

Climate changes and their impact on urbanization

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Abstract:

The Egyptian urbanization has been witnessing a state of continuous mobility since its inception, in which a range of political, social, economic and environmental factors intervene. These factors sometimes influence positively and sometimes negatively, all of which go together in parallel, one of which may appear rapidly, and this effect may appear in the long term. As the world is currently experiencing severe warnings and warnings of the threat of climatic changes that have been growing since the beginning of the twenty-first century, but not of the century's birth, but of the twentieth century, which saw a movement of climate changes, but not as accelerated as expected in the twenty-first century. The threat of climate change threats is high global warming, which will lead to different scenarios for rising Mediterranean waters. These scenarios vary between optimistic, medium and pessimistic, but the least pessimistic scenarios predict an increase of one-meter sea level in 2100 and a half meters in 2050. From 2050 onwards, States participating in the Mediterranean borders will see a major threat. Their shortcomings have begun since the beginning of the twentieth century. All studies that have predicted the risk of climate changes to States indicate that Egypt will be one of the most affected by these changes.

Keywords: Climate changes- urbanization- The environment- Global Warming- Greenhouse gases

Introduction:

The threat to Egypt is the sinking of the coastal strip from Port Said to Alexandria along with the coast of Delta governorates, which threatens Egypt's loss of hundreds of thousands of acres in the existing urban bloc and hundreds of thousands of acres of agricultural acres, as well as the displacement of millions of citizens as a result of the drowning of their homes and lands inside the Delta and Egyptian coasts. So in its methodology, this paper attempts to track the climate changes that Egypt experienced in the twentieth century. and monitoring of the most prominent gases constituting the Egyptian atmosphere and knowledge of the various sectors causing Egypt's gas emissions, The impact of these gases on global warming through official data issued by the government agencies entrusted with the management of the environment in Egypt and the analysis of the increase in the proportion of gas emissions over the past two decades, and the identification of projected scenarios for the rise of the Earth's surface level and measuring the magnitude of the losses to which Egyptian urbanization will be exposed as a result of projected climate changes over the current century.

Environment and urbanization:

The environment is divided into two axes, the first being the combination of factors and variables "physical, chemical," that drive man and other beings to sustain and survive life, and the second axis is the medium in which man and other beings live, influence and be influenced. The environment is defined as, at some point in time and somewhere, a stock of social and material resources to satisfy man's needs and aspirations. Article 1 of the Egyptian Act No. 4 of 1994 defines the environment as the biosphere, which includes living organisms and the material contained therein and the air, water, soil and installations surrounding them.

One of the definitions of the above-mentioned term "environment" is that there is an inevitable intersection between environmental variables and urban development. The term "urbanization" refers to the outcome of man's interaction with the surrounding environment. Man is at the centre of both environmental and urban aspects. Environmental studies are one of the fundamental and essential pillars

of urban development, especially sustainable development, which has become necessary and inevitable.

In Egypt, an environmental study within or outside Egypt has not compromised but warned that Egypt will be one of the countries most affected by the climate changes of rising sea levels as a result of global warming, and that the areas most threatened by drowning are coastal areas and delta governorates.

Egypt's coastal strip is 3,500 km long, of which 1,200 km is on the Mediterranean Sea. 2300 km on the Red Sea according to the statistics of the Environmental Affairs Authority 2016. The coastal areas account for 15% of Egypt's population. This means that in the future this proportion of the population faces the risk of displacement as a result of drowning coastal areas as cautioned by the Information and Decision Support Centre 2011, the coastal area of the Nile Delta is prone to flooding as a result of rising water surface, as well as fears of soil decline in these areas.

Global Warming:

Global warming refers to an increase in the world's surface temperature, as well as an increase in the amount of carbon dioxide, methane, and some other atmospheric gases called greenhouse gases.

Greenhouse gases:

Greenhouse gases are defined as the group of atmospheric gases that emit and absorb infrared radiation. Greenhouse gases consist of carbon dioxide, water vapor, nitrous oxide, ozone, methane gas and other man-made gases, namely fluorescent hydrocarbons, chlorine-containing ether and sulphur hexafluoride bromide, and Hcarbonate.

Emitting Sectors in Egypt emissions in 2015. The energy sector is the largest contributor to emissions at 64.5% and thus this sector produces about 87% of CO₂ emissions, about 3% of N₂O emissions are in the energy sector as a result of two key factors. The first is fuel combustion by 97%, which is divided into 43% energy

industries, Manufacturing and Construction Industries 23%, Transportation 23%, Other Sectors 8%, Second is the 3% emissions from fossil fuels (Natural Gas, Oil).

Agriculture and forestry sector:

Agriculture and forestry is the second largest sector responsible for GHG emissions at 14.9% and these emissions in agriculture, forestry and other land uses result from intestinal fermentation by 22.1%, Animal dung management 11.97%, emissions from biomass burning 1.62%, Use of urea 2.8%, direct nitrous oxide emission from managed soil 42.61%, Indirect nitrous oxide emission from managed soil 11.06%, direct nitrous oxide emission - animal dung 0.45%, 7.39% rice cultivation.

Industrial Operations Sector:

The industrial operations sector is the third gas emitting sector in Egypt at 12.5%. This sector produces about 12% CO₂ emissions, and about 12% N₂O emissions. Emissions in this sector result from 54% mining industries, 18% chemical industries, 17% metallurgical industries, and the use of products as alternatives to 11% ozone-depleting substances.

Waste Sector:

The last sector contributing to greenhouse gas emissions in Egypt is the waste sector at 8.1%. Emissions in this sector result from solid waste disposal at 50%, wastewater treatment and discharge at 47%, biological treatment of solid waste at 1%, incineration and detectable burning of waste at 2%.

Inventory of Egypt's greenhouse gases:

The Arab Republic of Egypt's first biennial report to the United Nations Framework Convention on Climate Change (UNFCCC) in 2018 stated that it accounted for greenhouse gases and their emissions in Egypt according to the above-mentioned sectors, where total greenhouse gas emissions in 2015 (325614 Gg CO₂ equivalent) were divided and distributed as shown in the following table:

percentage	Size Gg CO2 equivalent	Component emitted
73%	237871	carbon dioxide
13%	41483	methane
12%	38574	nitrous oxide
1%	4308	hydrofluorocarbons
1%	3379	hydrofluorocarbons

Greenhouse gases emitted in Egypt's atmosphere 2015

The report stated that the volume of some of the gases emitted in 2015 had increased from 2005, while the proportion of other elements had decreased, but that the proportion of increasing emitters was much more than declining. In 2015, the proportion of greenhouse gases increased by about 40% of emissions in 2005, as shown in the following table:

Percentage2015	Percentage2005	Component emitted
73%	67%	carbon dioxide
13%	15%	methane
12%	15%	nitrous oxide
1%	0%	hydrofluorocarbons

Egypt was greatly affected by climate change in the twentieth century. Over the decades, Egypt has experienced aerial and environmental changes that significantly affect the country.

One of the most prominent challenges Egypt has faced is the scarcity of water and the low level of the Nile River. Owing to climate change, evaporation has increased and rainfall has decreased, resulting in a shortage of freshwater resources. Egypt relies heavily on Nile water to meet its water needs, and the low level of the river has been affected by its ability to irrigate and provide water to the population. Egypt has also experienced increased temperatures and drought, resulting in high evaporation rates and their impact on agricultural crops and livestock. Agriculture is an important part of Egypt's economy, and climate change exposes agricultural land

to drought and desertification, negatively affecting agricultural production and food security.

In addition, Egypt is exposed to the impacts of climate change by increasing the frequency and severity of extreme weather events such as floods, sandstorms and tropical storms. These extreme weather events cause serious damage to infrastructure and property and threaten the safety of the population. To address these challenges, the Egyptian Government is taking action to adapt to climate change, including improving water management and increasing water efficiency, promoting sustainable agriculture, developing climate-friendly agricultural techniques, and strengthening infrastructure to counter extreme weather events. At the global level, Egypt is also engaged in international efforts to reduce greenhouse gas emissions and mitigate the effects of climate change, through cooperation with the United Nations and relevant international conventions. It is important that the entire world collaborates to address the challenges of climate change, as these changes affect different countries differently, and international cooperation requires joint efforts to adapt to these challenges and reduce their impacts on humanity and the environment.

beach erosion in Egypt:

Egypt suffers from the problem of beach erosion, which is one of the environmental impacts of climate change. This problem causes the degradation and erosion of sandy beaches along the coasts. Beach erosion is caused by numerous factors, including sea level rise as a result of melting glaciers and rivers falling in polar regions, changing wind pattern and marine currents, and the impact of violent storms. These factors cause sand to be dredged from the shores and transported to other areas or submerged by marine waters. Beach erosion has negative effects on the environment and the Egyptian economy. On the environmental front, the shrinking of beaches causes loss of marine biomass and natural saline mixing, and biodiversity and coastal flora and fauna are affected. In terms of economy, Egyptian beaches are an important tourist destination, and some coastal cities rely heavily on beach tourism, thus erosion of beaches adversely affects the tourism sector and reduces its attractiveness.

To address the problem of beach erosion, the Egyptian Government is taking various actions, including implementing engineering projects to stabilize and strengthen beaches by creating dampened waves and coastal fences, and using sand deposits to renovate beaches. It also organizes human activities on beaches and promotes environmental awareness to preserve the beaches and maintain the balance of the coastal system.

Climate changes affect multiple regions around the world in different ways. Some regions experiencing the effects of climate change are as follows:

Polar regions: Both the Arctic and the Antarctic suffer from melting ice and rising sea levels. These changes cause the erosion of glaciers and loss of the polar biomass, affecting the marine life and ecosystems of those areas.

Coastal areas: Coastal areas around the world suffer from sea level increases and beach erosion. This causes loss of coastal land and threats to coastal infrastructure and property, and affects beach tourism and beachfront communities. **Dry and desert areas:** Rising temperatures and droughts increase desertification of dry and desert areas. Ecosystems, agriculture and community's dependent on those regions' limited water resources are affected. **Mountain regions:** Mountain regions are affected by climate changes through melting snow and ice and changing snowfall patterns. This affects the availability of freshwater, natural resources and biodiversity in those areas.

Coastal areas and major cities: Major cities and coastal areas are exposed to multiple threats as a result of climate change, such as increased tsunami, increased frequency of violent storms and increased floods. These changes cause massive human and economic losses and threaten infrastructure and population. These regions represent only some examples of areas affected by climate change, and attention must be paid to improving environmental sustainability, taking action to adapt and reduce the impacts of climate change around the world.

Egypt faces a number of negative impacts as a result of climate changes. Here are some key effects:

Water shortage: increased drought and reduced rainfall affects the availability of fresh water in Egypt. Egypt relies heavily on Nile water to meet its water needs, and the amount of water flowing into the river is reduced by climate changes, affecting its ability to irrigate agriculture and provide water to the population.

Coastal erosion: rising sea levels erode and recede Egyptian shores. This puts coastal areas and infrastructure under threat and affects beach tourism and beachfront communities. Rising temperatures and droughts: Rising temperatures and increasing global heating in Egypt, causing increased drought and lack of water resources. This negatively affects agriculture, agricultural production and food security.

Increased frequency of floods: The frequency of floods in some areas may increase as a result of increased rainfall and changing rainfall pattern. Floods cause massive human and economic losses and threaten infrastructure and property. Impacts on livestock and ecosystems: Egypt's livestock and ecosystems are affected by climate change, as the change affects the availability of food resources and biotechnology and leads to the degradation of biodiversity and flora and fauna.

Climate changes require effective action by the Egyptian government and the international community to adapt to these challenges, and develop strategies to reduce and mitigate their negative effects.

Egypt faces significant challenges in increasing desertification rates as a result of climate change and other factors. Here are some points related to increasing desertification in Egypt:

Water shortage: Egypt is one of the countries with high dependence on Nile water as the main source of freshwater. However, rising temperatures and climate changes increase water evaporation and lack of water available for irrigation and agricultural use. This leads to agricultural land degradation and increased desertification rates.

Sand crawl: Some areas in Egypt face the sand crawl phenomenon where sand and dry soil spread abnormally and cover agricultural spaces and cities. Climate change

promotes this phenomenon by increasing drying and soil degradation. Increased drought and rainfall shortages: Much of Egypt suffers from a lack of rain and persistent drought. This affects biodiversity and ecosystems and causes increased desertification in those areas.

Ineffective management of land resources: Egypt faces challenges in effectively managing land and water resources. Unsustainable agricultural operation and lack of appropriate agricultural techniques increase desertification and agricultural land degradation rates. To address increased desertification rates, the Egyptian Government is taking action to strengthen water management, improve sustainable agricultural techniques and implement agricultural transformation and soil conservation and biodiversity projects. This requires sustained efforts and collaboration between government, community and international organizations to address this challenge.

Conclusion:

To address the impacts of climate change on urbanization, Egypt needs to adopt strategies for climate adaptation and mitigation. This includes implementing resilient urban planning, improving water management practices, investing in green infrastructure, promoting energy efficiency, and raising awareness among urban residents about sustainable practices. International cooperation and support are also crucial in tackling these challenges.

Heat island effect: Urban areas in Egypt experience the heat island effect, where cities become significantly warmer than their surrounding rural areas. Climate change exacerbates this effect, leading to higher temperatures in urban centers. This can result in heat stress, increased energy demand for cooling, and reduced air quality, impacting the livability and health of urban residents.

Flood risks: Climate change increases the frequency and intensity of extreme weather events, including heavy rainfall and flooding. Urban areas in Egypt, particularly those located in coastal regions and along the Nile River, are vulnerable to flooding. This poses risks to infrastructure, property, and the safety of urban populations.

Sea-level rise and coastal erosion: Rising sea levels associated with climate change pose a threat to Egypt's coastal cities. Increased coastal erosion, saltwater intrusion, and the loss of coastal land can impact urban infrastructure, including buildings, roads, and utilities. It also affects tourism, which is a significant economic sector in coastal areas. Infrastructure vulnerability: Climate change places additional stress on urban infrastructure systems, including transportation, water supply, and sanitation. Extreme weather events can damage or disrupt these systems, leading to service interruptions and increased costs for repairs and maintenance.

Water scarcity: Egypt already faces water scarcity, and climate change further intensifies this challenge. Reduced rainfall, increased evaporation, and changes in precipitation patterns contribute to water stress in urban areas. This can lead to water shortages for domestic use, agriculture, and industrial activities, affecting the livelihoods and economic development of urban populations.

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