International Journal for Research Trends in Social Science & Humanities
Volume 3 Issue 3
May-June 2025, PP 1-06

Topic- Environmental Economics

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Abstract- This research investigates the economic effects of increasing water scarcity in the Middle East especially focusing on Bahrain, Kuwait, Oman, Lebanon, Cyprus, and Qatar. As climate change, urbanization, and population growth exacerbate the regional water crisis, sectors like agriculture, industry, tourism, and public health are increasingly impacted. The project draws on World Bank, FAO, and national data to show how falling farm production, increasing water prices, and labour market contraction erode the economy. The impact is particularly harsh on vulnerable groups, with women and internally displaced people shouldering the bulk of poor access to amenities. The analysis also assesses regional initiatives and possible solutions like desalination, wastewater recycling, water-efficient irrigation, public awareness, and transboundary coordination over shared water resources.

Keywords- Water scarcity,Middle East,Economic impact,Climate change,Urbanization, Population growth,Agriculture

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I. Introduction

One of the Middle East's more emerging challenges today is water shortage. Ever since, this land of droughts and distant oases has been challenged by the scarcity of fresh water. However, since years the issue has proliferated due to population growth, expansion of urban areas, climate
change and high temperatures. It is restricting agriculture, food security, industry and tourism as water becomes scarcer and the effects propagate into other sectors of the economy.

Water scarcity is not just a daily reality for the people of Bahrain, Kuwait, Oman, Lebanon, Cyprus and Qatar; it is an economic issue that affects their livelihoods and national security. Farmers struggle to produce sufficient food, industries incur higher expenses as they use water-intensive processes, and governments are compelled to invest immensely in desalination and other costly water-efficient technologies, services or infrastructure.

It looks at the economic impact of water shortage on the Middle East focusing on agriculture, trade, tourism, industrial and overall growth. Our principal question is: “What are the effects of the rising scarcity of water on the economies of the Middle East?” Our analysis will follow the effect of climate change and water scarcity on government policy in a way that includes key statistics from trusted sources such as: World Bank, United Nations (etc.), local governmental bodies. This project points to the urgent need for sustainable solutions and illustrates how vital water management is for the Middle East economic future.

Economic Impact Of Water Scarcity In Agriculture

Increasing water shortage has a substantial detrimental influence on food output. As water scarcity worsens, agricultural production will suffer significantly, and crop types will shift. The consequences will vary depending on the economy and the type of water management strategies implemented to deal with scarcity. Under the moderate economic development scenario used in this study, Saudi Arabia is projected to lose the most of its agricultural production by 2050 (about 65 percent of current levels), followed by the Republic of Yemen (35 percent reduction) and the Syrian Arab Republic (13 percent reduction). Under the proposed scenario, the Islamic Republic of Iran and Lebanon will each lose about 5% of their agricultural output. North African economy is projected to sustain fewer losses. Water supply limits will affect the crops grown in the region. Water scarcity constraints may impact crop basket adjustments, especially in countries that are already likely to face agricultural production losses. Saudi wheat production is projected to plummet drastically. This is consistent with the government's plans to phase out wheat cultivation due to major concerns about groundwater depletion (FAO 2017).
The Republic of Yemen's herb production, mainly qat, is predicted to fall severely.

Rice production in the Islamic Republic of Iran's northern area is also expected to decline as water constraint increases. Water scarcity is expected to reduce food production opportunities, resulting in lower export income from agricultural commodities. According to models, in some economies, agriculture export profits could fall by tens of billions of dollars. The picture below depicts the change in total net exports between 2050 and 2100. The Arab Republic of Egypt, Saudi Arabia, Israel, and the Republic of Yemen appear to have the biggest predicted agricultural export losses under the scenario considered.
Given the backdrop of decreasing agricultural production due to water constraint, achieving food security in the region is a challenging task. Agricultural systems must maintain current levels of productivity in a more unpredictable environment, with substantially greater temperatures and extremes, as well as more competition for limited water supplies from growing cities. As discussed in the following section, improving safety nets and increasing participation in global markets are two strategies for ensuring food security in a water-stressed world.

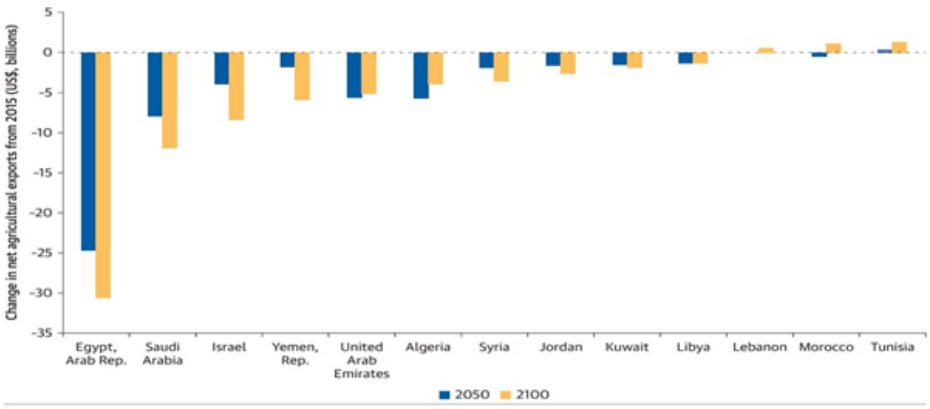
Economic impacts:
At the most fundamental level, limiting the availability of freshwater resources has effects within households in terms of the proportion of household income spent on water provision, as well as the expenditures and time investment connected with water storage, especially for women. SDG 6 monitoring results from UNICEF and the Joint Monitoring Programme (JMP) show that Northern Africa and Western Asia, which primarily overlap with the Arab region, have the

second-highest rate of water expenditures. Almost 20% of the population spent more than 2-3% of their family income on Water, Sanitation, and Health (WASH) services.

Vulnerable people, who are typically not connected to water supply and sanitation networks, end up paying much more for water-related services than their connected

peers. According to World Bank estimates from 2010, poor water supply and sanitation systems cause $21 billion in
economic losses across the Middle East and North Africa each year, accounting for approximately 1% of the region's GDP and considerably more in conflict-affected countries (2-4%).

FIGURE 3.1. Projected Change in Net Agricultural Exports in the Middle East and North Africa, 2050 and 2100



Source: World Bank and University of Maryland calculations.
Note: Net exports are calculated as the difference between consumption and production multiplied by crop prices estimated by the Global Change Assessment Model (GCAM). No data available for Iraq and the Islamic Republic of Iran. This was estimated using the Goddard Institute for Space Studies (GISS) climate model, one emission scenario (Representative Concentration Pathway [RCP] 6), and the Shared Socioeconomic Pathway 2 (SSP2) scenario for socioeconomic development. Results should be used with caution because different estimates may be obtained depending on the scenarios and model used.

Growing cities and informal settlements, including the approximately 26 million internally displaced people and refugees in the Arab world, are putting more and more pressure on water service providers to meet their demands.3 Water and sanitation services are in greater demand due to the growing number of displaced communities, however displaced people occasionally
lack the funds to meet their basic WASH needs.

For instance, in Yemen, where there is a severe water shortage, women are forced to spend hours each day gathering water due to rising prices for water bought from private suppliers. Women in Yemen's rural areas spend one to two hours twice a day gathering water, according to a study conducted by the International Rescue Committee. Even if trucked water supplies might be closer to home, women are forced to travel further to public taps due to the high expense of purchasing

from private sellers.4. In the Arab world, women are also regularly subjected to sexual assault and verbal harassment while travelling to fetch water.

The productivity costs of inadequate water and sanitation systems are clearly linked to the public health consequences of water scarcity. According to initial estimates, the productivity expenditures related to water-borne diseases, expressed in disability-adjusted life years (DALYs), range from 0.1% (Qatar) to 1.5% (Syrian Arab Republic) of GDP in Arab nations. In addition to possible labour productivity losses, a shortage of water might result in labour market contractions because many jobs rely on it as an input. Three out of every four occupations in the global labour market are either somewhat or strongly dependent on water, per the 2016 UNEP research.

Based on figures from the International Labour Organisation, an estimated 40 million jobs in the Arab world are primarily related to water. This includes jobs in agriculture, forestry, fisheries and aquaculture, mining and resource extraction, water supply and sanitation, and most forms of power generating. Furthermore, 46 million employment are somewhat dependent on water, including occupations in manufacturing/transformation industries such as metals, paper, rubber/plastics, and wood, as well as jobs in construction, recreation, and transportation. Some of these economic sectors—like forestry, fishery, and agriculture—represent important sources of job growth for the Middle East and North Africa labour market, in contrast to worldwide trends of labour market contractions in these regions.

Water service companies incur higher operating and maintenance costs as a result of water scarcity. For instance, the network's vertical and horizontal pumping costs rise as a result of groundwater depletion. While the Gulf Cooperation Council (GCC) countries have historically managed water scarcity issues in the region fairly well, Al-Zubari et al. (2017) finds that factors like growing populations, shifts in consumption patterns, and inefficiencies in water delivery—all of which are made worse by the ripple down effects of climate change—are putting the expensive infrastructure put in place to address the issue to the test in new ways. The GCC nations have invested heavily in water infrastructure, such as dams and facilities for water treatment and desalination. Given the sharp rise in demand and the fall in availability, the GCC nations may need to make additional investments in desalination capacity. The energy required to operate desalination programs and the associated costs of utilising oil and petrol to do so can make this costly.

Many of the economic impacts of water scarcity across different sectors described herein are also interconnected. Water scarcity affects the agriculture sector by reducing crop yields, as well as the labour market because lower yields necessitate fewer workers to harvest. When agricultural yields in a region fall, food security suffers, resulting in a shortage of healthy intake for the population, which has negative public health consequences and leads to an increase in

public health spending. Water scarcity has an economic impact along this chain of events, resulting in lower crop yields for farmers, a loss of household income for laid-off agricultural workers, and an increase in healthcare expenditures linked with hunger. Land degradation and
aridity, as well as the associated water shortage that affects supply chains and logistics, result in increased prices for other industrialists, which are likely to be passed on to consumers, affecting household budgets and expenditure. In this scenario, industrialists, transportation businesses, and consumers bear the economic consequences of water scarcity. The complicated links of water scarcity and its consequences need creative and imaginative solutions that cut across
multiple economic sectors and dimensions.

Solutions:

Solving the issue of water scarcity within the Middle East needs technological innovation, sustainable policies and also international cooperation. One is to invest in high-tech water conservation and recycling techniques, such as those that have been pioneered in Israel, whose drip irrigation has dramatically reduced agricultural use of water. Countries need the largest amount of water for farming, which is more important in dry areas such as the Middle East, and by using efficient irrigation methods; they can reduce this demand. It also relieves pressure from freshwater resources to extend the recycled wastewater use for irrigation, already adopted in Cyprus and Oman. Wastewater recycling for irrigation and industrial purposes not only preserves water but also decreases pollution load in natural sources.

Desalination is yet another solution to this problem, common in the region (Qatar and Saudi Arabia are heavily reliant on desalination). But, on the other hand, desalination brings a fresh supply of water but is an energy expensive process and can be quite expensive as well.

Governments can do this with renewably powered desalination plants (The United Arab Emirates is testing solar-powered desal plants in Abu Dhabi). This would decrease the environmental impact and ensure a reliable water supply. The unmet demand can also be satisfied through public awareness and water conservation campaigns. Awareness campaigns combined with tiered water pricing to make excessive household water use expensive has shown success in Jordan where such policies help reduce domestic water demand.

Also, many Middle Eastern countries share transboundary rivers and aquifers so regional cooperation on shared water resources is vital. The Jordan River basin cooperation is an example of how shared resources can be jointly managed resulting in a decrease in conflict and more equitable distribution. Global frameworks, such as the United Nations Watercourses Convention, would provide countries with guidance in negotiating binding agreements capable of preventing conflict and promoting effective sustainable management of shared resources. In addition, the nations of the Middle East can replicate such principles as seen in Singapore, which has integrated these productive strategies into a comprehensive system — with desalination, rainwater harvesting and recycling referred to as its 'Four National Taps' system – thus providing sustainability and durability in water security.

II. CONCLUSION

The scarcity of water is one of the biggest dangers to Middle Eastern economies, affecting agriculture and industry, tourism and food security. The scarcity of water, now compounded by climate change and population growth, puts pressure on everything from crop production to labour markets and family budgets. Efficient irrigation, recycling of wastewater and
renewable-powered desalination are environmentally-sustainable solutions to save water. Public outreach and water pricing will help to reduce over-harvesting demand. Needless to say, regional agreements on shared water resources contribute not only the promotion of equitable distribution but conflict avoidance, as evidenced by the Jordan River basin (Mason 2023). A model such as the Four National Taps in

Singapore would offer a stage for multidimensional water security. Overcoming water scarcity needs high and strategic solutions which need to be urgent, national and regional matters of economic viability.