



Threats and Challenges to Egyptian Water Security and Their Impact on the Management of Egyptian Water Resources

Sameh Farag Awad Awad*

Water Management Research Institute - National Water Research Center

Article Information

Keywords:

Threats; Challenges;
Water security;
Water resources

*Corresponding author:

Sameh Farag

E-mail:

Samehfarag737@gmail.com

Received: 17/03/2024

Accepted: 19/07/2024

Abstract

The research mainly aims to study the impact of regional and local threats and challenges on the management of Egyptian water resources through the following sub-objectives: (1) Study Egyptian water security indicators, (2) Study regional threats and their effects on Egyptian water security, (3) Study local challenges and risks and their effects. On the management of Egyptian water resources, (4) Study of the development of water losses from Assoun to the mouths of canals. Egypt and the Nile Basin countries face a number of challenges linked to a variety of factors, as challenges that cross all borders are linked to economic issues, in addition to challenges related to political motives, in addition to climate changes and natural phenomena, which affect most of the Nile Basin countries. The construction of the Renaissance Dam by Ethiopia, the upstream country, represents a threat to Egypt's historical share in the Nile River, and a violation of all legal agreements regulating international water relations between Egypt and the Nile Basin countries, which reduces Egypt's share of the Nile water by about 20 billion cubic meters, which negatively affects food security. Egyptian projects resulted in the loss of about 2 million agricultural acres out of 10 million acres. Other Ethiopian projects include a dam on the Faro River, a tributary of the Sobat River, to store about 1.5 billion cubic meters of water annually, To reclaim 750 thousand acres of land, in addition to the Italian state financing two other projects on the Nile, both of which would store about 100 million cubic meters to reclaim 25 thousand acres. Despite Ethiopia signing a cooperation agreement with Egypt in 1993, Ethiopia is still opposed to establishing Projects on the Nile resources for both Egypt and Sudan in the Upper Nile.

تهديدات وتحديات الأمن المائي المصري وأثارها علي إدارة الموارد المائية المصرية

سامح فرج عوض*

مدير محطة بحوث مقننات ري - معهد بحوث إدارة المياه - المركز القومي لبحوث المياه

معلومات عن البحث:

الكلمات الدالة:

تهديدات، تحديات، الأمن المائي،
الموارد المائية

المؤلف المسئول عن نشر البحث:

سامح فرج عوض

الإيميل:

Samehfarag737@gmail.com

تاريخ الإرسال:

17/03/2024

تاريخ قبول النشر:

19/07/2024

تعتمد مصر علي الموارد الطبيعية في شتي المجالات وخاصة الموارد المائية، وزيادة الطلب القومي علي تلك الموارد للاستخدامات المختلفة يواجهه بعدة قيود أولها محدودية وندرة الموارد المائية، وما تتعرض له من مشكلات كمية ونوعية، وإنخفاض كفاءة إدارة تلك الموارد في القطاع الزراعي الذي يستهلك نحو 82% من جملة الاستخدامات المائية المصرية، وتتعرض الموارد المائية إلى تحديات إقليمية أهمها الأثار المتوقعة لمشروعات أعالي النيل خاصة سد النهضة الأثيوبي وتأثيره على نصيب وحصة مصر من مياه النيل، وما يتناسب مع الأوضاع المائية المصرية سواء المحلية أو الإقليمية، حيث أصبحت إدارة استخدام الموارد المائية والحفاظ عليها ضرورة قومية لمواجهة تلك التحديات، وتحت القيود الحالية والمتوقعة خاصة وأن مصر أصبحت ضمن الدول الواقعة تحت خط الفقر المائي.

يستهدف البحث بصفة أساسية دراسة أثر التهديدات والتحديات الإقليمية والمحلية علي إدارة الموارد المائية المصرية من خلال الأهداف الفرعية التالية: (1) دراسة مؤشرات الأمن المائي المصري، (2) دراسة التهديدات الإقليمية وأثارها علي الأمن المائي المصري، (3) دراسة التحديات والمخاطر المحلية وأثارها علي إدارة الموارد المائية المصرية، (4) دراسة تطور الفاقد المائي من أسون إلي أفمام الترع.

يرتبط الأمن المائي بالأمن القومي بعلاقة تأثيرية حيث لا يقتصر الأمن القومي علي الجوانب العسكرية فقط بل يشمل الأمن المائي أيضاً إلي جانب الأمن الغذائي بالإضافة إلي الجوانب الاجتماعية حيث أن نقص الموارد المائية يؤدي حتماً إلي نقص الغذاء الذي يتوقف عليه الحياه الإنسانية، وتعد قضية المياه في مصر من أهم ركائز الأمن القومي المصري، ومحور رئيسي في تحقيق التنمية المستدامة.

يختلف عدد سكان كل دولة من دول حوض النيل، كما تتباين دول حوض النيل من حيث المساحة، كما تتباين هذه الدول في معدلات النمو السكاني، الأمر الذي يؤدي إلي زيادة إحتياجات سكان دول الحوض للمياه لاستخدامها في القطاعات المختلفة، ويعتبر نهر النيل هو مصدر الحياه لمصر حيث أن دول حوض النيل لا تعتمد بشكل أساسي علي نهر النيل نظراً لأن لديها مصادر أخرى للمياه من أهمها مياه الأمطار ومصادر أخرى.

1. INTRODUCTION

Egypt faces many threats and challenges in managing and planning the water security file, especially in light of the current problems and obstacles and securing Egyptian water resources to meet the needs of citizens. The water file is at the forefront of unprecedented concerns to keep pace with the local demand for water resulting from the steady population increase, in addition to the growing trends for sustainable water development. To confront the potential effects of climate change in addition to the Ethiopian Renaissance Dam crisis, which exacerbates the current water crisis in Egypt, and as a result of these regional and local threats and challenges, the water security file has become the most important file that has captured the attention of decision-makers as a result of its effects and repercussions on Egypt in all security and political fields. Social and economic.

Egypt depends on natural resources in various fields, especially water resources, and the increasing national demand for these resources for various uses faces several restrictions, the first of which is the limited and scarcity of water resources, the quantitative and qualitative problems it is exposed to, and the low efficiency of managing these resources in the agricultural sector, which consumes about 82%. Among the Egyptian water uses, water resources are exposed to regional challenges, the most important of which are the expected effects of the Upper Nile projects, especially the Ethiopian Renaissance Dam and its impact on Egypt's share and share of the Nile waters, and what is appropriate for the Egyptian water conditions, whether local or regional, as managing the use and preservation of water resources has become a national necessity to confront these challenges, and under the current and expected restrictions, especially since Egypt has become among the countries located below the water poverty line.

To enhance water security against this backdrop of increasing demand, water scarcity, increasing uncertainty, increasing severity of extreme weather events, and water scarcity challenges, it is necessary to have institutional tools such as legal and regulatory frameworks, water pricing, and incentives to improve the allocation, regulation, and conservation of water resources. It is also necessary to have information systems to monitor and follow up this resource, make decisions, and conduct network analyses, Make predictions and issue hydro-meteorological warnings. Investments must be sought in innovative technologies to enhance productivity, preserve and protect this rare resource, recycle stormwater and wastewater, develop non-conventional water sources, in addition to looking for opportunities to harvest rainwater.

2. RESEARCH PROBLEM

The problem of the study is that water security has multiple dimensions, including: (1) The political dimension: It is related to protecting and defending Egyptian water security, (2) The economic dimension: It seeks to meet citizens' water needs and demands to achieve well-being by following development policies, (3) The social dimension: It includes all state policies that seek to develop the national sense of belonging and loyalty among citizens and work to raise awareness to rationalize water use, (4) The moral or ideological dimension: related to securing the thoughts and beliefs of citizens to preserve natural resources, especially the water resource, (5) The environmental dimension: related to preserving water resources from pollution and confronting climate change to ensure the

achievement of sustainable environmental development, (6) The informational dimension: It refers to To provide the necessary information to achieve sustainable water development and develop future plans for the state.

3. RESEARCH AIMS

The research mainly aims to study the impact of regional and local threats and challenges on the management of Egyptian water resources through the following sub-objectives: (1) Study Egyptian water security indicators, (2) Study regional threats and their effects on Egyptian water security, (3) Study local challenges and risks and their effects. On the management of Egyptian water resources, (4) Study of the development of water losses from Assoun to the mouths of canals.

4. METHOD AND DATA SOURCES

In achieving its objectives, the study relied on both the descriptive and quantitative analytical method in order to describe and clarify the research objectives under study, and on the main economic and technical indicators for the efficiency of use of available water resources in Egypt. The study is based on data collected from bulletins and periodicals issued by the Ministry of Water Resources and Irrigation. The National Center for Water Research, the Central Agency for Public Mobilization and Statistics, and the Central Administration for Agricultural Economics at the Ministry of Agriculture and Land Reclamation, in addition to data that could be obtained from the International Communications and Information Network (The Internet).

5. RESULTS AND DISCUSSIONS

First: The main concepts of the study and the relationship of water security to national security:

1- The concept of water security:

Water security expresses the quantity and quality of fresh water needed to meet human needs within a year, and is linked to all economic, social and environmental activities, and promotes social and technological progress in various fields.

2- The concept of the water crisis:

It expresses the state of current water resources and the human demand for them. This concept varies from one country to another according to the quantities of available water, the country's population, and regional conflicts over this rare resource.

3- The concept of water scarcity:

It is defined as the lack of availability of the quantities of water necessary to meet human uses and the agricultural, economic and environmental sectors in a given area.

4- The relationship of water security to national security:

Water security is linked to national security in an influential relationship, as national security is not limited to military aspects only, but also includes water security, along with food security, in addition to social aspects, as the lack of water resources inevitably leads to a lack of food on which human life depends, and the water issue in Egypt is It is one of the most important pillars of Egyptian national security, and a major axis in achieving sustainable development.

Second: Study of Egyptian water security indicators:

1- Egyptian Water Resources Index:

Egypt is considered the driest country in the world as a result of the low rate of annual rainfall, which reduces Egypt's water resources, as water sources other than the Nile River in Egypt are estimated at about 3%, and the water of the Nile River is considered the primary and almost the only water resource that supplies Egypt with about 97% of Water needs, to meet Egypt's water needs, as Egypt's water needs are estimated at about 60 billion cubic meters. The Nile River supplies Egypt with about 55.5 billion cubic meters, and Egypt obtains 4.5 billion cubic meters of groundwater, rain, and reused wastewater, which puts enormous pressure on decision makers. To secure Egypt's water security resources and develop them to maximize the benefit from them.

2- Rainfall index:

The rate of rainfall in Egypt ranges between 50 - 250 mm, which is a rate that may be non-existent. Therefore, the interests of Egyptian national security are linked to securing and protecting water security, represented by the waters of the Nile River, as the Nile Basin countries have other sources of water from fresh lakes and rivers in addition to the abundance of Rainfall, which makes these countries much less dependent on the waters of the Nile River than Egypt.

3- Water gap index:

Egypt's water resources amount to about 60 billion cubic meters annually, with Egypt's share amounting to about 55.5 billion cubic meters of Nile River water, in addition to limited quantities of rainwater and groundwater in deserts, which amount to about 4.5 billion cubic meters annually, while the size of Egypt's water needs is about 114 billion cubic meters annually, and thus the Egyptian water gap is estimated at approximately 54 billion cubic meters annually. This gap is filled by reusing agricultural and sanitary wastewater and desalinating sea water, in addition to importing food products estimated at approximately 34 billion cubic meters of water annually.

4- Annual per capita water share index:

The per capita share of water in Egypt is estimated at only about 550 m³ of water in 2022, which is less than half of the global water poverty line, which is about 1,000 m³, which pushes Egypt towards a pressing rate of water poverty and constitutes a challenge to development efforts and a threat to the development of Egyptian fresh water resources.

5- Index of per capita share of water consumed:

It turns out that the average per capita share of pure water produced was about 106.8 m³ in 2021, compared to 110.1 m³ in 2020, and the average per capita share of pure water consumed was about 82.6 m³ in 2021, compared to 84.7 m³ in 2020, and the percentage of water loss reached 27.9% in 2021. Compared to 28.4% in 2020, a decrease of 1.8%.

It is clear from the previous indicators that there is a large deficit in Egyptian water resources, which means that Egypt faces a number of threats that increase the seriousness of the Egyptian water security file, and force decision-makers to develop the necessary policies to reduce the rate of water poverty and reach rates lower than the current rates.

Third: Regional threats and challenges and their effects on Egyptian water security:

The population of each Nile River country varies, and the Nile Basin countries also vary in terms of area. These countries also vary in population growth rates, which leads to an increase in the needs of the population of the basin

countries for water for use in various sectors, The Nile River is considered the source of life for Egypt. As the Nile Basin countries do not depend primarily on the Nile River because they have other sources of water, the most important of which is rainwater, which makes them much less dependent on Nile water than Egypt, and Ethiopia ranks last in relying on Nile water, since Egypt depends on 97% of its water resources on the Nile River, Egyptian water security is closely linked to securing Egypt's share of the Nile waters and thus protecting Egyptian national security in the Nile Basin countries. Egyptian water security is considered one of the most important priorities for Egyptian national security.

Egypt and the Nile Basin countries face a number of challenges linked to a variety of factors, as challenges that cross all borders are linked to economic issues, in addition to challenges related to political motives, in addition to climate changes and natural phenomena, which affect most of the Nile Basin countries.

The most important challenge facing Egypt is to confirm the historical rights to the waters of the Nile River, and to convince other Nile Basin countries of these rights, in addition to the fact that it is the most Nile Basin country in its increasing needs for water, to confront conditions of drought and desertification, population growth, the requirements of agriculture, and various other sectors, and attempts to solve the problem of scarcity. Water.

1- Political challenges:

The instability in some Nile Basin countries negatively affects the relations between the Nile Basin countries and each other, and the difference in the directions and inclinations of the upstream and downstream countries affects political relations in addition to external interference in the affairs of the Nile Basin countries, and attempts by some foreign countries such as Israel in influencing political relations between the Nile Basin countries, it represents the most important negative effects on political relations in the Nile Basin region.

2- Natural and environmental challenges facing the Nile Basin countries:

A- Deterioration of soil quality as a result of excessive cutting of trees in the Upper Nile and Ethiopia, in addition to overgrazing, which causes soil erosion and degradation, which requires more water to cultivate these lands that have been degraded by removing their vegetation.

B- Pollution of the Nile River is considered the most important environmental challenge for all Nile Basin countries.

C- Drought and desertification are one of the causes of climate and environmental changes in the Nile Basin region, and drought affects many African countries. Drought also led to a decrease in water quality and also soil quality in addition to a decrease in groundwater levels. As a result of desertification, forests in Ethiopia decreased by about 40% in the last century to about 4% currently.

D- Nile River floods lead to catastrophic effects on life, and to avoid these effects, the Nile Basin countries must cooperate to confront this disaster by providing support with data and information for early warning, to take the necessary measures in order to benefit from the excess Nile water without waste.

3- Threats facing Egypt:

Some Nile Basin countries reject many of the agreements regulating the shares of Nile water. Specifically, the agreements prevent the establishment of activities on the course of the Nile without the approval of the

downstream countries, Egypt and Sudan. It also works to issue new agreements for the use of the Nile water, which negatively affects Egypt and Sudan's shares of the Nile River water.

A- Ethiopian threats:

Ethiopia conducted a feasibility study to develop the Blue Nile Basin and presented thirty-three projects, most of which affect the Nile resources in Egypt. These projects included the construction of four large dams: Mabel, Mendia, Kardi, and another on the Ethiopian-Sudanese border known as the Ethiopian Renaissance Dam, and cultivation of an estimated With about one million acres of trees, the water required for these projects amounted to about 5.2 billion cubic meters annually, as shown in Table No. (1).

The construction of the Renaissance Dam by Ethiopia, the upstream country, represents a threat to Egypt's historical share in the Nile River, and a violation of all legal agreements regulating international water relations between Egypt and the Nile Basin countries, which reduces Egypt's share of the Nile water by about 20 billion cubic meters, which negatively affects food security. Egyptian projects resulted in the loss of about 2 million agricultural acres out of 10 million acres. Other Ethiopian projects include a dam on the Faro River, a tributary of the Sobat River, to store about 1.5 billion cubic meters of water annually, To reclaim 750 thousand

acres of land, in addition to the Italian state financing two other projects on the Nile, both of which would store about 100 million cubic meters to reclaim 25 thousand acres. Despite Ethiopia signing a cooperation agreement with Egypt in 1993, Ethiopia is still opposed to establishing Projects on the Nile resources for both Egypt and Sudan in the Upper Nile, which will lead to a decrease in the level of Lake Nasser to about 15 metres, which will affect the rates of power generation from the High Dam, which will have negative effects on industry, agriculture, development and population consumption.

B- Eritrean threats:

The policy of successive Eritrean governments is heading in ambiguous directions, and it is clear that most of these trends are similar to the Ethiopian position towards the downstream countries of Egypt and Sudan.

C- Threats to the Equatorial Plateau countries:

The countries of the Equatorial Plateau include Tanzania, Uganda, Kenya, Rwanda, Burundi, and the Democratic Republic of the Congo, and the policy of the governments of these countries shows the same position towards the downstream countries of Egypt and Sudan, as the policy of the governments of these countries refuses to recognize the current Nile water agreements in addition to trying to change them.

(1) Tanzania:

It is planning to establish joint projects with Rwanda and Burundi, to benefit from the waters of the Kagera River and Lake Victoria, to grow 55,000 acres of cotton. Tanzania is also seeking to use about 30 billion cubic meters of Nile River water to cultivate about 10 million acres in Shinya County.

(2) Uganda:

It is seeking to establish several projects in the Tonga region, which will affect water storage in Lake Albert, which will reduce the flow of water in the White Nile. It is also planning to start five electrical power generation projects, in the Bujagali Reservoir, the Kumedni Reservoir, the Emar Izon Reservoir, Abuja 1, and Abuja. 2, The risks of these projects are estimated at a decrease in water flow at the Aswan reservoir by about 3 billion cubic metres.

Table No. (1): Ethiopian projects affecting Egypt's share of the Nile River water

Project	Purpose	River	Initial capacity is one million m³	Impact on the Nile water, million m³
Megish graffiti	irrigation	Mgish	225.3	83.280
Rib River	irrigation	Rib	3112.6	183.240
Gomara River	irrigation	Gomara	236.7	155.040
West Megish pumps	irrigation	Lake Tana	1587	84.960
East Megish pumps	irrigation	Lake Tana	12.987	70.680
Pumps northeast of Tana	irrigation	Lake Tana	12.987	60
Upper Belize	Multi	Lake Tana	12.987	788.400
Central Belize	Energy	Belize	3.974	-
Upper Bear	irrigation	Belize	537.4	292.200
Debo hell	irrigation	Debo hell	50.1	50.400
Lower Bear	irrigation	Bear	3.161	79.200
Giama River	Energy	Giama	300.7	-
Moger River	Energy	Moger	70.6	-
Goodyear Supreme	irrigation	Bello	2.755	61.200
Lower Goodyear	Energy	Goodyear	464	61.200
Fincha	Multi	Fisha	847.6	180
Amarti/nish	Multi	Amarti and Nishi	2.130	101.880
Urgo	-	Didya	1.617	201.600
Dabana	-	Dabana	3.572	73.200
Angar	-	Angar	4.862	362.400
Lower Didia	Energy	Didya	-	-
Daboos	irrigation	Daboos	-	180
Daboos	Energy	Daboos	3.960	-
Dendbar	Multi	Dendbar	789.8	699.600
Gallego	irrigation	Gallego	1.902	139.200
Rahad	irrigation	Rahad	32.5	637.200
Caradobe	Energy	Blue Nile	13.600	-
Mabel	Energy	Blue Nile	15830	-
Mandaya	Energy	Blue Nile	1.574	-
Border	Energy	Blue Nile	-	-
Addis Ababa Ext	Energy	Blue Nile	-	-
Giga Spring B Lot	irrigation	Syring	-	2.658
German Jingle Abay	-	Gemma Cogg	1.017	746.680
Total			118.4278	5.205.648

Source: http://www.moqatel.com/openshare/Behoth/Siasia21/NileWater/sec20.doc_cvt.htm

(3) Kenya:

It benefits from about 16% of the Nile River water, and it is the Nile Basin country that most objects to the current Nile water agreements. It seeks to exploit a larger percentage of the Nile River water to reclaim about 755 thousand acres around Lake Victoria. It has also reclaimed 120 thousand acres, needing about one billion cubic meters. From the waters of the Nile.

(4) Rwanda and Burundi:

Rwanda and Burundi targeted the expansion of agricultural lands and electrical power generation systems, and Rwanda and Burundi are seeking to establish the Roseau reservoir in cooperation with Tanzania, to store about one billion cubic meters of Nile water annually.

(5) South Sudan:

It is moving to establish a number of dams and projects, which will directly affect Egyptian interests in the Nile Basin, as Egypt's full share of the Nile passes through South Sudan, and it is expected that South Sudan plans to establish a variety of dams and projects on the Nile River in order to cultivate barren lands. Power generation represents a threat to Egypt's annual share of Nile water.

The activities and projects currently being implemented in the Nile Basin, which may have a negative impact on the amount of Nile water flowing into Egypt, could reduce the flow reaching Aswan, and hydroelectric and irrigation development activities in the Baro Akobo-Sobat Basin, which is part of the Nile Basin. The eastern one drains water into the White Nile.

Fourth: Threats of climate change and their effects on water resources:

Egypt is one of the countries in the world most exposed to risks resulting from the effects of climate change, even though it is the country that contributes the least to global greenhouse gas emissions. Egypt's percentage of greenhouse gas emissions is about 0.6% of the world's total emissions.

High temperatures increase the rate of evaporation of water in the atmosphere, which leads to an increase in the ability of the atmosphere to carry water, and increased evaporation reduces moisture levels in the soil, which in turn increases the frequency of drought and increased desertification, in addition to a decrease in the percentage of moisture in the soil. Also, there is a decrease in filtration rates, which leads to a decrease in the rate of recharge in groundwater, Climate change also changes the availability of fresh water, making it more scarce in more areas. Global warming exacerbates water shortages in water-poor areas and increases the risk of drought in agriculture, thus affecting crops. Environmental drought increases Weakness of ecosystems.

Climate change affects sea water levels, and rising sea levels lead to a decrease in the nature and abundance of water in coastal areas, and rising sea levels negatively affect the quality of groundwater through salt water intrusion into it, in addition to rising sea levels affecting the water cycle. Under the surface of coastal areas, which leads to a decrease in the flow of fresh water and a decrease in the proportion of fresh water areas.

Usable and available fresh water represents 0.5% of the water on Earth - climate change is seriously affecting this rare resource, in addition to reducing ground water reserves and changing its quality. Rising sea levels also lead to increased salinization of groundwater, causing negative effects. A major threat to water security.

Water quality is also affected by climate change, and rising water temperatures and the frequency of floods and droughts exacerbate many forms of water pollution.

Increased frequency of heavy rain events in most areas, with more resulting floods, increasing the proportion of lands vulnerable to severe drought, increasing flood-related disasters and thus increasing the economic and social losses associated with floods.

Climate change will also increase pressure on water resources in Egypt, with rainfall in the Nile Basin decreasing by up to 40%, and thus the annual flow to the High Dam Lake will decrease by more than about 16%.

Fifth: Local challenges and risks and their effects on the management of Egyptian water resources:

1- Challenges of population increase:

The increasing population growth rate is considered one of the most important factors affecting the decline in the per capita share of water annually, and slowing growth rates through strategies that are practiced, such as strengthening health care and education, helps in preserving the per capita share of water.

2- Challenges of losses in water networks:

Water leakage in drinking water networks leads to a severe shortage of water resources, and the percentage of water loss at the national level has reached about 29.7% of the total quantities of water produced, equivalent to 9.3 billion cubic meters.

3- Challenges of water pollution:

Water pollution and poor sanitation services cause many diseases and diseases. The low level of water and sanitation services and their poor management lead to the risk of infection and disease. Poor management of wastewater in urban, industrial and agricultural areas leads to contamination of the water that millions of people use for drinking, and it may be Pollution is caused by the naturally occurring presence of chemicals including arsenic and fluoride, and the level of other chemicals, such as lead, may be high in drinking water as a result of these substances leaching into water supply networks and their interaction with drinking water.

It is estimated that in many parts of the world, insects that live or reproduce in water carry serious diseases. Some insects known as vectors reproduce in clean water and household drinking water containers are used as a breeding ground for them. Covering water storage containers reduces the proliferation of these pathogenic insects and thus pollution. Water.

4- Inadequate infrastructure challenges:

The water infrastructure in Egypt has expanded significantly in recent decades, and 91% of Egyptians have benefited from clean fresh water, and while the water situation in urban areas has stabilized, the number of residents who do not have access to clean drinking water in urban slum areas has reached about 1.5 percent. Million people, while about 5.8 million people in rural areas did not have access to clean drinking water, with a total of about 7.3 million people, while about 8.4 million people did not have access to improved sanitation networks in rural areas.

It turns out that reduced access to clean water and sanitation, in addition to poor public hygiene, contribute to the spread of diseases that negatively and significantly affect children's health and nutrition, and a high rate of deaths from diseases.

5- Risks of wasting water:

The problem of water shortage has become a threat to the lives of millions, in addition to the high rates of water wastage in Egypt. Despite the expected negative impact of the construction of the Ethiopian Renaissance Dam on Egypt's water share, it is clear that the population in Egypt is wasting the clean water produced in the streets and homes and the wasteful use of water in irrigation. Gardening, street spraying, and car washing, in addition to wasteful use of water in their homes.

Egypt is one of the countries that suffer from water scarcity, with increasing water needs as a result of population growth, which has led to a decrease in the per capita share of water annually and successively reaching the water poverty line, as the water poverty line is about 1,000 cubic meters per person annually, which is the minimum per capita in the world of clean water.

The average consumption of drinking water in Egypt is the highest in the world, as the population consumes about 11.5 billion cubic meters annually. About 50% is lost in drinking water networks, and about 3 billion cubic meters are lost as a result of not rationalizing water use. Therefore, the government participates in wasting water through...

Infrastructure that needs to be replaced and renovated, as 50% of the water that is wasted is the result of dilapidated water networks.

The leaking water leads to raising the groundwater level and deteriorating low-lying areas, which include archaeological areas, or causing a subsidence in the roads, and a rise in water levels as a result of the leakage. As a result of the shortage of water coming into the Nile River from Ethiopia, the percentage of pollutants resulting from sewage and industrial sewage will rise, leading to catastrophic damage. As a result of the deterioration of public health and the deterioration of crops and foods, failure to dispose of them leads to catastrophic and food security crises.

Groundwater is one of the most important non-traditional water resources that is geographically widespread in Egypt in the Nile Valley, the Delta, the Western Desert, the Eastern Desert, and the Sinai Peninsula. Modern methods of irrigation must be followed to limit the use of this water, as it is a real and indispensable wealth as a result of the challenges. The water conditions facing Egypt at the present time.

6- The dangers of social unconsciousness of water scarcity:

Rationalizing water use is one of the issues that preoccupies international public opinion and Egyptian public opinion in particular. The responsibility to conserve water is a societal responsibility in which all members of society participate in order to preserve natural resources. Rationalizing water use means that it must be used optimally in the least amount, by educating the consumer about the importance of Water is considered a vital resource on the basis of which life is based, and the development of water resources has become one of the most important goals of sustainable development in all industrial, tourism and agricultural fields.

Intensifying the dissemination of community awareness of the importance of rationalizing water consumption through various media, preparing awareness programs on television, radio, and the local press, and holding seminars and scientific conferences to spread community awareness of the importance of rationalizing this important resource, its scarcity, the challenges facing it, and the necessity of preserving water and working to develop it as a rare and irreplaceable resource. It must be wasted in order to preserve current generations without ignoring the rights of future generations.

Sixth: Study of the development of water losses from Assoun to the mouths of canals during the period (2010 - 2022):

Table No. (2) shows the development of the quantities of water discharged at Aswan and the mouths of the canals and the field. It was found that the minimum amount of water discharged at Aswan reached about 40138 million m³ in 2012, The maximum limit of the quantities of water discharged at Aswan reached about 51204 million m³ in 2010, with an average of About 45988.23 million m³, It was also found that the minimum quantities of water arriving at the mouths of canals amounted to about 36928 million m³ in 2012, The maximum amount of water arriving at the mouths of canals reached about 46090 million m³ in 2017, with an average of about 41896.69 million m³, It also became clear that the minimum amount of water at the field reached about 30867 million m³ in 2011, and the maximum limit of water quantities at the field reached about 43659 million m³ in 2016, with an average of about 37820.77 million m³.

By studying the development of water losses from Aswan to the field during the period (2010-2022), it was found that they ranged between a minimum of about 2996 million m³ in 2016, and a maximum of about 13410 million m³ in 2010, with an annual average of about 8167.46 million m³ during the same period. The annual decrease rate was about 0.04 with a decreasing annual rate of change of about 350.4. This estimate also proved significant at the 5% probability level as shown in Table No. (2), Table No. (3).

Table No. (2): Evolution of water losses from Assoun to the mouths of canals and fields in million m3 during the period (2010 - 2022)

The year	The amount of water in Aswan	The amount of water in the mouths of canals	The amount of water in the field	Total water loss from Aswan to the field
2010	51204	42687	37794	13410
2011	43224	36959	30867	12357
2012	40138	36928	32109	8029
2013	46031	43025	37817	8214
2014	46569	43578	38258	8311
2015	44233	41231	36750	7483
2016	46655	44471	43659	2996
2017	50043	46090	41921	8122
2018	44635	41248	36450	8185
2019	45567	42562	40163	5404
2020	46353	41997	38420	7933
2021	45742	41650	38250	7492
2022	47453	42231	39212	8241
Minimum	40138	36928	30867	2996
Maximum	51204	46090	43659	13410
Average	45988.23	41896.69	37820.77	8167.46

Source: Central Agency for Public Mobilization and Statistics, Water Resources and Irrigation Bulletin, various issues.

Table No. (3): The general time trend equation for the development of total water losses from Aswan to the field during the period (2010-2022)

Statement	The equation	R ²	R ²	F
Total water loss from Aswan to the field	$Y_i = 10620 - 350.4 x_i$ (7.85)** (- 2.06)*	0.278	0.212	4.23*

Source: Collected and calculated from: statistical analysis of the data presented in Table No. (2) using the SPSS program.

*Significant at the probability level (0.05).

Seventh: Egyptian efforts in managing available water resources and ways to develop them:

Egypt has prepared a set of plans and policies for managing and developing water resources, and has begun developing a strategic plan for water resources management until the year 2037. The strategy is based on hard work to confront the threats and challenges of Egyptian water security, and to undertake national projects to develop water resources, reduce waste of available water, and rationalize its use. The national projects are as follows:

1- Nile River Protection Project:

The Nile River is the most important water resource for Egypt, and to maximize the benefit from the Nile water, Egypt has undertaken the Nile River Protection Project, in order to protect the Nile River from encroachments. About 57 thousand cases of encroachment on the Nile River, with an area exceeding 8 million square meters, have been removed. The Nile River Protection Project also aims to Maintaining the river course from pollution and encroachments through developing facilities, canal networks, and drains. The project also included removing, disinfecting, and removing weeds.

2- Development projects for the Nile Basin countries:

The Egyptian state sought to strengthen its relations and build confidence with the Nile River Basin countries, through a series of investments and huge development projects within the Nile Basin countries to achieve cooperation on Nile River issues and exploit waste and losses in the Upper Nile. Among the most important projects that were implemented was the project to build 6 groundwater drinking water stations. In South Sudan and the Great Lakes region, in addition to the water analysis laboratory project in South Sudan, and the development axis project (Lake Victoria - Mediterranean Sea), which aims to transform the Nile River into a development axis linking the countries of the basin and contributing to facilitating joint development cooperation.

In the Democratic Republic of the Congo, Egypt established the Rain and Climate Change Prediction Center in the Congolese capital, Kinshasa, with Egyptian funding, in addition to a project to remove aquatic weeds within the framework of the Egyptian-Uganda project in Lakes Albert and Kyoga in Uganda. Seven dams were also constructed to harvest rainwater in the state of Uganda in the districts of (Kibuga - Waksu - Sironoko - Adjumani), in addition to drilling 75 groundwater wells in Uganda, 180 groundwater wells in Kenya, and 30 wells in Tanzania.

3- Modern irrigation project:

The project works on converting traditional irrigation to modern irrigation systems with the aim of more efficient use of water and developing the irrigation system with the aim of improving the efficiency of water transfer and field irrigation, achieving equitable distribution of irrigation water, and treating agricultural and sanitary wastewater and reusing it.

4- The national project to rehabilitate canals:

The project seeks to maintain the efficiency of water used in irrigation, reduce waste, and raise the level of canals and rehabilitate them to maximize the benefit from irrigation water, by clearing canals, removing weeds, increasing the area allocated for public utility, and developing bridges.

Statistics indicate that the rehabilitation of 5,232.5 kilometers has been completed by 2022, and approximately 9,322 kilometers are being rehabilitated, and the total lengths covered by the project are 12,050.5 kilometers.

5- Seawater desalination project:

Egypt's 2050 strategy included expanding the establishment of desalination plants to meet drinking water needs with a total capacity of 6.4 million cubic meters per day at a total cost estimated at about 134 billion pounds. The first five-year plan (2020-2025) includes the establishment of desalination plants with a total capacity of about 2.866 million cubic meters per day, including the Matrouh governorates. , the Red Sea, South Sinai, Ismailia, Port Said, Suez, Dakahlia, Kafr El-Sheikh, and Beheira Governorate. The total number of pure water producing stations reached 32 stations with a production quantity of about 0.05 billion m³.

6- Coastal Protection Project:

The coastal protection project aimed to adapt to climate change, confront the phenomenon of rising sea levels, stop the decline of beaches, preserve agricultural lands and investment projects located on the coast, in addition to preserving population centers and blocs in coastal areas. About 210 kilometers were protected in the governorates of: Alexandria, Marsa Matrouh, Beheira, Port Said, Kafr El-Sheikh, Dakahlia and South Sinai, while the project aims to protect an additional 50 kilometers, which are being implemented.

7- Projects to confront the dangers of floods:

Floods pose a challenge that includes environmental risks and disasters, and Egypt has moved towards benefiting from floods to maximize the use of the water resulting from them, through the project to reduce the dangers of floods. The project included the establishment of a number of lakes, barriers, and obstruction dams in the governorates of Minya, Giza, and Aswan, while in South Sinai, it was Construction of 11 dams and 5 lakes to absorb flood water at a total cost of about 227 million pounds, Matrouh Governorate is exposed to large annual rains that reach the point of torrential rain. The benefit from this rain was maximized by establishing ground water tanks to absorb rainwater. The total number of tanks reached 175 ground tanks with a total capacity of 100 m³, at a cost of about 15 million pounds. About 1,500 facilities were established to protect against the dangers of torrential rains. And about 117 flood outlets.

8- Agricultural wastewater treatment:

The Egyptian state adopted a project to develop and renew agricultural drainage networks and reuse them at a cost amounting to 1.96 billion pounds, and to establish and renew agricultural drainage networks in all governorates of

Egypt. The most important agricultural wastewater treatment projects are the Bahr Al-Baqar water treatment plant project at a cost of 10.35 billion pounds, and the treatment plant water is transported to areas Targeted agricultural reclamation in North and Central Sinai, and the establishment of Bahr al-Baqar and Shader Azzam lifting stations with an amount of about 5.17 thousand m³ at a cost of about 507 million pounds.

9- Al Qanater projects:

Egypt has maximized the use of water resources by paying attention to barrage projects, developing and renovating old barrages, and constructing new ones. Among the most important new barrage projects are: the New Dayrut Barrage Project, and the modernization of the Dayrut Barrage, which aims to serve about 1.6 million agricultural acres in five governorates: Assiut, Minya, and Beni Suef. Fayoum, Giza, equivalent to 18% of the total Egyptian cultivated land, with a total of 9.6 billion m³.

10- Drinking water and sanitation networks:

Egyptian policy directed towards drinking water and sanitation services in all governorates, especially slums and remote areas, increasing the percentage of drinking water coverage to about 98.7% in urban and rural areas, and increasing the percentage of sanitation coverage to about 66.7% in urban and rural areas.

6. REFERENCES

- 1- (Sharaqi, Abbas Sharaqi, 2011) "The Challenges of Achieving Arab Water Security," a case study of the Nile River Basin, Institute of African Research and Studies, Cairo University, 2011.
- 2- (Sharaqi, Abbas Sharaqi, 2014) The geology of the Ethiopian Renaissance Dam and its impact on the safety of the dam, research published in the Nile Water Issue Symposium, Faculty of Arts - Cairo University - March 2014.
- 3- (Al-Hilali, Hala Al-Sayed, 2019) Egyptian Water Security: A Study of Threats, Risks, and Coping Mechanisms "The Renaissance Dam as a Model".
- 4- (Metry, Mariet Adel, 2023) Study of effects of climatic changes on the Nile River Basin (African Countries) and Egyptian water.
- 5- (Hammond, Michael Hammond, 2018) the Grand Ethiopian Renaissance Dam and the blue Nile : Implications for transboundary water governance, Global Water Forum, University of Exeter, United Kingdom, February 2018.
- 6- (Khaddam, Munther Khaddam, 2001) Arab Water Security: Reality and Challenges, previous reference, p. 45. See also: - On the concept of Egyptian water security and how to measure its indicators.
- 7- (Taye, Muhammad Salman Taye, 2013) "An Analytical View of Egyptian Water Security Indicators," International Policy, Issue (191).), January 2013.
- 8- Mai Ghaith, The Renaissance Dam Crisis and Egyptian Water Security, Arab Center for Research and Studies, December,
- 9-<http://www.internationalrivers.org/compains/grand-ethiopia-renaissance-damon:11-3-2014>.
- 10- <https://www.mena.org.eg/news/dbcall/table/webnews/id/9607583>
- 11- <https://www.eip.gov.eg/IDSC/Publication/View.aspx?ID=4872>
- 12-<https://www.undp.org/ar/egypt/%D8%8A%D8%B1%D8%AA%D9%86%D9%85%D8%A9-%D8%A7%D9%84%D8%A8%D9%8A%D8%A9-%D9%81%D9%8A-%D9%85%D8%B5%D8%B1-2021>.