



# Impact of Climate Changes on Different Sectors of Egyptian Water Security

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## Article Information

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**ABSTRACT:** The issue of climate changes and the unprecedented rise in temperatures occupies the whole world, and its expected repercussions on global economies and gaseous emissions resulting from human activity in various fields of energy use have led to global warming. The global effects of climate change are wide-ranging and unprecedented in terms of scale. From changing weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic floods and adapting to these effects will be more difficult and costly if drastic measures are not taken to reduce the expected negative effects of global warming on the agricultural sector in general. And on the development of water resources in particular, and the research aimed at: (1) Identifying the effects of climate change and global warming on the various Egyptian sectors, (2) Studying the effects of climate changes and global warming on Egyptian water resources, (3) Studying the impact of climate changes on the Egyptian agricultural sector, (4) Studying mechanisms and policies for adaptation to changes climate and global warming.

The most important results of the research were (1) the application of appropriate agricultural practices that are sensitive to climate changes, (2) the rationalization of the use of non-renewable energy and the expansion of the use of renewable energies, (3) the mitigation of the emission of carbon dioxide by finding drains for it through well-managed agricultural soil (4) Expanding forests, raising awareness of the issue of climate change at all levels, and coordinating with international agencies and developing countries, (5) rationalizing domestic, industrial and agricultural water uses, and working through programs that do not conflict with economic and social development plans, (6) increasing water drinking water and liquids, be careful to operate water heaters, and not to place gas cylinders in the sun, and stay away from exposure to direct sunlight, especially during the period from 10 in the morning until 3 in the afternoon, (7) Put water cans in windows, courtyards, fences, farms, and balconies, in order to quench the thirst of birds, cats and other animals so as not to disturb the environmental balance, and beware of scorpions and snakes, they will come out of their holes significantly and may enter farms and homes to search for the humid atmosphere, (8) Increase the planting of trees on both sides of the main and secondary roads to avoid the extreme rise in temperatures and increase the percentage of oxygen gas (O<sub>2</sub>) in the atmosphere to reduce the harmful effect of carbon dioxide (CO<sub>2</sub>).

## INTRODUCTION

The phenomenon of climate change is considered a natural phenomenon, but it is due to human activity, and this phenomenon negatively affects all areas of life in Egypt and the world. about climate changes.

Climatic changes in the Earth's climate system lead to the emergence of new climate patterns that persist for a long period of time, and this time period may reach only several decades or may reach millions of years, and since the industrial revolution, the climate is increasingly affected by human activities that lead to Global warming (Advancing the science of climate change, 2010)<sup>(1)</sup>, and the Arab Republic of Egypt is one of the countries most affected by the negative

effects of climate change, and these damages are summarized in sea level rise, water poverty, and the deterioration of public health and environmental systems, which leads to economic losses estimated at billions, which affects the Its food security, as well as climate change affects the nature of rainfall, evaporation, snow, flow of water springs and other factors that affect the availability and quality of water worldwide.

Fresh water resources are very sensitive to changes in weather and climate. Climate change is expected to affect water availability in areas where the amount of rivers and streams water depends on snowmelt, and increasing temperatures lead to an increase in the proportion of sedimentation falling in the form of rain instead of

Snow, which leads to reaching the maximum annual spring flow of excessive water in the early period of the year, and this may lead to the possibility of winter flooding and reduce the rate of water flow in rivers in the late summer period, The rise in sea levels leads to the entry of salt water into the groundwater and fresh water streams, and this leads to a decrease in the amount of fresh water available for drinking and agriculture, and the hotter water temperatures also affect the quality of water and increase the speed of its pollution, which results from climate change with serious effects of changes in sea level, plant life and mass extinctions, as well as affecting human societies.

#### **RESEARCH PROBLEM:**

The issue of climate change and the unprecedented rise in temperature occupies the whole world, and its expected repercussions on global economies and gaseous emissions resulting from human activity in various fields of energy use have led to global warming. The global effects of climate change are wide-ranging and unprecedented in terms of scale. From changing weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic floods, and adapting to these effects will be more difficult and costly if drastic measures are not taken to reduce the expected negative effects of global warming on the agricultural sector in general, And the development of water resources in particular.

#### **Research objectives:**

Study the effects of climate changes on food production, food security, water resources, within:

- 1- Identifying the effects of climate change and global warming on the various Egyptian sectors.
- 2- Studying the effects of climate change and global warming on the Egyptian water resources.
- 3- Studying the impact of climate change on the Egyptian agricultural sector.
- 4- Studying the mechanisms and policies of adaptation to climate change and global warming.

#### **Methodology and source of data:**

The research was based mainly on the available data related to the subject of the study, which will be collected from bulletins and periodicals issued by the Ministry of Water Resources and Irrigation, the Central Agency for Public Mobilization and Statistics, the Central Administration for Agricultural Economy at the Ministry of Agriculture and Land Reclamation, the National Water Research Center, the ministries concerned with the subject of the study, and the Organization Food and Agriculture and the World Bank, in addition to the data that can be obtained from the international communication and

information network "Internet" as well as the use of research, publications, conferences and scientific theses closely related to the field of research.

#### **RESULTS AND DISCUSSIONS:**

Climate change is defined as any effective change that occurs to a particular area in the weather, which includes temperatures, humidity, rainfall and wind conditions, and changes occur due to the dynamic processes of the earth such as volcanoes, or due to external forces such as changes in the intensity of sunlight or the fall of large meteorites, or due to the activity of Human, as human activities are currently the main cause of global warming.

#### **The main reasons that led to the occurrence of global warming:**

There are many reasons that led to the emergence and occurrence of the phenomenon or crisis of global warming on Earth, including:

**First:** The extraction and burning of coal at the beginning of the process of expansion and expansion of industrial activities, which played a major role in the emission of carbon dioxide in a huge way.

**Second:** The process of developing the use of the fuel known as oil on a large and very large scale, which worked on releasing more carbon dioxide gases, specifically when human expansion began and increased dependence on the use of aircraft and cars.

**Third:** The gas used in the various cooling systems is Freon, which was one of the most important causes of the erosion of the ozone layer in the Earth's atmosphere.

**Fourth:** Increasing the urban expansion processes that were at the expense of the cultivated areas and lands, which led to a decrease in their percentage, which contributed to the increase in the proportion of carbon dioxide gas in the atmosphere.

#### **The effects of global warming on Earth:**

The problem of global warming has become one of the most important, complex and largest of those problems facing the world today, as the reason for paying attention to this problem was the damages that resulted from it, including:

**First:** The rise in the Earth's temperature, which led to the expansion and rise of the water content as a result of the melting of ice at the North and South Poles, which threatened to drown many water islands and coastal cities and even cause devastating floods as a result of the increase and rise of seas and oceans.

**Second:** The loss of agricultural crops, the spread of desertification and the extinction of many living creatures, as a result of this environmental imbalance and as a natural result of the spread of diseases and epidemics due to pollution.

**Third:** Air pollution, which led to an increase in the number of deaths resulting from various diseases, especially lung diseases, as a result of severe pollution.

**Fourth:** The rise in temperatures in the winter season, which shortened its original period a lot than usual.

### **Components of greenhouse gases that cause greenhouse gases:**

Water vapor produced by the evaporation process. Carbon dioxide (CO<sub>2</sub>) resulting from fuel combustion and smoke emission sources such as vehicle and factory exhaust, forest fires...etc.

Nitrous oxide N<sub>2</sub>O.

O<sub>3</sub> ozone.

Methane, CH<sub>4</sub>, which is produced from livestock.

Chlorofluorocarbons (PFCs), a substance that was used to cool refrigerators.

Sulfur hexafluoride.

**Table No.: (1) The amount of carbon dioxide emissions in Egypt and their ratio to the world**

The amount of carbon dioxide emissions in Egypt (million tons)	% of the amount of emissions in Egypt relative to the world
107	0.4
150	0.55
152	0.57
217	0.71
198	0.54
199	0.56

**Source:** M. M. Fawaz, An economic study of climate change and its effects on sustainable development in Egypt, The Egyptian Journal of Agricultural Economics, June, 2015.

The main greenhouse gas emissions will rise by 25% to 90% by 2030 compared to 2000 if no resolute additional measures are taken to reduce this expected rise. With the right policies, the rise in the level of greenhouse gases in the atmosphere can be slowed down and eventually stabilized.

### **The negative effects of climate change in Egypt:**

Egypt is one of the countries most affected by the negative effects of climate change, and these damages include rising sea levels, water poverty, deteriorating public health, and environmental systems, in addition to damages related to food security, which leads to economic losses estimated at billions.

### **Impact on the ecosystem:**

Climate change affects the ecosystem and disrupts the coral reefs in the Red Sea and the increase in temperatures and acidity of sea water leads to the deterioration of coral reefs. It is also expected that the bleaching of coral reefs will increase to 80% by 2060 with the rise in sea levels, which leads to the inundation of wetlands in the natural reserves located in the northern coasts of Egypt, which are considered a reserve for migratory birds during their arduous journey from north to south. A decrease in the number of birds, which will result in a disturbance of the environmental life in those environmental reserves, and so far there are no detailed studies on the magnitude of the danger and its impact on these birds.

### **Impact on public health:**

Rising temperatures provide a suitable climate for the growth and reproduction of insects that transmit diseases such as malaria and dengue fever, and the increase in temperatures will affect vulnerable groups such as children and the elderly, which increases death rates as a result of heat stress, and air pollution is related to high temperatures, the higher the temperature increases. The effect of these pollutants, especially on respiratory patients, which exposes them to respiratory crises and possibly the loss of life (L. S. Kalkstein and K. E. Smoyer, 1993).

### **Impact on urban areas:**

A one-meter rise in sea level will lead to the inundation of 970 square kilometers of delta lands, according to estimates by World Bank experts. Increasing the effect of the heat island phenomenon, this negatively affects the thermal comfort, especially in the degraded slum areas.

### **Effect on energy:**

Rising temperatures will increase the demand for the use of air conditioners to adapt to the high temperatures during the summer, especially since the housing sector in Egypt lacks environmental standards for energy efficiency in homes, and this negatively affects the energy sector and may lead to frequent power cuts, especially as the energy sector suffers of the problems in providing the fuel needed to run power plants.

### **Impact on the economy:**

The dangers referred to in the previous paragraphs lead to significant economic losses.

According to a study conducted to measure the impact of climate change on the Egyptian economy, the impact of climate change on agriculture leads to losses estimated at about 20 billion pounds by 2030, rising to 122 billion pounds by 2060. The value of financial losses resulting from facilities and roads subject to drowning is estimated at one billion Egyptian pounds annually by 2030, to rise to about 7 billion Egyptian pounds by 2060, and deaths resulting from heat stress and breathing problems lead to losses of approximately 24 billion Egyptian pounds by 2060.

Tourism income is also expected to decline to about 19 billion pounds in 2030 to rise to 85 billion pounds in 2060 as a result of coral bleaching and environmental disturbances. These losses may reach about 52 billion pounds in 2030, and about 228 billion pounds by 2060, and these losses represent resulting from the dangers of climate change is approximately 3.9% of the projected gross national product of Egypt in 2060.

Global warming leads to a decrease in wheat production by 18% until 2050, a decrease in maize by 14%, and rice by 11%, as well as a decrease in the productivity of potatoes and soybeans, while the productivity of the cotton crop increases by 17%, when the temperature rises to about two degrees. In fact, the productivity of cotton reaches about 31% if the temperature rises to about 4%, to be the only agricultural crop that benefits from global warming, while the percentage of barley production decreases to about 18% if the temperature rises by two degrees, as well as the decrease in the productivity of tomatoes as well as sunflowers, and most agricultural crops are not only the lack of food crops, but also the quality of the crops themselves that will be affected by climate change. Where the study indicates that wheat grain, when it is grown under high levels of carbon dioxide expected by 2050 AD, contains 9% of zinc, 5% less iron, and 6% less protein, while corn and rice suffer from poor quality.

#### **The impact of climate change on the Egyptian agricultural sector:**

Geographically and climatically, Egypt is located under the scope of the Mediterranean climate over thousands of years, one of the most clear and stable climates of the world regions. With climate change and the occurrence of severe climatic reversals in the climatic factors characteristic of Egypt, a more dispersed and less stable change occurs in the climatic factors and the rule of a state of severe climatic fluctuations such as Very short and very cold winters, a short spring of the fifties more fierce, long and very hot summers and unseasonal rains that extend and

penetrate into the summer months and increase their penetration with the passage of years.

The agricultural sector is considered the most affected by climatic changes, as the imbalances that occur in the climate that cause a radical change in the weather, and agricultural and food production is affected by climatic changes in many developing countries, and there is an inverse relationship between the variables: summer rain, autumn temperature, summer temperature, Spring temperature, with an increase in each of them by 1% leads to a decrease in the value of agricultural production by about 0.07%, 1.45%, 1.03%, respectively, and there is a direct relationship between autumn rain, spring rain, winter rain, and winter heat, on the value of agricultural production, whereby an increase in these variables by 1% leads to an increase in the value of agricultural production by about 0.88%, 0.022%, 0.011%, 2.63%. It is also clear that there is an inverse relationship between the variables: spring rain, spring heat, and winter heat, as an increase of these variables by 1% leads to a decrease in the value of agricultural production by about 0.244%, 86.6%, and 2.21%, respectively, as it was found that there is a direct relationship between each of the two rains. Autumn, summer rain, winter rain, autumn heat, summer heat, and the dependent variable the value of agricultural production, whereby an increase in these variables by 1% causes an increase in the value of agricultural production by about 0.211%, 0.052%, 0.128%, 6.34%, 33.56%, and there are A direct relationship with a significant effect between the amount of heat emissions and the value of Egyptian agricultural production at the level of 1%, whereby an increase of 1% causes an increase in the value of agricultural production by about 1.07%. It was also found that there is an inverse relationship between the variable intensity of emissions and the value of agricultural production, and its significance was proven at a significant level of 1%, as an increase of 1% leads to a decrease in the value of agricultural production by about 0.84%.

Table No. (2) shows that the feddan productivity of the wheat crop will decrease by about 9% when the temperature rises by 2 degrees Celsius, and the feddan productivity of the wheat crop will increase to decrease to reach about 18% when the temperature increases by 3.5 degrees Celsius, and the consumption of wheat acre increases from Water is about 3% compared to current weather conditions.

It was also found that when the temperature rises by 3.5 degrees Celsius, the acre productivity of the barley crop decreases by 18%, and the acre water consumption decreases by about 2%.

**Table No.: (2) Acre productivity and water consumption percentage of the most important strategic crops**

Crops	Percentage of change in acre productivity (%)				Percentage change in water consumption (%)
	4	3.5	2	1.5	3.5
Wheat		-18	-9		3
Barley		-18			-2
Maize		-18			8
Rice		-11			16
Tomatoes		-50		14	14
sugar cane		25			2.5

**Source** - compiled and calculated from: Meteorological Research Unit data, Land and Water Research Institute, National Agricultural Research Center.

It was also found that when the temperature rises by 3.5 degrees Celsius, the feddan productivity of the maize crop decreases by 18%, and the percentage of water consumption per acre increases by about 8%.

It was also found that when the temperature rises by 3.5 degrees Celsius, the acre productivity of the rice crop decreases by 11%, and the acre water consumption of rice increases by about 16%.

It was also found that when the temperature rises by 3.5 degrees Celsius, the acre productivity of the tomato crop decreases by 50%, and the percentage of the tomato acre water consumption increases by about 14%.

#### **Impact on Food Security:**

Climate change leads to a decrease in the productivity of the main agricultural crops in Egypt, such as wheat by 18%, rice by 11%, and soybean by 28%, as a result of the following factors:

- 1- Rising temperatures and the expected shortage of available water resources, which affect plant productivity.
- 2- The sinking and the increase in salinity of many low agricultural lands in the delta as a result of the rise in sea level.
- 3- Rising temperatures will lead to an increase in insects and diseases that cause damage to agricultural crops.

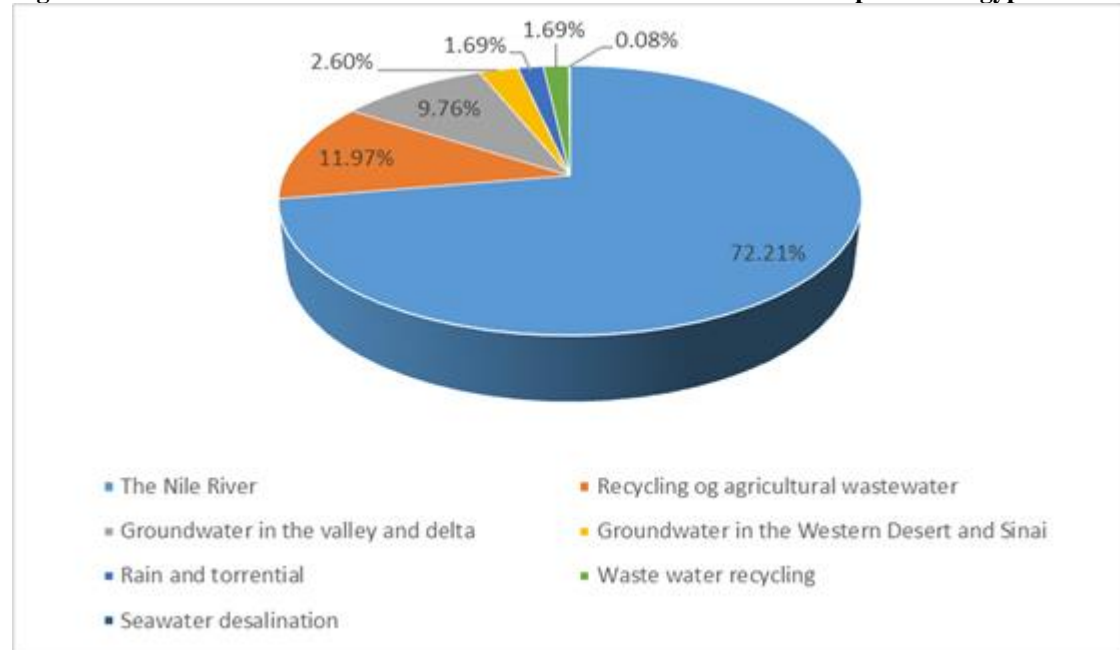
This will lead to a decrease in agricultural production by 8%, an increase in the unemployment rate in the agricultural sector to 39%, and an increase in food prices from 16-68% by 2060, while the economic losses of these damages are estimated at 40-234 billion Egyptian pounds.

#### **Climate changes and their effects on water resources:**

The Nile River supplies Egypt with the equivalent of 97% of its water needs. However, Egypt has been suffering from water poverty since the nineties, and the water gap is estimated at about 20 m<sup>3</sup>, and it is expected that water needs will increase due to the increase in the population rate and the increase in demand for water with poor water management. It is expected Climate change will lead to an increase in the sea rate due to higher temperatures, which will lead to a decrease in the surface runoff of the Nile by 15% by 2081-2098. Studies favor the first scenario, not only is the waters of the Nile River at risk, it is expected that the rainfall rate will decrease in North African countries and the Arab world by 15%. The sea level rise in the northern coasts of Egypt will lead to an increase in the degree of salinity of groundwater in those coastal lands to a depth of 7 km from those coasts, according to a study conducted by the Groundwater Research Institute in Egypt in 2011.

All of these factors will lead to an increase in water poverty in Egypt in the medium term, and Figure No. (1) shows the sources of water resources in the Arab Republic of Egypt.

The agricultural uses of water are estimated at about 61.5 billion cubic meters, which is what agriculture uses from the Nile River water, rain, groundwater and wastewater recycling in the old and new lands. The farm at Aswan is about 46.56 billion cubic meters and reaches about 38.26 billion cubic meters at the field after excluding the losses in the transmission and distribution networks. The share of agriculture in Upper Egypt is about 7.9 billion cubic meters, representing about 20.7% of the total used of the Nile water. The share of agriculture in Central Egypt amounted to about 7.1 billion cubic meters, representing about 18.6% of the total use of the Nile water, while the share of agriculture in Lower Egypt amounted to about 23.3 billion cubic meters, representing about 60.7% of the total use of the Nile water.

**Figure No. 1: Presentation of the available water resources in the Arab Republic of Egypt in 2020**

**Source:** Compiled and calculated from: Central Agency for Public Mobilization and Statistics, Water Resources and Irrigation Bulletin, 2020.

Climate change affects the availability of water for basic human needs (The United Nations Global Report on the Development of the World's Water Resources "Water and Climate Change", issued on March 22, 2020), and will consequently restrict the rights of billions of people to enjoy clean drinking water and sanitation, and the report warns that, by 2050, 52% of the world's population will lose access to their right to safe drinking water and sanitation, as a result of the impact of climate change on water resources; Emphasizing the close relationship between them.

Global water consumption has increased during the past 100 years, by six times, and is still growing at a rate of 1% annually, due to the increase in population, economic development, and changing consumption patterns. It is estimated that climate change will lead to storms, floods and droughts, and will exacerbate the situation. In countries already experiencing water stress, similar problems will be generated in new areas, 41 countries will be exposed to the risks of water stress, and increased drought and accelerated desertification will exacerbate the severity of the situation, as it is expected that at least one in four of the world's population will be affected by repeated water shortages. by 2050.

Water quality is affected by high temperatures, and a decrease in the percentage of dissolved oxygen in it, which results in a decrease in the self-purification capacity of fresh water masses, and the risks of water pollution, and pollution that cause diseases caused by floods, and the high concentration of pollutants during drought

periods, and causes climate change. In the occurrence of shifts in the seasonal abundance of water throughout the year in several places.

Water resources suffer from severe weakness in spending on measures to mitigate these effects and find appropriate alternatives to deal with the causes of climate change. There are about 2.2 billion people who do not currently have access to drinking water, in addition to nearly 4.2 billion people who lack access to sanitation services, which is an estimated 55% of the world's population.

Funding for climate change adaptation projects has increased in recent years from about 360\$ billion in 2012 to an estimated 510\$ billion to 530\$ billion in 2017. But of the 455\$ billion invested in 2016, only 11\$ billion went to management Water and sanitation, and achieving the sustainable development goals will be very complicated if spending on water management projects globally is reduced by three times the current spending to reach 114\$ billion per year. Water, in addition to protecting wet areas.

The water cycle is affected by climatic changes, as the water cycle includes the continuous and uninterrupted transfer of water through the following processes (Sameh Farag Awad, Water Resources Management and Efficiency in Egyptian Agriculture, Ph.D. Thesis, Department of Economics and Agricultural Business Administration, Faculty of Agriculture, Alexandria University, 2019), (1) evaporation of water from oceans and water bodies, in addition to the process of transpiration from land plants in the form of

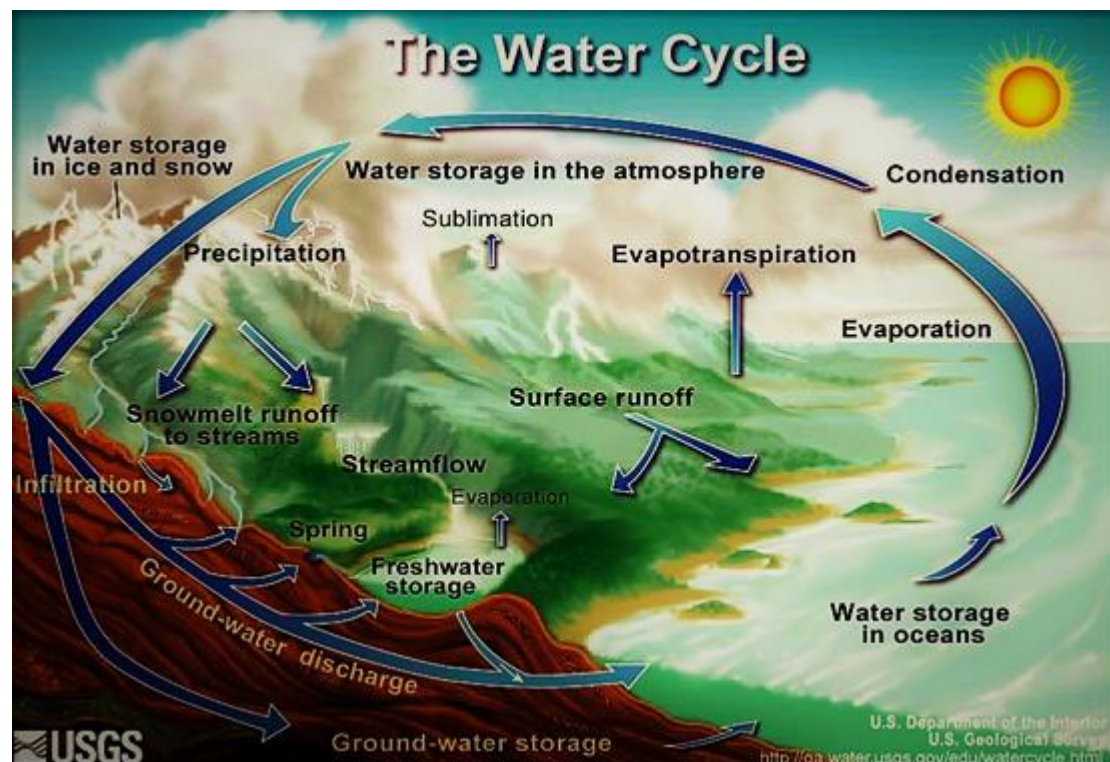
water vapor to the air. (2) Condensation of water vapor from the air and the occurrence of precipitation that ensures the return of water by falling on the ground. (3) A flow to the oceans and bodies of water, and most of the water vapor above the oceans condenses and returns to them, but sometimes the winds carry water vapor to the land so that precipitation and precipitation can occur on it, This is related to the geographical region and the climate of the region. Precipitation can be in different forms, the most famous of which is rain, but precipitation may occur in the form of snow or hail, and the formation of fog and dew also contribute to the precipitation process. In contrast, drought and drought occur when relatively long periods of time pass. It may reach months and sometimes years without precipitation, which leads to a decrease in its water stock below the normal rate for that geographical area, and when water run-off occurs, the water collects in the form of catchments, which drifts into rivers and from them completes its way according to its mouth to the oceans or evaporates directly from them, The

hydrological transport model is defined as carrying out a mathematical modeling process to simulate the flow of a river or stream, and to calculate the factors affecting water quality. A large amount of heavy rain on flat lands, so that the rate of precipitation in a period of time is greater than the rate of discharge, which leads to the rise of the water level in the rivers and its inundation of the surrounding areas, as shown in Figure No. (2).

#### The effect of global warming on the quality of the Nile water:

The danger of global warming in Egypt is represented in the rise in sea level, which poses a threat to coastal cities such as Alexandria, Matrouh, Sinai and the Nile Delta, in addition to the danger of a decrease in the level of dissolved oxygen in the Nile River, which leads to a deterioration in water quality, and exposes some types of aquatic life to the threat of extinction. and a decline in the country's fish and agricultural production.

Figure No. (2): The water cycle



Source: <https://ar.wikipedia.org/wiki/%D9%85%D8%A7%D8%A1>

Dissolved oxygen is the basis for the survival of animals and plants, but its concentration decreases in warm waters, and this negatively affects river organisms. over the entire ecosystem.

The concentration of dissolved oxygen in Luxor decreased by 3.8% in February and 4% in

August, while it decreased in Alexandria by 1.4% in February and 5.4% in August, which indicates that global warming has a negative impact on the concentration of dissolved oxygen in The Nile River, and the water quality. The low levels of dissolved oxygen in the river are due to the high temperatures of the river water, in addition to the danger this poses to the survival of river plants and

fish, and the low levels of dissolved oxygen in the Nile water make it difficult to irrigate some food crops, such as wheat, Such water is only suitable for irrigating non-food crops, such as weeds, The dissolved oxygen must have a specific concentration in order for the water to be suitable for human use, and the water must be treated in a dedicated factory, and many chemicals must be added to the water in order for it to be suitable for human consumption, but this will affect health, as well as high treatment costs.

The effects of global warming in the long term may be final, as it was found from the 2014 Human Development Report that 15% - 40% of the carbon dioxide emitted will remain in the air for more than 1,000 years, and thus will affect the rate of sea level rise. around the world.

**Adaptation mechanisms and policies to climate change and global warming:**

Global warming is considered the most serious challenges and threats facing the world in general and the Arab Republic of Egypt in particular, which cause climate change, coastal floods, heat waves, drought and melting glaciers. Studies conducted on the effects of global warming have shown that the phenomenon of global warming has a detrimental effect on Human health due to poor air and water quality, and the increase in negative effects has been associated with high temperatures and high levels of pollution, Therefore, it is necessary to find island solutions to confront these risks and challenges, as this environmental change will lead to the spread of new diseases and epidemics, and it may reach mass extinction. Therefore, the most important proposals to confront global warming are:

**First:** Reliance on renewable and environmentally clean energy sources such as solar energy and hydropower and abandoning the usual non-renewable energy sources such as oil, gas and coal.

**Second:** Increasing the percentage of cultivated areas on the surface of the earth, by expanding the planting of trees and preventing the cutting of trees from forests.

**Third:** Reducing the emissions of factories and resulting from production processes, by placing strict control over them, and placing purifiers on the smokestacks of those factories.

**Fourth:** Reducing human dependence on private means of transportation such as cars and increasing reliance on mass transportation to reduce the proportion of emissions from cars and others.

**Fifth:** Stopping urban expansion, especially in agricultural areas and areas.

**Sixth:** Reducing those military industries carried out by developed countries, which may generate huge amounts of carbon dioxide.

**Seventh:** Carrying out the process of feeding marine plants by pumping large quantities of nutrients to them, as it has been scientifically proven that these marine plants have a major and essential role in purifying the atmosphere.

**Eighth:** Rationalizing energy consumption by individuals by encouraging the construction of houses according to the principle of thermal insulation, which reduces the need for heating in the winter and cooling in the summer, and thus reducing heating costs to 25%.

**Ninth:** Accelerating the cycle of carbon dioxide gas, due to its return to its natural places, instead of accumulating it in the layers of the atmosphere, causing the phenomenon of global warming.

**Tenth:** Imposing taxes and heavy fines on those who generate carbon emissions from factories.

**Eleven:** Using energy-saving products The use of energy-saving household electrical appliances helps reduce greenhouse gas emissions.

**Based on the foregoing, the study recommends the following:**

- 1- Apply appropriate agricultural practices that are sensitive to climate changes.
- 2- Rationalizing the use of non-renewable energy and expanding the use of renewable energies.
- 3- Reducing the emission of carbon dioxide by finding drains for it through well-managed agricultural soils.
- 4- Expanding forests, raising awareness of the issue of climate change at all levels, and coordinating with international bodies and developing countries.
- 5- Rationalizing domestic, industrial and agricultural water uses, and working through programs that do not conflict with economic and social development plans.

**As for public health, the study recommends:**

Cars must be emptied of: (1) carbonated substances, (2) lighters, (3) soft drinks, (4) perfumes and batteries of appliances in general, (5) car windows must be opened slightly (breeze), (6) not filling the tank Full car fuel, (7) Filling car fuel in the evening shift, (8) Not traveling by car in the morning period, (9) Not filling car tires more than necessary, especially when traveling.

Drink plenty of water and fluids, and be careful to operate water heaters, and not put gas cylinders in the sun, and stay away from direct



sunlight, especially during the period from 10 am to 3 pm.

Ensure that the loads are not overloaded on the electricity meters and that the air conditioners are not operated except in the places where the family is located, especially during times of peak heat.

Putting water cans in windows, courtyards, fences, farms and balconies, in order to quench the thirst of birds, cats and other animals so as not to disturb the ecological balance, and beware of scorpions and snakes, they will come out of their burrows significantly and may enter farms and homes to search for humid weather.

Increase the planting of trees on both sides of the main and secondary roads to avoid the extreme rise in temperatures and increase the percentage of oxygen gas (O<sub>2</sub>) in the atmosphere to reduce the harmful effect of carbon dioxide (CO<sub>2</sub>).

The research discussed an important phenomenon that affects different aspects of life, which were climate changes and its effect on crop productivity where the rise in temperature had laid a negative effect on wheat, rice and tomato and a positive effect on cotton and sugarcane productivity. Tough the research included useful information. It was descriptive.

Egypt is one of the countries most affected by the negative effects of climate change, and these damages are summarized in sea level rise, water poverty, and the deterioration of public health and environmental systems, which leads to economic losses estimated at billions, which affects the Its food security, as well as climate change affects the nature of rainfall, evaporation, snow, flow of water springs and other factors that affect the availability and quality of water worldwide.

Fresh water resources are very sensitive to changes in weather and climate. Climate change is expected to affect water availability in areas where the amount of rivers and streams water depends on snowmelt.

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## الملخص العربي

## أثر التغيرات المناخية علي القطاعات المختلفة والأمن المائي المصري

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تشغل قضية تغير المناخ والإرتفاع غير المسبوق في درجات الحرارة للعالم كله، وتداعياتها المتوقعة على الاقتصاديات العالمية، والانبعاثات الغازية الناتجة عن النشاط البشري في المجالات المختلفة لاستخدام الطاقة أدت إلى إحتباس حراري عالمي، فالآثار العالمية لتغير المناخ هي واسعة النطاق ولم يسبق لها مثل من حيث الحجم، من تغير أنماط الطقس التي تهدد الإنتاج الغذائي، إلى إرتفاع منسوب مياه البحار التي تزيد من خطر الفيضانات الكارثية، وسيكون التكيف مع هذه التأثيرات أكثر صعوبة وأكثر تكلفة إذا لم يتم إتخاذ إجراءات جذرية تحد من الآثار السلبية المتوقعة من الإحتباس الحراري علي القطاع الزراعي بصفة عامة وعلي تنمية الموارد المائية بصفة خاصة، وإستهدف البحث: (1) التعرف علي أثار التغيرات المناخية والإحتباس الحراري علي القطاعات المصرية المختلفة، (2) دراسة أثار التغيرات المناخية والإحتباس الحراري علي الموارد المائية المصرية، (3) دراسة أثر التغيرات المناخية علي القطاع الزراعي المصري، (4) دراسة أليات وسياسات التكيف مع التغيرات المناخية والإحتباس الحراري.

وكانت أهم النتائج التي توصل إليها البحث (1) تطبيق ممارسات زراعية مناسبة مراعية للتغيرات المناخية، (2) ترشيد استخدام الطاقة غير المتجددة والتوسع في استخدام الطاقات المتجددة، (3) التخفيف من إصدار ثاني أكسيد الكربون بإيجاد مصارف له عن طريق تربة زراعية مدارة جيداً، (4) التوسع في الغابات، ورفع الوعي بقضية التغيرات المناخية على جميع المستويات والتنسيق مع الجهات الدولية والدول النامية، (5) ترشيد استخدامات المياه المنزلية والصناعية والزراعية، والعمل من خلال برامج لا تتعارض مع خطط التنمية الاقتصادية والإجتماعية، (6) الإكثار من شرب الماء والسوائل، كما يجب الحرص من تشغيل سخانات المياه، وعدم وضع إسطوانات الغاز في الشمس، البعد عن التعرض لأشعة الشمس مباشرة وخصوصاً خلال الفترة من الساعة ١٠ صباحاً وحتى الساعة ٣ ظهراً، (7) وضع علب ماء في الشبابيك والأحواش والأسوار والمزارع والبلبونات، وذلك لري عطش الطيور والقطط وغيرها من الحيوانات حتي لا يحدث إختلال في توازن البيئة، ويجب الإنتباه من العقارب والثعابين فسوف تخرج من جورها بشكل ملحوظ وقد تدخل المزارع والمنازل للبحث عن الجو الرطب، (8) زيادة زراعة الأشجار علي جانبي الطرق الرئيسية والفرعية لتجنب الإرتفاع الشديد في درجات الحرارة وزيادة نسبة غاز الاكسجين (O<sub>2</sub>) في الجو للحد من التأثير الضار لغاز ثاني أكسيد الكربون (CO<sub>2</sub>).