Research paper

(Water Situation in Gaza Strip)

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A research paper entitled "The Water Situation in Gaza Strip"

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Section 1: -

The water situation in Gaza Strip: -

Water has always been the crucial element of life and the main guarantor of its sustainability. In the past, Gaza Strip relied heavily on groundwater, surface water, and rainwater. Now adays, in contrast with the past the water problem in Gaza Strip has become in a state of serious quantitative and qualitative deterioration, which constitutes a concern for the Palestinian citizen due to many restrictions such as water scarcity and lack of rainfall or irregularity due to climate changes. Moreover, dryness of surface water due to urban sprawl, Israeli practices of diverting the course of the valleys, the construction of dams, the work of water traps, and the separation wall, which extends to a depth of 50 meters underground aims to extend the occupation's control over the Palestinian waters. In addition, the continuous deficit and continuous pollution of the aquifer stock due to the high population density in Gaza Strip, which amounts to 2.2 million people, and the excessive use of pesticides and the deterioration of sewage networks or their non-existence in some places in the Strip,

This large quantitative water deficit, which is estimated at 120 million cups annually, has led to damage to the aquifer stock, as the level of the reservoir has become lower than sea level by 8 meters in the north to 20 meters in Rafah, according to (Water and Environmental Quality Authority). Consequently, sea water overlapped and invaded the depth of Gaza wells water as the maximum depth of sea water reached 3.2 kilometers in the Gaza and Jabaliya regions, and this leads to a real disaster in the aquifer.

This quantitative deterioration in the aquifer has negatively affected the per capita consumption of water, which is estimated at an average of 83 liters / day, while the required consumption according to the World Health Organization ranges from 100-120 liters / day.

As for the water quality, it is also in constant decline. Some wells in the Jabalia region were closed due to their salinity and pollution. The average percentage of nitrates in all wells is estimated at 108 mg/L, while it should not exceed 50 mg/L, and the average percentage of chloride is 930 mg/L. While the standard value should not exceed 250 mg/l. kindly note that there are some wells have reached 250 nitrates and chlorides to 4000 mg/l and that means it has become more salinity than sea water.

Based on the above mentioned, it became necessary to find continuous and constructive solutions to meet the sector's need for water and to make strategic plans to treat the aquifer by scientific methods and technologically advanced uses to search for new water resources that meet the citizen's need and address the water problem.

Section 2: -

Water resources in Gaza Strip: -

Gaza Strip consumes approximately between 240-250 million cups of water annually, and the consumption in 2021 was amounted to be 243 million cups, while the aquifer is fed annually with approximately 125 million cups of rainwater and other sources such as side flow and water returning from irrigation water and networks, etc… The annual deficit in the aquifer reaches 120 million cups annually as Water and Environment Quality Authority reported. Basically, there are five wastewater treatment plants with a production capacity of 40 thousand cups daily that are filtered to the aquifer. For instance, Al-Fokhari plant produces approximately 16 thousand cups daily, moreover, Al Buraj and the north plants produce the rest. On the other hand, Rafah and Sheikh Ajlin station' production is sometimes treated and pumped directly into the sea; however, the water is always pumped into the sea untreated because of many restrictions such as power outages, excessive pumping and the lake of capacity of the station. Therefore, this leads to an environmental disaster and sea water pollution.

The quantities fed to the aquifer and the average consumption quantities are as follows:

First, consumption quantities: -

- The annual agricultural and animal consumption is 50% of the public consumption, which ranges between 120-125 million cups.

- Industrial consumption is 12% which includes (desalination plants, tourist areas, mosques, private home wells and chalets) ranging between 29-30 million cups annually.

- Population consumption is estimated to be 38% of public consumption, which ranges between 91-95 million cups annually.

Secondly, the quantities and types of resources:

In terms of type, water resources are divided into two main types, traditional and non-traditional. As for traditional resources, they include rainwater, surface water, and groundwater. The other type is non-traditional sources such as (Mekorot water - seawater desalination plants - and utility water that is treated and pumped into networks - filter ponds),

The quantity of inputs for the year 2021 was distributed as follows- :

- **rain water- :**

The amount of rain was estimated to be 110 million cups, only 27 million cups are used, i.e. 24.5%. This is due to the following reasons:

1 .Climate changes, as the amount of rain that fell is very large, especially in the last decade, but in a short period of time, which made most of rain fall into the sea without being used and that leads to increase the sea level by 4 mm annually.

2 .The infrastructure of Gaza Strip, as the infrastructure of Gaza Strip does not have the ability to absorb the amount of rainfall, in addition to the lack of separation in the sewage networks and rainwater networks.

3 .Urban expansion, where the population density led to the horizontal extension of buildings at the expense of green areas and agricultural lands.

- **Surface water- :**

It is the filtered water from the Gaza Valley and the surface water and it is estimated to be 3 million cups. The lack of filtration is also due to urban expansion.

. Eastern flow- :

The flow into the aquifer from the occupier's side to Gaza Strip is estimated to be only 10-15 million cups annually due to the water traps along the border of Gaza Strip with the occupier, in addition to the separation wall that was established at a depth of 50 meters underground, which impedes the flow of groundwater from east to west. Kindly note that if those wall and water traps could not be existence , the flow would reach in the worst conditions 40 million cups annually.

. Filtration tanks: -

The amount of benefit from the nomination was 17.5 million cups.

. Sea water desalination plants- :

The amount of desalinated water during 2021 was estimated to be 3.3 million cups annually.

. Mekorot Water- :

The amount of water purchased from the company during the 2021 was estimated to be 14.3 million cups annually.

- **Leakage from irrigation- :**

The leaked water from irrigation is estimated to be 28.75 million cups and it is nearly clean water because it contains a high percentage of nitrates due to the excessive use of fertilizers, especially in the north.

•Filtration from water networks- :

The water networks Gaza Strip are rickety networks due to their age and water salinity, as the average efficiency of the networks is only 57% in Gaza Strip. For instance, the lowest efficiency goes to Al Moghraga area with 32% and the highest goes to Khosaa area with 86% with a filtration of 18.5 million cups.

. Sewer leaks- :

12.8 million cups annually, and this is accounted to be danger, as this filtered amount is polluted water and has great damage to groundwater.

Section 3:-

Challenges and difficulties of water and sanitation in Gaza Strip:

The political, economic and social challenges that the water and sanitation sector suffer from are considered an obstacle to the development of the water sector and to achieve the goals according to the vision of the Palestinian government. Moreover, this led to decrease the consumption of water to each citizen to an average of 83 liters / day, while the necessary consumption according to the World Health Organization ranges from 100-120 liters / day.

Moreover, the sewage system is also not in the best condition due to the lack of investments, which leads to a low level of wastewater treatment and extensive environmental damage.

In addition, the institutions that have been established since 1995 to manage water resources did not achieve their goals in meeting the needs. The lack of clarity of the powers and responsibilities of the sector's institutions weakened their capacity and management. Additionally, the occupation adds obstacles against the development of policies and strategies necessary to manage water resources and develop the infrastructure (according to the Palestinian Water Authority).

Challenges of the water and sanitation sector- :

The challenges in the water sector, according to the Palestinian Water Authority, are as following:-

First, political challenges- :

1 -Obstructing and preventing the entry of many basic materials and equipment needed for development, maintenance and rehabilitation of various construction and technical works, especially in Gaza Strip, which has been under siege since 2007.

2 -Pumping water towards the Palestinian territories land.

3 -The Palestinian division that results to obstruction of work and a decrease in the operating budget of existing projects, for both human and operational staff.

4 -Clear fluctuations in purchasing water from Mekorot due to the political and financial conditions.

5- The repeated military attacks of the Zionist occupation on the water sector during the aggressions of 2008, 2012, 2014 and 2021, which exhausted the infrastructure and prevented the rehabilitation, reconstruction and development of the water sector.

Second, institutional challenges:

The presence of more than 300 service provider institutions in various governorates of the country facing challenges in the level of efficiency in providing services, including:

1 -The water deficit resulting from the lack of supply compared to demand and the overlapping of sea water in the aquifer.

2 -Poor infrastructure that serves many communities and high losses.

3 -The lack of a sewage infrastructure in the eastern regions of Khan Younis Governorate.

4 -The need to raise and develop institutional capacities.

5 -Poor collection and collection efficiency.

Third, financial challenges:

1 -Funding of many projects has stopped due to the political situation.

2 -Changing the priorities of donor countries due to the political situation in the world, in addition to the spread of the Corona virus.

3 -Occupation's piracy of clearing funds.

4 -The non-compliance of local bodies to pay the water bill in favor of the Water Authority and the accumulation of debts on municipalities and local bodies.

5 -The Israeli side deducted the water prices directly from the clearing funds, which led to a deficit in the state treasury budget.

6 -Relying mainly on external funding.

Fourth, social challenges:

Water, sanitation and hygiene projects require a high level of community awareness, but these projects sometimes face social obstacles, summarized as follows:

1 -Obstructing a number of strategic projects, especially wastewater management projects and treatment plants.

2 -Not clearly applying the policy of using treated water in agriculture.

3 -The drilling of illegal agricultural wells that drain the aquifer, which is estimated at 5282 unlicensed wells compared to 1118 licensed wells.

4 -Lack of awareness of the seriousness of illegal encroachments on lines and networks.

5 -Overcrowding and high population density in Gaza Strip, which led to horizontal and vertical urban expansion.

6 -Excessive use of nitrogen fertilizers and pesticides (agricultural and animal waste).

7- The lack of a real partnership with the community that contributes to the optimal use of water and the rationalization of consumption.

Consequences of the water problem- :

- Low amount of supply for home consumption.
- Decrease in the quality and quantity of water used for domestic and agricultural consumption.
- Increasing salinity and pollution in the aquifer as a result of sewage leakage.
- The amount of water deficit has reached about 120 million cups.
- Environmental pollution of sea water as a result of wastewater pumped into the sea without treatment.
- A problem related to the non-uniform water pricing between the different municipalities of Gaza Strip.
- The spread of diseases such as diarrhea, cholera, tooth stains, skin diseases, etc.... .

Solutions and strategic plans that have been proposed and are being implemented to solve the water crisis

All theses aim to achieve the concept of water security in the short and long term, develop and protect water resources, and maintain their sustainability and quality in accordance with the principles of the integrated circuit. This is considered a major goal that the Water Authority seeks to achieve in the coming years through the following strategic objectives:

- Improve the efficiency of water supply and use.
- Protecting water sources from pollution and depletion.
- Promote and apply the principles of participation in planning, operation, management and knowledge.
- Preparation of integrated policies, strategies and plans for the water sector.
- Overseeing and controlling the development of distribution systems at the national and local levels.
- Developing regulations and legislation related to fairness of distribution.
- Establishment and development of institutions operating in the water sector at the level of water management and distribution.
- Building the technical and administrative capabilities of workers in the water sector.
- Achieve the concepts of financial sustainability and enhance the participation of the private sector in the management and distribution of water and sanitation.
- Achieving the administrative and operational efficiency of the Water Authority.
- Organizing and developing financial resources.
- Enhance communication and connection both internally and externally.

Conclusions and recommendations- :

In the light of the above the water situation in Gaza Strip is really threatened in terms of quantity and quality by many risks. Therefore, the process of sovereign development and building infrastructure and human capacities are important and necessary to avoid further damage in the water sector.

The study recommended the following:

1 -The necessity of immediate action at all levels in order to consolidate and disseminate the concept and importance of sovereign development as a tool and means to develop comprehensive and strategic solutions to enhance the chances of solutions in facing this disaster in order to improve the coastal aquifer in Gaza Strip.

2 -Putting pressure on the international community to respect and implement international agreements regarding water sovereignty.

3 -Ending the Palestinian division, unifying the authorities, and forcing the occupation to lift the unjust blockade on equipment for treatment and desalination plants.

4 -Exploiting the available water resources through the integration of self-sufficiency policies with water harvesting policies and wastewater treatment policies in order to recover the aquifer.

5 -Work to promote scientific research projects that work to find effective solutions to the technical problems facing the water sector, provide alternatives, and urge Palestinian universities to do so.

6 -Work on the establishment and expansion of wastewater plants and use them for agricultural irrigation and inject the surplus into the aquifer through filtration.

7 -Seeking financing, whether local or international, to renew and construct water and sanitation infrastructure in all fragile and non-fragile areas. prevent the construction of cesspits and illegal encroachments, and install prepaid meters in order to reduce losses from networks and protect the aquifer from polluting leaks.

8 -Finding solutions to the electricity problem that treatment and desalination plants suffer from, such as solar or wind energy, or even using the sea to generate energy.

9 -Issuing laws and legislations that compel citizens to construct ponds to collect water and injection wells near homes as a condition for building permits, as population density, urban sprawl and climate change have led to a scarcity of large lands, which has led to the failure to utilize rainwater optimally.

10 -Closing all unlicensed wells, design a well- studied criteria by all concerned authorities based on scientific methods to allow drilling new wells and ensure that paying money in exchange for license is not a criterion.

11 -Educating and urging farmers to use electronic irrigation and exploit treated water for irrigation, and not to use excessive agricultural pesticides, under the supervision of the concerned authorities.

12 -Exchanging experiences, building capacity, and providing operational budgets for professional development.

13- Self-reliance, state building, rationalization of consumption, cultivation of environmental culture, exploitation of domestic urban agriculture, and application of legislation and laws.

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