "Conference of the Parties Serving as the Meeting of Parties to the Kyoto Protocol" (CMP);**[2]** also parties to the Convention that are not parties to the Protocol can participate in Protocol-related meetings as observers. From 2011 the meetings have also been used to negotiate the Paris Agreement as part of the Durban platform activities until its conclusion in 2015, which created a general path towards climate action.

1995: COP 1, The Berlin Mandate

The first UNFCCC Conference of the Parties took place from 28 March to 7 April 1995 in Berlin, Germany. It voiced concerns about the adequacy of countries' abilities to meet commitments under the Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI).

1996: COP 2, Geneva, Switzerland

COP 2 took place in July 1996 in Geneva, Switzerland. Its ministerial declaration was noted (but not adopted) on 18 July 1996, and reflected a United States position statement presented by Timothy Wirth, former Under Secretary for Global Affairs for the United States Department of State at that meeting, which:

1. Accepted the scientific findings on climate change proffered by the Intergovernmental Panel on Climate Change (IPCC) in its second assessment (1995);
2. Rejected uniform "harmonized policies" in favor of flexibility;
3. Called for "legally binding mid-term targets".

1997: COP 3, The Kyoto Protocol on Climate Change

COP 3 took place in December 1997 in Kyoto, Japan. After intensive negotiations, it adopted the Kyoto Protocol, which outlined the greenhouse gas emissions reduction obligation for Annex I countries, along with what came to be known as Kyoto mechanisms such as emissions trading, clean development mechanism and joint implementation. Most industrialized countries and some central European economies in transition (all defined as Annex B countries) agreed to legally binding reductions in greenhouse gas emissions of an average of 6 to 8% below 1990 levels between the years 2008–2012, defined as the first emissions budget period. The United States would be required to reduce its total emissions an average of 7% below 1990 levels; however, Congress did not ratify the treaty after Clinton signed it. The Bush administration explicitly rejected the protocol in 2001.

1998: COP 4, Buenos Aires, Argentina

COP 4 took place in November 1998 in Buenos Aires. It had been expected that the remaining issues unresolved in Kyoto would be finalized at this meeting. However, the complexity and difficulty of finding agreement on these issues proved insurmountable, and instead the parties adopted a 2-year "Plan of Action" to advance efforts and to devise mechanisms for implementing the Kyoto Protocol, to be completed by 2000. During COP4, Argentina and Kazakhstan expressed their commitment to take on the greenhouse gas emissions reduction obligation, the first two non-Annex countries to do so.

1999: COP 5, Bonn, Germany

COP 5 took place between 25 October and 5 November 1999, in Bonn, Germany. It was primarily a technical meeting, and did not reach major conclusions.

2000: COP 6, The Hague, Netherlands

COP 6 took place on 13-25 November 2000, in The Hague, Netherlands. The discussions evolved rapidly into a high-level negotiation over the major political issues. These included major controversy over the United States' proposal to allow credit for carbon "sinks" in forests and agricultural lands that would satisfy a major proportion of the U.S. emissions reductions in this way; disagreements over consequences for non-compliance by countries that did not meet their emission reduction targets; and difficulties in resolving how developing countries could obtain financial assistance to deal with adverse effects of climate change and meet their obligations to plan for measuring and possibly reducing greenhouse gas emissions. In the final hours of COP 6, despite some compromises agreed between the United States and some EU countries, notably the United Kingdom, the EU countries as a whole, led by Denmark and Germany, rejected the compromise positions, and the talks in The Hague collapsed. Jan Pronk, the President of COP 6, suspended COP-6 without agreement, with the expectation that negotiations would later resume.**[3]** It was later announced that the COP 6 meetings (termed "COP 6 bis") would be resumed in Bonn, Germany, in the second half of July. The next regularly scheduled meeting of the parties to the UNFCCC, COP 7, had been set for Marrakech, Morocco, in October–November 2001.

2001: COP 6, Bonn, Germany

COP 6 negotiations resumed on 17–27 July 2001, in Bonn, Germany, with little progress having been made in resolving the differences that had produced an impasse in The Hague. However, this meeting took place after George W. Bush had become the President of the United States and had rejected the Kyoto Protocol in March 2001; as a result, the United States delegation to this meeting declined to participate in the negotiations related to the Protocol and chose to take the role of observer at the meeting. As the other parties negotiated the key issues, agreement was reached on most of the major political issues, to the surprise of most observers, given the low expectations that preceded the meeting. The agreements included:

1. Flexible mechanisms: The "flexibility mechanisms" which the United States had strongly favored when the Protocol was initially put together, including emissions trading, joint implementation (JI), and the Clean Development Mechanism (CDM) which allows industrialized countries to fund emissions reduction activities in developing countries as an alternative to domestic emission reductions. One of the key elements of this agreement was that there would be no quantitative limit on the credit a country could claim from use of these mechanisms provided domestic action constituted a significant element of the efforts of each Annex B country to meet their targets.
2. Carbon sinks: It was agreed that credit would be granted for broad activities that absorb carbon from the atmosphere or store it, including forest and cropland management, and re-vegetation, with no over-all cap on the amount of credit that a country could claim for sinks activities. In the case of forest management, an Appendix Z establishes country-specific caps for each Annex I country. Thus, a cap of 13 million tons could be credited to Japan (which represents about 4% of its base-year emissions). For cropland management, countries could receive credit only for carbon sequestration increases above 1990 levels.
3. Compliance: Final action on compliance procedures and mechanisms that would address non-compliance with Protocol provisions was deferred to COP 7, but included broad outlines of consequences for failing to meet emissions targets that would include a requirement to "make up" shortfalls at 1.3 tons to 1, suspension of the right to sell credits for surplus emissions reductions, and a required compliance action plan for those not meeting their targets.
4. Financing: There was agreement on the establishment of three new funds to provide assistance for needs associated with climate change: (1) a fund for climate change that supports a series of climate measures; (2) a

least-developed-country fund to support National Adaptation Programs of Action; and (3) a Kyoto Protocol adaptation fund supported by a CDM levy and voluntary contributions.

A number of operational details attendant upon these decisions remained to be negotiated and agreed upon, and these were the major issues considered by the COP 7 meeting that followed.

2001: COP 7, Marrakech, Morocco

At the COP 7 meeting in Marrakech, Morocco from 29 October to 10 November 2001, negotiators wrapped up the work on the Buenos Aires Plan of Action, finalizing most of the operational details and setting the stage for nations to ratify the Kyoto Protocol. The completed package of decisions is known as the Marrakech Accords. The United States delegation maintained its observer role, declining to participate actively in the negotiations. Other parties continued to express hope that the United States would re-engage in the process at some point and worked to achieve ratification of the Kyoto Protocol by the requisite number of countries to bring it into force (55 countries needed to ratify it, including those accounting for 55% of developed-country emissions of carbon dioxide in 1990). The date of the World Summit on Sustainable Development (August–September 2002) was put forward as a target to bring the Kyoto Protocol into force. The World Summit on Sustainable Development (WSSD) was to be held in Johannesburg, South Africa.
The main decisions at COP 7 included:

1. Operational rules for international emissions trading among parties to the Protocol and for the CDM and joint implementation;
2. A compliance regime that outlined consequences for failure to meet emissions targets but deferred to the parties to the Protocol, once it came into force, the decision on whether those consequences would be legally binding;
3. Accounting procedures for the flexibility mechanisms;
4. A decision to consider at COP 8 how to achieve a review of the adequacy of commitments that might lead to discussions on future commitments by developing countries.

2002: COP 8, New Delhi, India

Taking place from 23 October to 1 November 2002, in New Delhi COP 8 adopted the Delhi Ministerial Declaration that, amongst others, called for efforts by developed countries to transfer technology and minimize the impact of climate change on developing countries. It is also approved the New Delhi work programmer. The COP8 was marked by Russia's hesitation, stating that it needed more time to think it over. The Kyoto Protocol could enter into force once it was ratified by 55 countries, including countries responsible for 55 per cent of the developed world's 1990 carbon dioxide emissions. With the United States (36.1 per cent share of developed-world carbon dioxide) and Australia refusing ratification, Russia's agreement (17% of global emissions in 1990) was required to meet the ratification criteria and therefore Russia could delay the process.**[1][2]**

2003: COP 9, Milan, Italy

COP 9 took place on 1-12 December 2003 in Milan. The parties agreed to use the Adaptation Fund established at COP7 in 2001 primarily in supporting developing countries better adapt to climate change. The fund would also be used for capacity-building through technology transfer. At COP9, the parties also agreed to review the first national reports submitted by 110 non-Annex I countries.

2004: COP 10, Buenos Aires, Argentina

COP 10 took place on 6-17 December 2004.

COP10 discussed the progress made since the first Conference of the Parties 10 years ago and its future challenges, with special emphasis on climate change mitigation and adaptation. To promote developing countries better adapt to climate change, the Buenos Aires Plan of Action**[3]** was adopted. The parties also began discussing the post-Kyoto mechanism, on how to allocate emission reduction obligation following 2012, when the first commitment period ends.

2005: COP 11/CMP 1, Montreal, Canada

COP 11 (or COP 11/CMP 1) took place between 28 November and 9 December 2005, in Montreal, Quebec, Canada. It was the first Meeting of the Parties (CMP 1) to the Kyoto Protocol since their initial meeting in Kyoto in 1997. It was one of the largest intergovernmental conferences on climate change ever. The event marked the entry into force of the Kyoto Protocol. Hosting more than 10,000 delegates, it was one of Canada's largest international events ever and the largest gathering in Montreal since Expo 67. The Montreal Action Plan was an agreement to "extend the life of the Kyoto Protocol beyond its 2012 expiration date and negotiate deeper cuts in greenhouse-gas emissions".[**4]** Canada's environment minister, at the time, Stéphane Dion, said the agreement provides a "map for the future".**[4][5]**

2006: COP 12/CMP 2, Nairobi, Kenya

COP 12/CMP 2 took place on 6-17 November 2006 in Nairobi, Kenya. At the meeting, BBC reporter Richard Black coined the phrase "climate tourists" to describe some delegates who attended "to see Africa, take snaps of the wildlife, the poor, dying African children and women". Black also noted that due to delegates concerns over economic costs and possible losses of competitiveness, the majority of the discussions avoided any mention of reducing emissions. Black concluded that was a disconnect between the political process and the scientific imperative.**[6]** Despite such criticism, certain strides were made at COP12, including in the areas of support for developing countries and clean development mechanism. The parties adopted a five-year plan of work to support climate change adaptation by developing countries, and agreed on the procedures and modalities for the Adaptation Fund. They also agreed to improve the projects for clean development mechanism.

2007: COP 13/CMP 3, Bali, Indonesia

COP 13/CMP 3 took place on 3-17 December 2007, at Nusa Dua, in Bali, Indonesia. Agreement on a timeline and structured negotiation on the post-2012 framework (the end of the first commitment period of the Kyoto Protocol) was achieved with the adoption of the Bali Action Plan (Decision 1/CP.13). The Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) was established as a new subsidiary body to conduct the negotiations aimed at urgently enhancing the implementation of the Convention up to and beyond 2012. Decision 9/CP.13 is an Amended to the New Delhi work programme. **[7]** These negotiations took place during 2008 (leading to COP 14/CMP 4 in Poznan, Poland) and 2009 (leading to COP 15/CMP 5 in Copenhagen).

2008: COP 14/CMP 4, Poznań, Poland

COP 14/CMP 4 took place on 1-12 December 2008 in Poznań, Poland.**[8]** Delegates agreed on principles for the financing of a fund to help the poorest nations cope with the effects of climate change and they approved a mechanism to incorporate forest protection into the efforts of the international community to combat climate change.**[9]**

Negotiations on a successor to the Kyoto Protocol were the primary focus of the conference.

2009: COP 15/CMP 5, Copenhagen, Denmark

COP 15 took place in Copenhagen, Denmark, on 7-18 December 2009.

The overall goal for the COP 15/CMP 5 United Nations Climate Change Conference in Denmark was to establish an ambitious global climate agreement for the period from 2012 when the first commitment period under the Kyoto Protocol expires. However, on 14 November 2009, the New York Times announced that "President Obama and other world leaders have decided to put off the difficult task of reaching a climate change agreement... agreeing instead to make it the mission of the

Copenhagen conference to reach a less specific "politically binding" agreement that would punt the most difficult issues into the future".**[10]** Ministers and officials from 192 countries took part in the Copenhagen meeting and in addition there were participants from a large number of civil society organizations. As many Annex 1 industrialized countries are now reluctant to fulfill commitments under the Kyoto Protocol, a large part of the diplomatic work that lays the foundation for a post-Kyoto agreement was undertaken up to the COP15.

The conference did not achieve a binding agreement for long-term action. A 13-paragraph 'political accord' was negotiated by approximately 25 parties including US and China, but it was only 'noted' by the COP as it is considered an external document, not negotiated within the UNFCCC process.**[11]** The accord was notable in that it referred to a collective commitment by developed countries for new and additional resources, including forestry and investments through international institutions, that will approach USD 30 billion for the period 2010–2012. Longer-term options on climate financing mentioned in the accord are being discussed within the UN Secretary General's High Level Advisory Group on Climate Financing, which is due to report in November 2010. The negotiations on extending the Kyoto Protocol had unresolved issues as did the negotiations on a framework for long-term cooperative action. The working groups on these tracks to the negotiations are now due to report to COP 16 and CMP 6 in Mexico.

2010: COP 16/CMP 6, Cancún, Mexico

COP 16 was held in Cancún, Mexico, from 28 November to 10 December 2010.**[12][13]**

The outcome of the summit was an agreement adopted by the states' parties that called for the 100 billion USD per annum "Green Climate Fund", and a "Climate Technology Centre" and network. However, the funding of the Green Climate Fund was not agreed upon. Nor was a commitment to a second period of the Kyoto Protocol agreed upon, but it was concluded that the base year shall be 1990 and the global warming potentials shall be those provided by the IPCC.

All parties "Recognizing that climate change represents an urgent and potentially irreversible threat to human societies and the planet, and thus requires to be urgently addressed by all Parties,". It recognizes the IPCC Fourth Assessment Report goal of a maximum 2 °C global warming and all parties should take urgent action to meet this goal. It also agreed upon greenhouse gas emissions should peak as soon as possible, but recognizing that the time frame for peaking will be longer in developing countries, since social and economic development and poverty eradication are the first and overriding priorities of developing countries.

2011: COP 17/CMP 7, Durban, South Africa

The 2011 COP 17 was held in Durban, South Africa, from 28 November to 9 December 2011.**[12][14]**

The conference agreed to a start negotiations on a legally binding deal comprising all countries, to be adopted in 2015, governing the period post 2020.**[15]** There was also progress regarding the creation of a Green Climate Fund (GCF) for which a management framework was adopted. The fund is to distribute US$100 billion per year to help poor countries adapt to climate impacts.**[16]**

While the president of the conference, Maite Nkoana-Mashabane, declared it a success, scientists and environmental groups warned that the deal was not sufficient to avoid global warming beyond 2 °C as more urgent action is needed.**[17]**

2012: COP 18/CMP 8, Doha, Qatar

Qatar hosted COP 18 which took place in Doha, Qatar, from 26 November to 7 December 2012.**[18][19]** The Conference produced a package of documents collectively titled The Doha Climate Gateway.**[14]** The documents collectively contained:

1. The Doha Amendment to the Kyoto Protocol (to be accepted before entering into force) featuring a second commitment period running from 2012 until 2020 limited in scope to 15% of the global carbon dioxide emissions due to the lack of commitments of Japan, Russia, Belarus, Ukraine, New Zealand (nor the United States and Canada, who are not parties to the Protocol in that period) and due to the fact that developing countries like China (the world's largest emitter), India and Brazil are not subject to emissions reductions under the Kyoto Protocol.**[16]**
2. Language on loss and damage, formalized for the first time in the conference documents. [clarification needed]

The conference made little progress towards the funding of the Green Climate Fund.**[16]**

Russia, Belarus and Ukraine objected at the end of the session, [clarification needed] as they had a right to under the session's rules. In closing the conference, the President said that he would note these objections in his final report.**[22]**

2013: COP 19/CMP 9, Warsaw, Poland

COP 19 was the 19th yearly session of the Conference of the Parties (COP) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 9th session of the Meeting of the Parties (CMP) to the 1997 Kyoto Protocol (the protocol having been developed under the UNFCCC's charter). The conference was held in Warsaw, Poland from 11 to 23 November 2013.**[23]**

2014: COP 20/CMP 10, Lima, Peru

On 1–12 December 2014, Lima, Peru hosted the 20th yearly session of the Conference of the Parties (COP) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 10th session of the Meeting of the Parties (CMP) to the 1997 Kyoto Protocol (the protocol having been developed under the UNFCCC's charter). The pre-COP conference was held in Venezuela.**[24]**

2015: COP 21/CMP 11, Paris, France

The COP 21 was held in Paris from 30 November to 12 December 2015.**[25][26]** Negotiations resulted in the adoption of the Paris Agreement on 12 December, governing climate change reduction measures from 2020. The adoption of this agreement ended the work of the Durban platform, established during COP17. The agreement will enter into force (and thus become fully effective) only if 55 countries which produce at least 55% of the world's greenhouse gas emissions ratify the Agreement.**[27]**

2016: COP 22/CMP 12, Marrakech, Morocco

COP 22 is expected to be held in Marrakech on 7–18 November 2016.**[28]**

2017: COP 23/CMP 13

COP 23 is expected to be held on 6–17 November 2017. (COP 23/CMP 13).**[29]**

2018: COP 24/CMP 14

COP 24 is expected to be held on 5–16 November 2018. (COP 24/CMP 14).**[30]**

2019: COP 25/CMP 15

COP 25 is expected to be held in 2019. (COP 25/CMP 15).**[31]**

Index ②

Dictionary

of

Words related to Climate Change

Dictionary of words related to climate change

الترجمة الى العربية *Translate to Arabic*	الكلمة او المصطلح *words or terminology*
impact of climate change	أثر تغيّر المناخ
global climate change trends	اتجاهات تغيّر المناخ العالمي
mitigation of climate change	التخفيف من آثار تغير المناخ
LECRD; low-emission and climate-resilient development	التنمية القائمة على تخفيض معدلات انبعاث الكربون والتكيف مع تغير المناخ
mitigation of climate change; limitation of climate change	الحد من تغير المناخ
climate resilience	القدرة على التأقلم مع آثار تغير المناخ
climate change	تَغَيُّر اَلْمُنَاخ
greenhouse-induced variations of climate	تغيرات مناخية متولدة عن ظاهرة الاحتباس الحراري
greenhouse-induced variations of climate	تغيرات مناخية متولدة عن ظاهرة الدفيئة
AIACC; Agricultural Impact Assessment of Climate Change	تقييم تأثير تغير المناخ على الزراعة
CAP; climate-altering pollutant	ملوِّث يؤدي إلى إحداث تغير في المناخ
bioclimatic changes	التغيرات الأحيائية المتأثرة بالمناخ
GCCA; Global Climate Change Alliance	تحالف الاتحاد الأوروبي العالمي لمواجهة تغير المناخ
Compendium on methods and tools to evaluate impacts of, and vulnerability and adaptation to, climate change	خلاصة اتفاقية الأمم المتحدة الإطارية بشأن تغير المناخ عن أساليب وأدوات تقييم تأثيرات تغير المناخ والقابلية للتأثر به والتكيف معه
global climate change	تغير المناخ العالمي
GHG emission (greenhouse gas emission)	انبعاث غازات الدفيئة
LECRD; low-emission and climate-resilient development	التنمية القائمة على تخفيض معدلات انبعاث الكربون والتكيف مع تغير المناخ
Green economy	الاقتصاد الاخضر
green economy in the context of sustainable development and poverty eradication;	الاقتصاد الأخضر في سياق التنمية المستدامة والقضاء على الفقر
green economy policy tracks	مسارات سياسات الاقتصاد الأخضر
environmental pollution	تلوث بيئي
Green Marketing	التسويق الاخضر
climate watch	تتبع (تغيرات) المناخ
Green Economy and Green Growth	الاقتصاد الأخضر والنمو الأخضر
SARD; sustainable agriculture and rural development	التنمية الزراعية والريفية المستدامة
green development	التنمية الخضراء

Source: https://ar.glosbe.com

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The End of the Book

The main aim of this book is the stand of the phenomenon of climate change and their possible impacts on the Egyptian national economy, in particular its effects on the Egyptian agricultural sector, monitoring the problems and constraints that could result from climate change, possibilities to overcome, and proposals and ways adaptation bundle agricultural sector, especially. The vegetation with artistic impressions phenomenon, and the vision of the authors in the preparation of this Book is from the standpoint of published literature for two researchers, prof. dr. Fawaz and dr. Soliman to develop a vision of authors and based on the results of the seminar conducted by the multiple and briefed them and they have to be examined, analyzing, summarizing, especially the scarcity of research and studies on the topic of climate change, effects expected accomplishments, has included also book green economy and path, and added some research topics on the subject for those wishing to study.

In the end, not to let perfection, heartedness criticism exhibition and welcome, will treasure this in other editions coming.

We hope from Allah that we have o in this work,
and Allah is the guardian of conciliation.

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