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SUMMARY

Study of Egypt

We aim to paint a broad yet accurate picture of the character of Egypt. Egypt is undoubtedly an ideal subject for such research, given its clearly defined geographical nature and its rich historical legacy. Interestingly, despite this, Egypt remains, by high global scientific standards, largely uncharted territory—though we refrain from calling it unknown. This holds true at both the specialized academic level and within global culture regarding Egypt's geography, particularly in foreign languages, where foreign scholars often dominate. The available information is typically limited to modest fragments or scattered shards, hardly amounting to a drop in the ocean for what one might seek in a library. Notably, there is still no comprehensive scientific reference in Arabic concerning the geography of Egypt, despite the existence of substantial geographical texts about various foreign and Arab countries in Arabic, which far surpass those available for Egypt.

Geography is not merely a pursuit related to Western countries; rather, it envelops us, akin to the air we breathe. Geography, like benevolence, begins at home, encompassing the geography of the nation. Every inch of Egypt—each village, field, and piece of soil in the valley, as well as every mountain and rock in the deserts—should be covered in a detailed, intensive study. Academically, this is vital. However, at the level of general culture, the harvest is meager; it could even be described as a harvest of chaff. We must recognize candidly that as ordinary citizens, we are quite ignorant about Egypt. The least known facts about Egypt—especially when shared by foreigners—often reflect a profound general ignorance about

the simplest truths of the nation. For instance, it is commonly stated that Sinai constitutes one-sixth of Egypt's area, whereas the correct figure is 6%, or one-sixteenth of the country. Furthermore, it is said that Egypt comprises half of the Arab population, while the reality is that it accounts for a quarter.

No wonder we observe and experience confusion in planning and setbacks across various sectors at multiple levels. It is no surprise that planning is chaotic, especially when geography is disregarded, resulting in failed strategies. Is there any escape from ongoing material, economic, and cultural underdevelopment? This sadness stems from a limited perspective, and even then, our approach is often more emotional than scientifically mature. We literally pay a heavy price in every aspect of our lives.

Moreover, we need a deep, comprehensive understanding of our capabilities, limitations, and deficiencies without bias or evasion. At a time when Egypt is facing a perilous historical decline, there is a pressing need for renewal and a reconsideration of our existence and destiny as a whole.

A prominent issue arises regarding the essence of regional character, both in intellectual and scientific terms, for Egypt and beyond. This issue is fundamentally linked to geography and the commitment to applying this knowledge for the benefit of one's community and homeland. Some may argue that discussing regional character emphasizes geographical differences, yet the quest for unity within the larger homeland remains paramount. The Arab Unity movement respects and acknowledges nationalism, with Egypt being a pivotal figure in the larger Arab nation. The relationship can be complex, sometimes leading to antagonism

towards Egypt, particularly from nationalists who misinterpret geographical fundamentals.

Geography is the foundation of all sciences, and humans, as early as possible, have always interacted with their geographical surroundings. As such, humans can be seen as geographical phenomena themselves. Thus, we emphasize the significance of middle geography, positioning it as a central element of our understanding. Egypt is, above all, an agricultural land, known for its crops.

Recent Tensions in the Nile Basin

In recent years, the Nile Basin has witnessed political tensions due to the upstream countries' intention to establish a new commission (the Framework Agreement or the Addis Ababa Agreement), which Egypt and Sudan have rejected. Concurrently, Ethiopia is advancing its plans to establish water projects on the tributaries of the Nile, including the completion of the Tekeze Dam on the Atbara River, which has a storage capacity of 9.23 billion cubic meters and was completed in 2009. Additionally, the Tana Beles project, which involves a tunnel to transfer water from Lake Tana Basin to the Beles River Basin without storage, was initiated in 2010. This project consists of three phases, and currently, the Grand Ethiopian Renaissance Dam (GERD) on the Blue Nile has a capacity of 74 billion cubic meters.

These projects have heightened Egyptian concerns regarding their impact on Egypt's share of water resources, prompting some to revive the idea of linking the Congo River to the Nile to safeguard Egypt's water security. The Congo River is the second-largest river in the world in terms of discharge volume, following the Amazon, with an annual discharge of

approximately 1,300 billion cubic meters, all flowing into the Atlantic Ocean. The Congo Basin covers an area of 3.7 million square kilometers, extending across 11 African countries, including the Democratic Republic of the Congo, Central African Republic, Angola, and Republic of the Congo. It is separated from the Nile Basin by the western rift mountains, spanning 600 kilometers in width and averaging 1,000 meters in height.

The Congo Basin contains Quaternary sediment deposits underlain by thick layers of sands and continental sandstone. On the eastern side, the basin is bordered by a range of ancient and modern igneous, metamorphic, and sedimentary rocks. This introduction aims to highlight the geology of the Congo Basin and identify the network of river tributaries and their relationship with the eastern and northern mountains through digital satellite imagery, analyzing surface slopes through various profiles, and determining the best pathways for potential linking in case of implementation.

The study Problem:

Water Scarcity and Pollution Challenges

Water scarcity, coupled with increasing pollution levels and a decline in green spaces, has rendered traditional solutions largely ineffective in addressing these challenges. The struggle for water is as old as humanity itself and will continue until the earth and all within it are inherited by God. This reality has prompted many countries in recent years to enter into joint agreements for water usage. The conflict over water resources is expected to intensify among nations, as seen in disputes between Egypt and Ethiopia in the Nile Basin, Syria and Iraq with Turkey, Palestine and Jordan, and Syria with Israel. Some regions, such as the Rif Mountains, have also seen residents ascend the hills to construct small dams, altering water sources to divert water flow, leading to fierce civil wars over limited water resources among the populations.

The struggle over water remains constant, especially with growing population pressures, rapid urbanization, increasing industrial and agricultural activities, rising individual consumption, and escalating demand for hydroelectric energy. In recent years, the Nile Basin has experienced political tensions due to Ethiopia's establishment of water projects on the Nile's tributaries. Notably, the Tekeze Dam on the Atbara River was completed in 2009, with a capacity exceeding 9 billion cubic meters, and the Kambalise project involves a series of tunnels from the Lake Tana Basin to the Beles River Basin.

Hostile tensions have escalated following the construction of the Grand Ethiopian Renaissance Dam (GERD) on the Blue Nile, which has a storage

capacity of 74 billion cubic meters, significantly affecting Egypt's water share. Additionally, the issue of water loss in South Sudan is concerning, as only 13 billion cubic meters of the river's yield—approximately 15% of the Nile's total 39 billion cubic meters—reach the area near Aswan, with around 26 billion cubic meters being lost in South Sudan. Furthermore, Lake Chad is facing critical degradation and must be the focus of proposals for development, as its surrounding fertile agricultural lands have remained uncultivated for over 4,200 years.

The importance of studying:

Unconventional Solutions for Increasing Water Resources, Reducing Pollution, and Expanding Green Spaces

The importance of this study lies in proposing unconventional solutions to increase water resources, reduce pollution, and expand green spaces. One key solution is the recycling of water through various methods. It has become essential for the Egyptian government to strive to preserve its water resources by implementing projects in irrigated areas, which have become a topic of extensive discussion in academic circles, such as the Ramsar Convention. Additionally, the processes of water recycling and reuse, along with desalination projects along coastal cities and tourist areas, are vital.

In South Sudan, there are more than 22 small and medium water projects, along with numerous proposed projects that have been studied over the years to increase the water yield of the Nile by minimizing losses occurring in South Sudan. For instance, there is a project for a dam to control the waters of the Bahr al-Jebel before it enters South Sudan, where 50% of the water is lost in the dam areas. Another project is the Jebelia Dam on the Sobat River in Ethiopia, along the border with Sudan, where the river loses 3 billion cubic meters upon reaching Sudan.

Furthermore, the completion of the Jengali Canal project aims to control the flow of Bahr al-Jebel, which has a yield of 34.5 billion cubic meters but loses 50% of its water in the dam areas due to shallow riverbeds. This involves digging a canal 360 kilometers long from Bor City to Malakal, with a width of 28 to 50 meters and a depth of 4 to 7 meters, and a slope of

7 to 12.5 cm per kilometer, to transport 25 million cubic meters annually. This project will engage Sudan in irrigated agriculture, providing economic benefits to local residents.

Moreover, a circular canal around the dam areas will address the significant losses, as more than 50% of the Bahr al-Jebel and over 95% of the Bahr al-Ghazal are lost in these regions. The water will be transferred before the Jengali Canal at the village of Jengali, spanning 300 kilometers. Subsequently, there will be a connection to Lake Kivu with the Kagera River over just 30 kilometers, which will meet Egypt's future water usage needs. Finally, the connection to the Shari River at Beit Awili on the Ubangi River will cover a distance of only 96 kilometers.

Objectives of the study:

- ***Complete and Sustainable Water Conservation*** *and optimal use for investment in modern agriculture and increasing wetland areas.*
- ***Complete and Sustainable Water Conservation*** *and optimal use for investment in modern agriculture and increasing irrigated areas.*
- ***Construction of the Jengali Canal*** *in South Sudan.*
- ***Construction of a circular canal*** *in South Sudan that feeds into the Jengali Canal.*
- ***Connecting Lake Kivu*** *and the Vuvuvu River that feeds the Kagera River over a distance of only 30 kilometers.*
- ***Connecting the town of Awili*** *on the Ubangi River to the Shari River over a distance of only 96 kilometers.*

Study hypotheses and questions:

Statements

1. ***The potential for increasing wetland areas*** *in desert regions without the adverse effects of climate change and environmental degradation.*
2. ***Assuming we can provide water*** *from alternative sources by significantly multiplying water quantities.*
3. ***Assuming continuity in water provision.***
4. ***Assuming an increase in cultivated land*** *to ten times its current area in Egypt, raising important questions.*

Questions

1. ***Is it really possible to provide all the water needed for future generations without struggle?***
2. ***Can we maintain water provision with the potential population growth?***
3. ***Is it feasible to cultivate more than 150 million acres in Egypt and Sudan, for example?***

Study Approach:

First - The Inductive Approach

This involves understanding the concepts of green infrastructure and others in the context of the Ramsar Convention, studying the criteria for linking in light of the principle of consultation in the case of proximity between the basins.

Second - The Analytical Approach

This entails analyzing the information derived from the inductive approach and comparing the elements between the lakes and their water volumes.

The limits of the study:

Spatial Boundaries: *Egypt — Congo — Rwanda — Chad.*
Temporal Boundaries: *2000 - 2024.*

This study encompasses the region from the pre-Gymnosperm era and the changes that have occurred on the land, which have altered the course of the Congo River. Its course is relatively modern, and work on reorganizing water flows may continue for several years, provided there is political will to act. By 2030, this could mark the end of Egypt's water crisis, accompanied by agricultural development in Chad, which has abundant fertile land covering 400,000 square kilometers (approximately 96 million acres) suitable for agriculture.

The study will focus on Lake Kivu and its connection to the Ruvu River, which feeds into the Kagera River, as well as the town of Wily on the Ubangi River and its connection to the Shari River in Chad, along with projects in South Sudan, and then to Egypt. In summary, the initial connection from the southeast of Lake Kivu to the Ruvu River is less than 30 kilometers, as illustrated on the map. The second connection from the town of Wily on the Ubangi River to the sources of the Shari River spans 96 kilometers, as mentioned in the book by Joudah Hassanein.

Study plan:

Introductory Chapter: Theoretical Framework and Scientific Concepts

Preliminary Chapter:

First Section: Water Resources in the Arab Region - Geography and Hydrology

1. *Rainwater*
2. *Groundwater*
3. *River Water or Surface Water Resources*

Second Section: The Nile River

1. *Surrounding Dams*
2. *The High Dam*
3. *The Tigris and Euphrates Rivers*
    - *Introduction*
    - *The Idea of Connecting the Congo to the Nile*
    - *The Concept of River Connections Is Not New but Very Old*
    - *Water Resources in Africa*

Chapter One: Water Resources in Egypt, Their Uses, and the Conflict Over Them

First Section: Overview of Egypt

1. *An Overview of Egypt from the Perspective of U.S. Intelligence*
2. *Geological History*
3. *Summary of Geological Geography*

Second Section: Water Resources and Water Uses in Egypt

1. *Water Resources in Egypt*
2. *Water Uses in Egypt*
3. *Conflict Over Water*

Chapter Two: Water Resources in Africa and Proposed Projects to Increase Them in South Sudan and Neighboring Countries

First Section: Water Resources in Africa

1. *Water Resources in Africa*
2. *The Nile River*

Second Section: Proposed Projects to Increase Water Resources in South Sudan and Neighboring Countries

1. *Proposed Projects to Increase Water Resources in South Sudan*
2. *Joint Projects with Neighboring Countries*
3. *Projects Within South Sudan*

Chapter Three: The Importance of the Congo River and Proposed Projects to Connect It to the Nile and the Shari River

First Section: Uganda - Geological and Hydrological Overview of the Congo River

1. *Overview of Uganda*
2. *Geology of the Congo River*
3. *Hydrology of the Congo River*

Second Section: Proposals for Connecting the Congo to the Nile

1. *Advantages*
2. *Connecting the Congo to the Nile*
3. *The Idea of River Connections Is Not New*
4. *Raising Water Through the Least Elevated Mountain Areas*
5. *South Sudan as a Transit Area for Nile Waters*

Chapter Four: Summary of the New Innovations for Both Egypt and Chad

First Section: Rwanda - A Comparative Geography of Some African Lakes

1. *Definition of Previous Findings and Discoveries*
2. *Introduction to Rwanda*
3. *Geography of Rwanda*
4. *Comparison Between Previous Tables Resulting from Lakes*
5. *Map of the Benue River*

Second Section: Chad and New Innovations to Save Lake Chad

1. *Another Country Like Chad and New Innovations to Save Lake Chad*
2. *Surface Features*
3. *Previous Projects to Revitalize Lake Chad*
4. *Proposals to Save Lake Chad*
5. *New Innovations to Save Lake Chad*

First: Water Resources in Egypt

The Nile River serves as the principal source of water for Egypt, contributing approximately 96% of the country's water supply. In addition to this vital resource, Egypt relies on several other sources, including deep water aquifers in the oases, limited rainfall along a narrow strip of the northern coast, some valleys, and small quantities produced by desalination plants. The salinity of some of these water sources poses additional challenges for utilization.

According to the 1959 Agreement between Sudan and Egypt, the average annual renewable surface water amounts to 55.5 billion cubic meters, primarily originating from external inflows from other Nile Basin countries. Rainfall in the region varies significantly, ranging from zero to 170 mm per year, with an average of approximately 51 mm annually over the total area of Egypt, which is around 1 million square kilometers. This translates to about 52 billion cubic meters of water; however, only around 2.3 billion cubic meters are effectively utilized.

Egypt possesses four main aquifer systems:

1. ***The Nile Aquifer***
2. ***The Nubian Sandstone Aquifer in the Western Desert***
3. ***The Moghra Aquifer, situated between the western Delta and the Qattara Depression***
4. ***The Coastal Aquifer (coastal groundwater layers in the northwestern coastal area)***

Groundwater in Egypt is classified into renewable and non-renewable fossil sources. Approximately 6.2 billion cubic meters of renewable

groundwater are utilized annually, originating from the total of 55.5 billion cubic meters due to seepage from irrigation canals and agricultural land in the Delta. The volume of non-renewable groundwater is estimated to be around 150 trillion cubic meters, equivalent to the inflow from the Nile over 1,800 years, of which about 2 billion cubic meters are used annually.

Non-renewable resources are characterized by their inability to be replenished at a rate equal to consumption; thus, the rate of natural resource replenishment is lower than the consumption rate. Notable examples of such resources include agricultural soil and water resources.

The soil of the Nile Valley and its delta is historically recognized as a significant product of the Nile River, comprising a comprehensive mix of minerals transported from the rich volcanic deposits of the Ethiopian Highlands, enhanced by vast quantities of organic matter accumulated over thousands of agricultural seasons since the advent of agriculture. The cultivation of the valley and delta has undergone various phases, reaching its zenith at the end of the Pharaonic era, after which a contraction phase occurred, followed by another agricultural cycle during the medieval period. A third agricultural cycle commenced in the early nineteenth century, with cultivated land expanding to approximately 3.0053 million acres, ultimately reaching five million acres by the early twentieth century, peaking in 1967 when cultivated land reached approximately 6.462 million acres.

However, cultivated land has experienced a gradual decline, particularly in the first eight years (1975–1967), followed by a more accelerated rate of decline, reaching 15.8% annually during the subsequent five years.

Consequently, Egypt lost approximately 762,000 acres of arable land over a span of thirteen years.

This rapid decrease in cultivated area, at a rate of 13.3% over a quarter of a century following the revolution, represents a significant loss, especially when we know that the maximum cultivation in the valley and delta slightly exceeds fourteen million feddans (14.04 million), including lands with lower-quality soils.

Furthermore, the uses of these lands are not limited to agricultural purposes alone; there are competing uses in both old and new agricultural lands. Below is a table showing the compound uses of the cultivated lands in the valley and delta in the mid-1970s (Table No. 7 and Figure No. 20-B).

Regarding the fertility of old agricultural lands, Gerard discusses it after numerous comparative experiments in France and Egypt, based on the ratio of crops to the quantity of seeds over a given area. He estimated the fertility of Egyptian soil against an average fertility of French soil, which is approximately 21.6. The trends in new growing lands and declining old lands have been observed.

In the 1980s, the cultivated area took two main directions: first, the decrease of old agricultural lands in the valley and delta; second, the growth of agricultural lands on the margins of the valley and delta through reclamation and cultivation of new lands. Consequently, it is difficult to track the growth of each developmental direction separately. However, overall, the cultivated area developed sequentially during the 1980s, as shown by official figures.

In reality, this period witnessed extensive activities in land reclamation on the eastern and western margins of the delta, in the western valley of Middle Egypt and Upper Sa'id. However, the last figure can be contested as it includes old agricultural lands consumed by urban growth of cities and villages at the expense of agricultural lands.

Within the cultivated area, the cultivated space is decreasing due to three main factors:

1. *The conversion of agricultural lands to residential uses in cities and villages.*
2. *The erosion of agricultural soil due to brick kilns.*
3. *The conversion of lands for high-yield future uses, along with storage and excavation activities.*

The following table (Table No. 8) illustrates the trends of converting agricultural lands to other uses in a recent sample. The number of violations on agricultural lands in the Qalyubia and Qalyub centers is 5,164 cases, which corresponds to one case for every 95 residents. This rate is quite high due to the proximity to the urban areas of Cairo and Shubra El-Kheima, where a considerable number of capital residents migrate from the heart of the city to the outskirts in search of housing in the villages of these centers, along with the displacement of storage jobs to marginal centers. The most common forms of violations were in construction and divisions (58 cases), followed by excavation and storage (4,001 cases), then brick kilns (58 cases), and finally, land conversion (19 cases) from the total violations. These encroachments occupied 296 feddans, averaging about 2.5 feddans (1.83 feddans) or 3.5 meters (39.2 square meters) per resident.

If the current population growth rates continue until the year 2000, alongside the encroachments on agricultural lands in 1987, it is expected that Egypt will lose more than twenty thousand feddans (20,501) at least, concerning encroachments by the public on agricultural land. The state's encroachments on agricultural land represent another issue with its own dramatic irony.

According to numerous studies, every increase of one thousand in the population results in the loss of approximately eleven acres (107 acres) from encroachments by both residents and the government. Considering the prevailing population growth rate during the transitional period (1976-1986), the population increase between 1987 and 2000 is estimated to be around twenty-five million people (25,399 thousand), requiring more than a quarter million acres (271) of agricultural land necessary for residential expansion and public services.

In summary, over four decades from the sixth to the ninth of the twentieth century, Egypt lost 274,000 acres of agricultural land, while at the same time gained 1,573,000 acres of cultivated land. On the surface, it seems that we gained one million and five million acres (1,199 thousand) of cultivated land.

However, due to the difference in production returns between old agricultural land and newly reclaimed land at a ratio of 5:1, the actual truth is that Egypt only recovered 1,573 acres of reclaimed land (374,000 acres lost × five times the reclaimed acre), while reclaiming 297,000 acres of new agricultural land.

If we consider the cost of reclaiming the acres of newly reclaimed land at the prices of 1989, which is approximately five thousand Egyptian pounds,

we discover that we wasted more than seventeen billion pounds (17,120 million). This highlights the long-term planning concept that restricts encroachment on agricultural land and plans the establishment of new communities on the desert margins, which the state has failed to address effectively.

It was previously noted that there was a lack of long-term regional planning to contain this phenomenon before it escalated. The confrontation began in the first half of the 1980s with the issuance of Law No. 116 of 1983, which prohibits any infringement on agricultural land and aims to preserve it, forbidding the uprooting of land, leaving it uncultivated, erecting buildings or structures, or dividing land for construction loans, along with penalties for violations.

However, the means to enforce and protect these laws were not available, thus the processes of construction, land reclamation, and degradation of agricultural land continued at rates similar to or slightly less than those ***before the law was issued. This is attributed to several main factors:***

1. *A lack of a well-developed regional plan that provides alternatives to random growth.*
2. *Government violations of decisions by encroaching on agricultural land and building on it, leading to a lack of role models.*
3. *The state's recognition of informal settlements on agricultural land in 1966, which encouraged people to continue random growth and the state's trend toward reconciling violators until 1985. This indicates an entry into a vicious cycle from which there is no exit, and recently, the government has resorted to the public prosecutor to announce its inability to confront the problem of collusion among*

senior officials, despite knowing that we waste a million and a quarter million pounds daily during the period from 1952 to 1990.

Second: Water Uses in Egypt

The uses of water in Egypt can be divided into three main areas: agriculture, domestic purposes, and industry.

Agriculture: *The agricultural sector accounts for about 78% of water needs. The cultivated area in Egypt has increased from 5.8 million acres to 8.5 million acres in 2012, reaching 20 million acres by 2024. Factors that have helped implement this policy include the expansion of the reuse of agricultural drainage water (13 billion cubic meters) and the use of surface and renewable groundwater in the Delta (6.5 billion cubic meters), totaling 36% of Egypt's annual water share. Additionally, the reduction of freshwater discharges into the Mediterranean Sea after the construction of the Faskour weir on the Damietta branch and the Adfeina weir on the Rashid branch has contributed to this.*

Providing the additional water needed for the agricultural sector in the future depends on changes in the needs and priorities for drinking water and industry, along with appropriate expansions in groundwater use. It also requires a reconsideration of agricultural policies regarding crop composition and a commitment to limiting the areas planted with water-intensive crops such as rice, sugarcane, and bananas. Moreover, modern irrigation methods should be used in some old lands in the valley and the Delta.

Domestic Uses: *Water usage for domestic purposes has increased to 9 billion cubic meters, accounting for 16%. This increase is due to the population growth from less than 30 million in 1970 to 84.7 million in 2013, and it is now approaching 112 million, coinciding with rising living*

standards and subsequent expansions in the construction of swimming pools, golf courses, artificial lakes, and more.

The establishment of new cities in the heart of the desert, such as Sixth of October City, Tenth of Ramadan City, Mubarak City, New Alamein City, Galala City, Sadat City, and the New Administrative Capital, along with developments in Ain Sokhna and tourist cities along the Red Sea and South Sinai down to Taba, and on the Mediterranean coast, known as the North Coast—with its modern recreational facilities—has led to excessive water consumption.

Industry: *Industry has also developed significantly in recent decades, with the water needs of the industrial sector reaching approximately 3.8 billion cubic meters in 2012. Surface water from the Nile and canal networks is the primary direct source for these uses, and it is also the most environmentally polluted due to the unjustified discharge of pollutants that do not meet international environmental standards.*

Third: The Conflict over Water

The conflict over water is as old as humanity and will continue until God inherits the earth and all who dwell upon it. This has prompted many countries to enter into joint agreements for water use. It is expected that this conflict will increase in the coming years, not only between countries, as is currently happening between the Nile Basin countries and between Syria and Iraq with Turkey, and Palestine and Jordan with Israel, but also within some countries themselves, such as South Sudan, Darfur, Morocco, the Moroccan Sahara, and the Rif Mountains. In these regions, some residents climb the mountains and attempt to build small dams to alter the flow of water sources, depleting water revenues and leading to fierce battles among the remaining residents for access to scarce water resources. This is evident in some Ethiopian tribes that cross the border into southeastern Sudan to occupy land during the planting season, and it has increasingly become an issue in certain Egyptian villages located at the ends of irrigation canals, which may not receive sufficient water due to technical problems or violations by some farmers at the beginning of the canals, such as planting crops in prohibited areas or expanding the cultivation of water-intensive crops like rice, which further depletes water resources (AGLAM, 2014).

In addition to the conflict over water, there is increasing population growth, rapid urban expansion, rising agricultural and industrial activities, and higher individual consumption, alongside a growing demand for hydropower.

Climate Fluctuations

Climate fluctuations may lead to water demand exceeding supply by up to 40% by 2040, according to a report from the U.S. Intelligence Office (2.1. (ICA, ZU). The report points to certain water-scarce areas where conflicts are expected to intensify due to the construction of water dams (resulting in shortages, poor water quality, and flooding). It emphasizes the strategic importance of regions such as the Nile River, the Jordan River, and the Tigris and Euphrates Rivers for U.S. national security. The report warns of the potential collapse of fragile water agreements, prompting some countries to use water as a political pressure tool in the future, similar to how natural gas and oil are used today. This has been clearly demonstrated by Ethiopian practices in establishing water projects on the Nile's tributaries, such as the Khatizzi Dam on the Atbara River (2009) and the Tana-Belis Tunnel, which connects Lake Tana to the sources of the Blue Nile, alongside the controversial Grand Ethiopian Renaissance Dam on the Blue Nile near the border with Sudan, without prior notification to the downstream countries, Egypt and Sudan, and in violation of international agreements between Egypt and Ethiopia, as well as international norms regarding transboundary rivers.

The Ramsar Convention on Wetlands

The Ramsar Convention on Wetlands is the oldest international agreement in the field of environmental protection, serving as a framework for international and national cooperation to conserve and rationally use wetlands and their resources. Established in 1971 in Ramsar, Iran, it came into force on December 21, 1975. It is considered the only international agreement addressing a specific ecosystem.

Scope of the Ramsar Convention

The Ramsar Convention aims to promote the conservation and rational use of wetlands through actions taken at the national or local level, and through international cooperation to achieve sustainable development worldwide. This convention encompasses various types of wetlands, including swamps, marshes, lakes, valleys, wet meadows, peatlands, oases, river deltas, estuaries, coastal zones, and nearshore marine areas with coral reefs. It also includes artificial wetlands such as fish farming ponds, wet rice fields, water reservoirs, and salt pans.

Role of Wetlands

Wetlands provide essential environmental services; they are critical to the hydrological cycle and are a source of biodiversity at all levels, including genetic and ecosystem diversity. Wetlands serve as windows into the interactions between cultural diversity and biological diversity, and they represent an economic and scientific resource. Their gradual decline or disappearance constitutes a severe environmental violation, with sometimes irreparable damages.

Rational Use of Wetlands

Rational use of wetlands is defined as "sustainable use that benefits humanity in a manner consistent with the conservation of the natural characteristics of ecosystems." It is also understood as "human use of these areas in a way that allows current generations to sustainably benefit from them while providing the means to meet the needs and aspirations of future generations." Rational use also involves the conservation, management, and restoration of wetlands.

Responsibilities of Contracting Parties or Member States

The countries that sign the convention (or parties) commit to the following:

- *Designate at least one wetland that meets the criteria for inclusion in the List of Wetlands of International Importance (Ramsar List) and ensure the conservation of the environmental characteristics of each site. Parties should strive to register as many wetlands as possible that meet the specified criteria. It is not essential for the registered site to be a protected area, as long as its environmental characteristics are preserved through rational use.*
- *Promote the rational use of all wetlands within their territories through national planning programs, while also ensuring the conservation and management of wetlands.*
- *Promote training in research and rational use of wetlands.*
- *Consult on the application of the convention, particularly regarding areas located at the borders of several countries, and concerning water systems and their conservation, as well as development projects affecting wetlands.*

How the Agreement Works

- *The Conference of the Parties (COP) meets every three years to promote policies and technical recommendations for the implementation of the agreement.*
- *An annual meeting of the Standing Committee, composed of representatives from the six Ramsar regions, directs the agreement between COP sessions.*

- *The Scientific and Technical Advisory Panel provides guidance on difficult issues, particularly related to the implementation of the agreement.*
- *The Secretariat of the Ramsar Convention, which shares the same headquarters with the International Union for Conservation of Nature in Gland, Switzerland, manages the daily activities of the agreement.*
- *Each party at the national level appoints an "Administrative Authority" responsible for ensuring the smooth implementation of the agreement.*
- *All countries are invited to establish national wetland committees, bringing together all governmental institutions with responsibilities in water resources, development planning, etc. Participation from non-governmental organizations and civil society is encouraged.*
- *If there are issues with maintaining the environmental characteristics of a Ramsar site, the concerned country must register that site in a special registry, after which technical assistance will be provided to address the issue.*
- *Accepted countries can request financial assistance from the Ramsar Fund for small grants from the "Wetlands for the Future" fund to support the operation and rational use of wetlands.*

Wetlands are ecosystems where water is the primary factor controlling the environment and the associated plant and animal life. The broad definition of wetlands includes freshwater, marine, and coastal ecosystems such as lakes, rivers, groundwater reservoirs, swamps, wet grasslands, peatlands, oases, estuaries, deltas, mangroves, and other coastal areas, as well as all human-made sites like fish ponds, rice fields, reservoirs, and salt flats.

They represent one of the most valuable ecosystems on Earth, essential for humans and nature due to their intrinsic value and the benefits and services they provide, including environmental, climatic, social, economic, scientific, educational, cultural, and aesthetic contributions to sustainable development and human well-being.

Despite covering only about 6% of the Earth's surface, wetlands are home to 40% of all plant and animal species. Their biodiversity is critical for human health, food supply, transport, and economic activities that generate job opportunities, such as fishing and tourism. Wetlands are vital for humans and other ecosystems, as they provide essential ecosystem services such as water regulation, flood control, and water purification. Over a billion people (one-eighth of the world's population) living in rural and urban areas around the globe rely on wetlands for their livelihoods.

Despite these significant benefits, wetlands are among the most severely degraded and lost ecosystems, with this negative trend expected to continue due to rapid population growth, unsustainable production and consumption, technological development, and climate change, resulting in a 35% loss globally since 1970. Wetlands are disappearing at three times the rate of forests. Human activities causing wetland loss include drainage and filling for agriculture and construction, pollution, overfishing, overexploitation of resources, invasive species, and climate change. This vicious cycle of wetland loss, threatened livelihoods, and deepening poverty is a result of a mindset that mistakenly views wetlands as barren land rather than as sources of life, jobs, income, and essential ecosystem services. One of the main challenges is changing people's mindsets and encouraging governments and communities to value and prioritize wetlands.

Wetlands: A Solution to Climate Change

Wetlands are a natural solution to climate change. Peatlands, mangroves, and seagrasses are among the most efficient carbon sinks on Earth, capturing and storing double the amount of carbon found in all the world's forests combined. However, when drained and destroyed, wetlands release significant amounts of carbon. Wetlands also protect us from natural disasters. In the face of rising sea levels, coastal wetlands reduce the impact of hurricanes and tsunamis, stabilize coastlines, and resist erosion.

There is an urgent need for public awareness at both the national and global levels to reverse the accelerated loss of wetlands and promote their conservation and restoration. World Wetlands Day is an ideal time for people to learn more about these vital ecosystems.

The theme for 2022, "Working for Wetlands for People and Nature," highlights the importance of ensuring that wetlands are used sustainably and wisely. This year's campaign is a call to urgent action to mobilize financial, human, and political capital to prevent the complete disappearance of wetlands worldwide and to restore those that have already been lost.

Wetlands and Sustainable Development Goals

Healthy wetlands are critical for achieving the Sustainable Development Goals (SDGs), particularly those related to Goal 6: ensuring clean water and sanitation for all, and protecting water-related ecosystems; Goal 14: conserving and sustainably using oceans, seas, and marine resources; and Goal 15: protecting, restoring, and promoting sustainable use of terrestrial ecosystems and inland freshwater ecosystems.

On August 30, 2021, the United Nations General Assembly declared February 2 as World Wetlands Day to raise awareness of the urgent need to reverse the rapid loss of wetlands and promote their conservation and restoration. This date marks the anniversary of the adoption of the "Convention on Wetlands of International Importance" in 1971 in Ramsar, Iran, on the shores of the Caspian Sea.

By designating protected areas, implementing effective policies, and sharing knowledge, the convention enables countries to take steps to protect their wetlands and use them wisely. It has been adopted by 172 countries, each of which, upon joining the convention, must designate at least one wetland to be included in the list of wetlands of international importance (Ramsar Sites).

Conclusion:

The global and Egyptian systems face numerous challenges that could impact the civilizational, cultural, social, economic, and environmental aspects of life. Water resources are limited, compounded by a growing population and a decline in green spaces. Studies have shown that the Nile waters are diminishing, posing an imminent threat of water scarcity in Egypt. The fixed water quantity from the construction of the High Dam was 55.5 billion cubic meters in 1971, with a population of 38 million, resulting in a per capita share of 2000 cubic meters. Currently, the population has increased to nearly 112 million, reducing the per capita share to less than 400 cubic meters, with no real water resources available to augment surface water in the Nile.

Therefore, there is an urgent need to compensate for this deficiency by using unconventional solutions to recycle water in various ways. Consequently, the Egyptian state must strive to preserve its water resources by supporting wetland projects, which have become a topic of extensive discussion in academic circles (Ramsar Convention), in addition to water recycling processes, seawater desalination in coastal cities, and more.

To increase water yield, a new project aims to connect Lake Kivu in Rwanda to the Kagera River and its tributary, the Ruvuvu, which is nearly adjacent to Lake Kivu. The connection is only about 30 kilometers long and requires no pumping stations or electrical power consumption, making it an economically viable project with low expenses and substantial water volume. Lake Kivu holds 500 cubic kilometers of water and is replenished year-round, experiencing two peak flooding periods: the first in February, March, and April, and the second in November, December, and January.

Notably, the volume of Lake Kivu is approximately 18 times that of Lake Tana, which feeds the Blue Nile. Lake Tana, located in a tropical region, has a single rainy season from June to August, with a water volume of 28 cubic kilometers.

As for the friendly country of Chad, a connection is proposed from the village of Fort Bousil, situated on the Ouango River, at the highest point in the Lake Chad basin (1380 meters) along the common border between the Nile and Chari river basins. The distance to connect to the Chari River is only 96 kilometers, making this connection 16 times less costly than previous projects, such as the Transco project in 1929, without affecting the water quantity from the source country.

Thus, Egypt and Chad can utilize the water they need according to their future requirements, ensuring no losses for the connected countries, Rwanda and Congo, with which we maintain good relations in various fields. Furthermore, pure scientific approaches must be used, particularly through the exchange and coordination of water routes, to maximize benefits and minimize water loss. The nourishing waters from countries like Ethiopia and South Sudan flow from July to September, while equatorial waters peak from January to March and from November to January. This strategy aims to ensure that the flow into the White Nile occurs with minimal loss and maximized volume.

Results:

1. *After Egypt's water share was fifty-five billion cubic meters in 1959, it has increased, according to the Egyptian Ministry of Irrigation's schedule, to 78.2 billion cubic meters. This is indeed an increase of 22.7 billion cubic meters above the available resources in Egypt, including groundwater, rainfall, desalination, and others.*
2. *It is proposed to build a dam to control water in the Jabal Sea before it enters South Sudan, which would provide 50% of the water in South Sudan, approximately 26 billion cubic meters, thus supplying half of that amount throughout the year, or 13 billion cubic meters.*
3. *The Jambila Dam on the Sobat River distributes the water quantity over 12 months instead of 8.1 billion cubic meters each month and 21.75 billion cubic meters annually.*
4. *Completing the Jambila Canal in its first phase provides 4.4 billion cubic meters, and in the second phase, it provides 7.6 billion cubic meters near Aswan.*
5. *A circular canal around the dam area could provide 30 billion cubic meters. If we consider the water source from South Sudan, it reaches approximately 22.7 + 13 + 21.75 + 7.6, totaling 65.5 billion cubic meters annually.*
6. *After digging the new 30-kilometer waterway between Lake Victoria, it could reach at least 100 billion cubic meters.*
7. *Regarding Lake Chad, the Chari River, once connected to the Wadi Benji at the town of Ouil along a 96-kilometer route, could raise 50 billion cubic meters annually.*
8. *The cultivated area in Egypt and Sudan will be increased to 150 million acres.*

9. *South Sudan will be transformed into irrigated agriculture, providing significant economic benefits for local populations.*
10. *As for the vast areas that could be cultivated, there are lands that have not been farmed for at least 4,200 years, covering approximately 400,000 square kilometers (96 million acres) recorded in the Global Geodetic Registry, creating a new global food basket with Egypt and Sudan to prevent famines and provide food security.*
11. *All of this will work towards reducing global warming, improving climate conditions, and decreasing ozone depletion.*

Recommendations:

- *At the Egyptian level, the Egyptian state must ensure that scientific and executive institutions collaborate to apply modern technologies for connecting rivers with neighboring countries. This is not the first instance, as Egypt follows countries like China, India, the USA, and Ethiopia in this regard. It is essential to adhere to the Ramsar Convention, which contains a clause stating that connections can be made in consultation with neighboring countries in the basin if the first country declares water scarcity, as was the case in 2004.*
- *At the African level, cooperation among basin countries is necessary to reorganize for the maximum benefit of all parties, aiming to make Africa resemble a small village where economic exchanges occur in all fields. This would enable all parties to benefit their populations and improve their currencies, leading to a surplus. After 2025, Africa could potentially become the global food basket, thanks to this proposed project and others, God willing.*
- *At the global level, international institutions, the World Bank, and FAO should support these projects due to their public benefit and to close the food gap, preventing any form of famine in Africa. The reorganization of this new project will increase cultivated areas, thus enhancing oxygen production on Earth. One primary benefit would be the reduction of global warming, which could slightly decrease Earth's temperature; such projects can help mitigate the ozone hole.*
- *At the academic level, there is a significant gap in research on the replenishment of rivers and lakes that are on the brink of collapse or depletion. Additionally, there is a lack of research on*

landscaping, despite the large number of architectural engineering colleges in Egypt and around the world. We urge the scientific community and academics, both within and outside Egypt, to consider any new ideas for rehabilitating lakes, rivers, and other areas, given the lack of trust in researchers presenting their work, who may be hobbyists studying at their own expense, for example.

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