Opinion
Volume 12:3, 2023

Irrigation & Drainage Systems Engineering

ISSN: 2168-9768 Open Access

Climate Change Vulnerability Assessment of Egypt's Governorates' Irrigation Water Requirements

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Introduction

Egypt's agricultural sector is the one that uses the most water, and climate change is affecting its crop yields. To accommodate the proposed change, irrigation technologies are a highly recommended adaptation option. Egypt has limited financial resources for climate change adaptation plans. Therefore, it is essential to identify the governorate that will be most affected by climate change in terms of irrigation water requirements (IWR). The purpose of this study is to determine the governorate-level vulnerability of IWR to climate change. Exposure factors, sensitivity factors, soil type, and the economic value of irrigation water all played a role in the selection of the reference evapotranspiration and precipitation change. Finally, we identified organizational capacity for adaptive capacity factors, poverty, and education.

Description

The findings revealed that the nine governorates in the middle and north of the country had the highest and highest levels of vulnerability. Under the climate change scenarios. One of the most significant environmental issues, global climate change, has an impact on development projects and survival in the future. Egypt, particularly its northern region, has been identified by numerous studies as one of the climate change hotspots. Countries in the Middle East and North Africa are impacted by climate change. Egypt is highly susceptible to climate change due to its small size, high population growth rate, and proximity to the Nile River. As a result, developing plans for adaptation necessitates conducting research on the effects of climate change and how it interacts with other obstacles [1,2].

A vulnerability assessment is a method for determining the extent of the impact of climate change on human and ecological systems and how they will respond to it. Vulnerability assessment identifies the places or communities that are most vulnerable to climate change as well as the main drivers of vulnerability. As a result, vulnerability is frequently used in various climate change studies to provide the most efficient and appropriate adaptation and mitigation strategies. Numerous attempts were made to create a formal vulnerability model, but there was disagreement regarding the definition of vulnerability that was most appropriate. There are three types of approaches to vulnerability in the climate change literature: The IPCC Fourth Assessment Report (AR4) defines vulnerability as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes."

The endpoint, starting point, and third approaches are based on the IPCC Third Assessment Report (TAR). This definition demonstrates that vulnerability is a function of exposure, sensitivity, and adaptive capacity. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed. The climate change rate is referred to as exposure (EX), and sensitivity (SE) refers to the degree to which a given climate change exposure has a positive or negative system impact. Lastly, Adaptive Capacity (AC) is a system's capacity to adapt to climate change. According to the Ministry of Water Resources and Irrigation (2014), Egypt's agricultural sector uses more than 85% of the water it needs, contributes about 20% to GDP, and employs 40% of its workforce [3-5].

Conclusion

Since agriculture is one of the most vulnerable sectors to climate change, numerous studies have been conducted to investigate the effects of climate change on water availability and the agricultural sector. As a result, Egypt faces a severe water scarcity issue because the demand for water exceeds the amount of water that is available by approximately 20 billion cubic meters (BCM) per year. Studied the predicted flow of the Nile River in response to climate change; they discovered a negligible rise in the flow, which does not correspond to the anticipated rise in the rate of evaporation. The studies demonstrated that climate change would result in lower crop yields. The proposed climate change will result in crop yield reductions of 28% for soybean and 11% for rice by 2050 and 36% for wheat and 20% for maize by 2100. As a result, adaptation plans must be implemented, and irrigation technology is one of the most highly recommended options. As a result, the purpose of this study was to ascertain which governorate's irrigation water requirements (IWR) are most affected by climate change.

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How to cite this article: Fufa, Fekadu. "Climate Change Vulnerability Assessment of Egypt's Governorates' Irrigation Water Requirements." *Irrigat Drainage Sys Eng* 12 (2023): 375.

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Received: 01 March 2023, Manuscript No. idse-23-90386; **Editor assigned:** 03 March 2023, PreQC No. P-90386; **Reviewed:** 15 March 2023, QC No. Q-90386; **Revised:** 22 March 2023, Manuscript No. R-90386; **Published**: 28 March 2023, DOI: 10.37421/2168-9768.2023.12.375