

COOPERATIVE SHARED WATER RESOURCES MANAGEMENT IN THE NILE RIVER BASIN: THE ENGINE FOR GROWTH

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ABSTRACT:

This study explores possibilities for cooperative shared water resources management options in the Nile river basin. The study analyzes the Nile Basin Initiative NBI as a genuine case study. The benefits of regional shared water cooperation extend to ecological, economic, political features, and also beyond the river for the good of all. The Nile Basin countries have invested momentous time, effort, and resources in commencement and supporting the cooperation through the Nile Basin Initiative. The Initiative is based on the recognition that the basin has a shared history and future. It represents deep commitment by the Nile riparian countries to follow jointly the sustainable development and management of Nile water resources for the benefit of all. The Initiative provides a mechanism for cooperation through a shared vision and basin-wide framework. The Paper concludes that NBI is a vital milestone for cooperation, peace, stability, joint investment, and prosperity and can be engine for national and regional economic growth. Also, cooperative shared water resources management can serve as a catalyst for greater regional integration, ecological, economical, social and political, with possible benefits doubtless far exceeding those derived from the river itself.

Keywords: Nile River Basin - Growth - Nile Basin Initiative - Cooperation

1. INTRODUCTION

Nile's waters flow across very different climatic regions, transboundary water management challenges with 224 million people and 11 countries sharing its water. Due to climate change and climate variability, the amount of water in the Nile Basin (Figure 1.a) may fluctuate and it can be safely assumed that water availability will not increase. Characterized by water scarcity and poverty, Nile Basin rapid population growth will likely compound the difficulty for the foreseeable future to be very complex. Limited water resources must be divided among more and more people, as a result of the above average projected population growth in the basin. It is even more vital to manage water sustainability, both within and among the Nile basin's countries. Development projects in several of the basin's countries include hydropower dams, irrigation projects, and other water-diversion projects.



Figure 1.a. Nile Basin

Cooperative water resources management is complex in any international river basin. Almost all of Egypt's population live along the river and depend heavily on its resources. As the Nile flows toward the Mediterranean Sea, it is lined with irrigation canals. Much of river water has been used for irrigation. The literature often predicts that water scarcity will be a future source of conflict among Nile Basin countries. Nile Basin may be a very trouble spot with its many riparian countries and unequal distribution of water resources. History of disputes over water resources suggests that aggressive international and regional conflict is rare. Nile Basin countries are more likely to cooperate in managing shared water resources. Formatted in 1997, the Nile Basin Initiative is just the latest of much efforts to work together to manage the Nile's resources across national boundaries.

Ageel analyzes step trends of the Nile River flow time series based on hydrological

year (June- May), using two statistical software. Karima discusses inundations by high releases, impact and rehabilitation of floods downstream high Aswan dam, reach located between Assiut and Delta barrages. Hoda investigates the appropriate irrigation water schedules in open fields and greenhouse for different vegetables using subsurface drip irrigation (SDI) system. Amira presents Flood Propagation of the Blue Nile in the Sudan. Abdalla discusses the use of remote sensing and fractures analysis in site investigation for the proposed Sabaloka hydropower dam project, river Nile state, Sudan. Ageel analyzes the Long-term Flows of the Nile River. Muna discusses Impact of Climate Change and climate variability and the Human Activities on Land Degradation in Arid and Semi-arid Regions, through



Figure 1.b. Nile Basin

the analysis of the vegetative cover and soil degradation. Mona calibrates a simplified model against a relatively more complex model with the objective to achieve simulations of Global Warming Impacts on Water Quality in the Nile Delta, Egypt.

Ayman analyzes development priorities in a fuzzy environment, water resources assessment based on climatic fluctuations in the Nile basin using artificial neural networks, magnification of non-conventional water resources in Nile basin countries, Nile river water-related treaties, magnification of water resources utilization in Nile basin countries, genuine sustainable development strategies for Nile river, Innovative water awareness model for new generation to achieve millennium development goals (MDG) in Egypt.

Mohamed presents an assessment of the performance of the Nile Forecast System (NFS) hydrological component with regard to long-term simulations for the purpose of using the NFS to assess the impact of climate change on the river flow. Eman presents validation results over the Blue Nile and Sobat basins, with Regional Climate Model to Simulate the Nile Basin Hydro-climatology. Amgad presents the use of water banking concept combined with different changing land use such as crop mixes to improve river water productivity and environmental performance. Baldassarre analyzed the effects of climate change on the water resources of the River Nile Basin, and outlined the principles of a code of good practice in climate change impact studies based on the explicit handling of various sources of uncertainty.

Salah provides an overview of issues related to international cooperation and water use in the Eastern Nile Basin, gives Basic environmental and socio-economic data and introduces an Ethiopian, Sudanese and Egyptian perspective. Yacob outlines Past initiatives as well as the current Nile Basin Initiative (NBI) and ends with suggestions on how to deal with open questions and lessons learned from the ongoing NBI process. Mohamed A. Hamouda outlines and applies a framework for assessing vulnerability of water systems in the Eastern Nile Basin. Osman gives an overview of Sudanese water development facts and potentials and their regional impact on the other countries sharing the Nile River. Muluneh addresses the physical and hydrological conditions of the basin and presents the cross-cutting issues of concern in the basin, discusses the uncertainty of availability of water in the face of climate variability and land degradation, discusses the challenges to obtain, protect, and manage the basin's water supply and ecosystem.

Assefa discusses the hydrometeorology, land use, soils, topography, agroecological zones, extreme flows, climatic variability and climatic teleconnections of the upper Blue Nile River basin. Bianca reports the findings of a first attempt to rigorously quantify environmental flows in the Blue Nile River. The results provide a basis for discussion and can contribute to the early phases of planning. Magdy examines the Nile question from an Egyptian perspective. Egypt's water policy focuses on demand management, environmental protection and international joint projects to increase the water supply. Emad discusses the Government and NGOs in Egypt perspectives of Water and Food Security in the River Nile Basin, take into account the social, economic and environmental conditions. Tazebe assesses the potential impacts of climate change on the hydrology and water resources of the Nile River basin using a macroscale hydrology model.

2. NILE BASIN INITIATIVE (NBI)

The Nile Basin Initiative (NBI) is a partnership initiated and led by the riparian states of the Nile River. The NBI looks for to develop the river in a cooperative manner, and promote regional peace and security. In the Nile Basin, which is characterized by water scarcity, poverty, a long history of dispute and insecurity, and rapidly growing populations and demand for water, it is particularly difficult. The NBI started with a participatory process of dialogue among the riparians that resulted in their agreeing on a shared vision to “achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.

Recognizing that cooperative development holds the greatest prospects for bringing benefits to the entire region, and aware of the challenges, the Nile riparians took an historic step in establishing the Nile Basin Initiative. Formally launched in 1999, the initiative provides an institutional mechanism, a shared vision, and a set of agreed policy guidelines to provide a basinwide framework for cooperative action. The policy guidelines define the following as the primary objectives of the NBI to develop the Nile Basin water resources in a sustainable and equitable way to ensure, prosperity, security, and peace for all its peoples, to ensure efficient water management and the optimal use of the resources, to ensure cooperation and joint action between the riparian countries, seeking win-win gains, to target poverty eradication and promote economic integration, and to ensure that the program results in a move from planning to action.

The Strategic Action Program represents the Nile riparians’ strategic approach to achieving sustainable socioeconomic development in the basin through the common Nile Basin water resources.” The Strategic Action Program provides the means for translating this shared vision into concrete activities through a two-fold, complementary approach to lay the groundwork for cooperative action through a regional program to build confidence and capacity throughout the basin (the Shared Vision Program), to pursue, simultaneously, cooperative development opportunities to realize physical investments and tangible results through sub-basin activities (Subsidiary action programs) in the Eastern Nile and Nile Equatorial Lakes regions.

Shared Vision Program SVP has many subprograms which are Applied Training Project, Nile Transboundary Environmental Action Project, Efficient Water Use for Agricultural Production, Confidence Building and Stakeholder Involvement, Socio-economic Development and Benefit Sharing, Shared Vision Program Coordination Project, Regional Power Trade, and Water Resources Planning and Management.

While the Eastern Nile resources are limited there are opportunities for development. The Blue Nile system provides the best opportunity for a first set of investments. Water losses are high and continued unilateral development is very risky, but there are significant water savings opportunities. Regional cooperation is essential to maximize benefits and manage risks but appropriate institutions will be required. Enhanced agriculture production in Ethiopia highlands is key to reducing erosion and improving livelihoods in the Eastern Nile Basin.

3. WATER RELATED GROWTH INDICATORS

Water area is the sum of the surfaces of all inland water bodies, such as lakes, reservoirs, or rivers, Figure 2. Coastline is the total length of the boundary between the land area (including islands) and the sea, Figure 3.

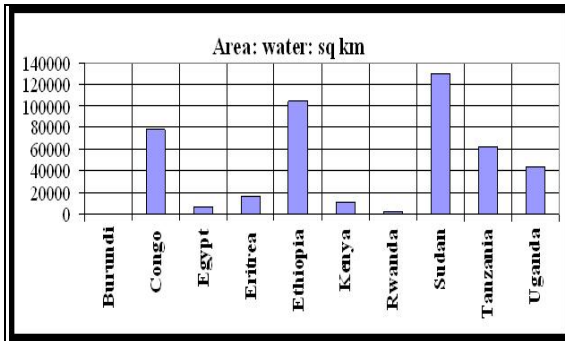


Figure 2. Water area: sq km

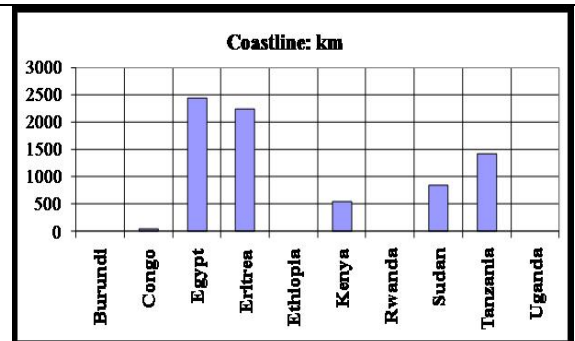


Figure 3. Coastline: km

Land use contains the percentage shares of total land area for three different types of land use arable land, permanent crops and other: which are land cultivated for crops that are replanted after each harvest; land cultivated for crops that are not replanted after each harvest; any land not arable or under permanent crops, respectively, Figure 4. Irrigated land gives the number of square kilometers of land area that is artificially supplied with water, Figure 5.

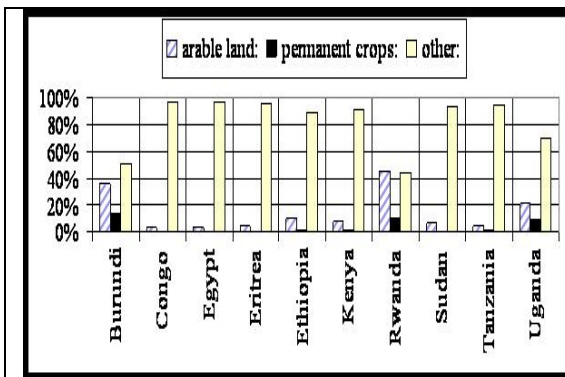


Figure 4. Land use:
arable land: permanent crops: other:

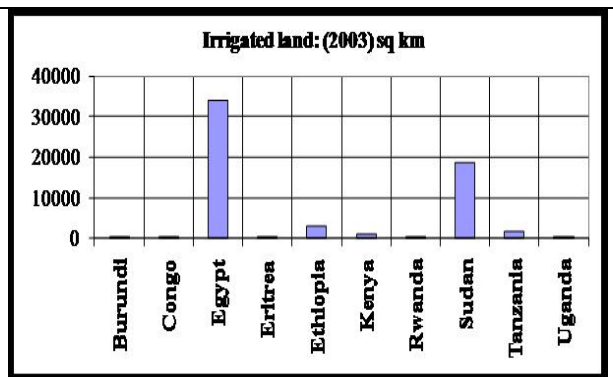


Figure 5. Irrigated land: sq km

Total renewable water resources provide the water availability for a country in cubic kilometers of precipitation, ground water, and surface inflows. The water available to a country does not include water resources that have been reserved through international agreements. Water resources fluctuate due to weather variations, Figure 6. Total annual water withdrawal cu m/yr and per capita water withdrawal, Figure 7.

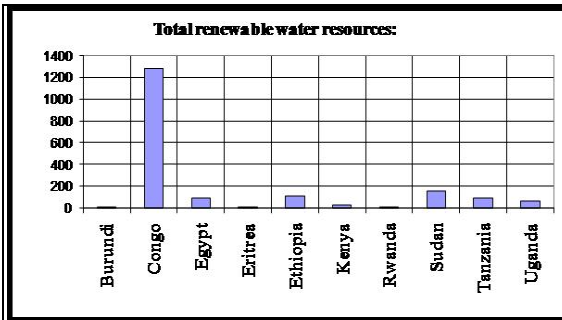


Figure 6. Total renewable water resources cu km

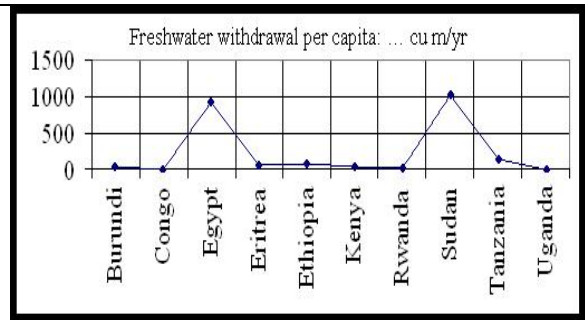


Figure 7. Freshwater withdrawal (cu km/yr)

Freshwater withdrawal (domestic/industrial/agricultural): provides the annual quantity of water in cubic kilometers. Domestic, Industrial and Agricultural water withdrawal refers to water supplied by public distribution systems, quantity of water used by industries, and water used for irrigation, respectively, Figure 8.

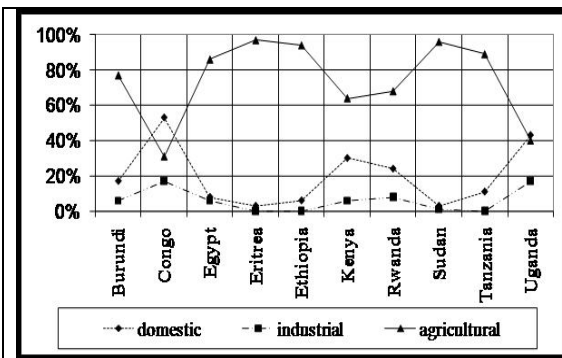


Figure 8. Freshwater withdrawal (cu km/yr) - (domestic/industrial/agricultural)

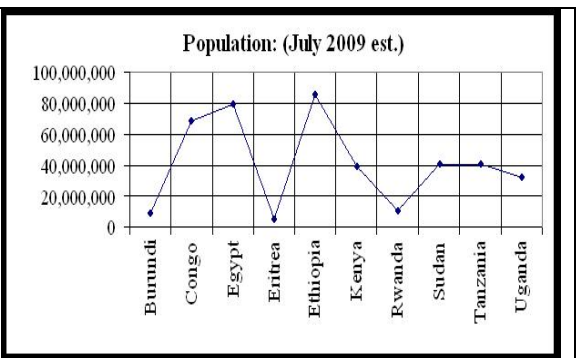


Figure 9. Population: (July 2009 est.)

Population gives an estimate to the recent past and on assumptions about future trends, Figure 9. Population growth rate is equal to the average annual percent change in the population, resulting from a surplus (or deficit) of births over deaths and the migrants entering and leaving. The growth rate is a factor in determining how great an obligation would be imposed on a country by the changing needs of its people for water resources and infrastructure, also other water related resources (e.g., food, electricity), and jobs. Rapid population growth can be seen as threatening by other basin countries, Figure 10.

Total fertility rate gives the average number of children that would be born per woman. The total fertility rate (TFR) refers to births per woman. This indicator shows the potential for population change in the country. A rate of two children per woman is considered the replacement rate for a population, resulting in relative stability in terms of total numbers. Rates above two

children indicate populations growing in size and may also indicate difficulties for families, to feed and educate their children and for women to enter the labour force, Figure 11.

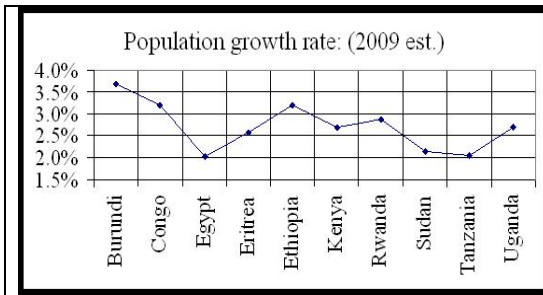


Figure 10. Population growth rate

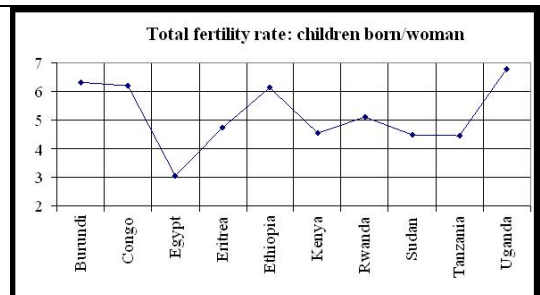


Figure 11. Total fertility rate

Economy includes the dealing with the economic development, and management of productive resources, i.e., water, land, labour, and capital. The gross domestic product (GDP) is the value of all final goods and services produced within a nation in a given year. GDP - real growth rate gives GDP growth on an annual basis adjusted for inflation and expressed as a percent, Figure 12. GDP - composition by sector gives the percentage contribution of agriculture, industry, and services to total GDP, Figure 13.

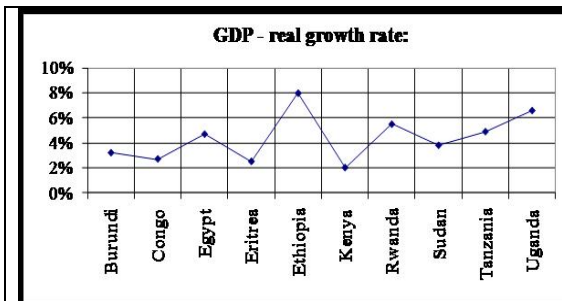


Figure 12. GDP - real growth rate

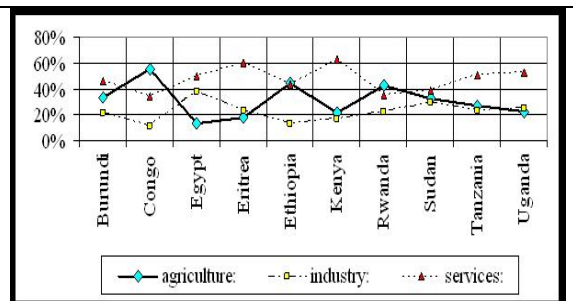


Figure 13. GDP - composition by sector

Labour force contains the total labour force figure, Figure 14. Inflation rate furnishes the annual percent change in consumer prices compared with the previous year's prices, Figure 15.

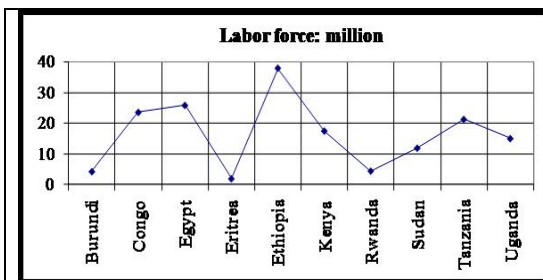


Figure 14. Labour force: million

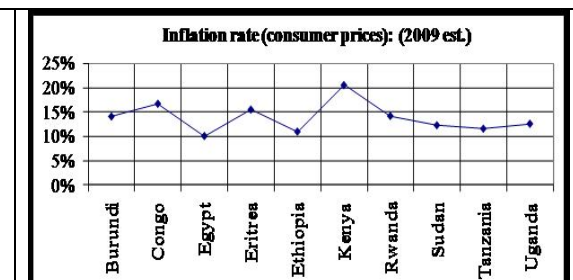
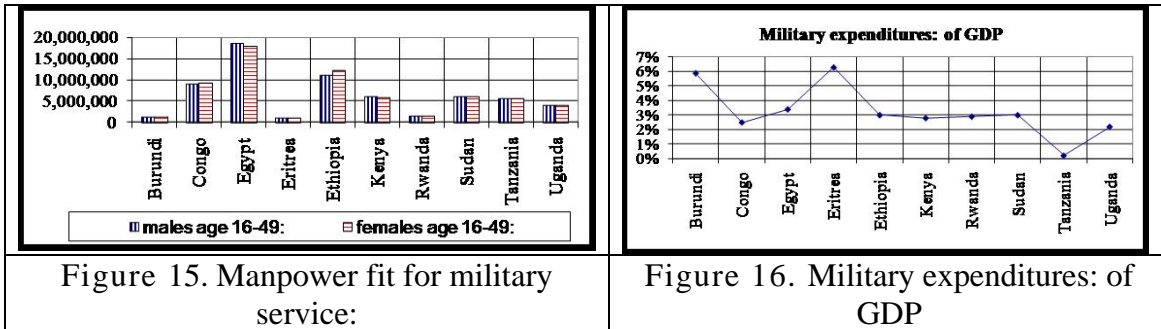


Figure 15. Inflation rate

Manpower fit for military service gives the number of both males and females in the military age range (ages 16-49) and who are not otherwise disqualified for health reasons; and provides a realistic estimate of the actual number fit to military serve, Figure 15. Military expenditures give spending on defence programs as a percent of gross domestic product (GDP) , Figure 16.



4. LEGAL SHARED WATER RESOURCES FRAME

Adopted by the UN General Assembly in 21 May 1997, UN Convention on the Law of the Non-navigational Uses of International Watercourses states that - Article 10 - in the event of a conflict between uses of an international watercourse, it shall be resolved with reference to articles 5 to 7, with special regard being given to the requirements of vital human needs, Appendix II.

5. CONCLUSIONS

Nile water resources are under rapidly growing pressure. Nile Basin needs major water investments. ‘Riparian’ cooperation and good regional relationships are essential to avoid conflict. In Nile Basin, water resources are under rapidly growing pressure due to growing water scarcity and falling per capita water availability. Nile Basin countries need major water investments to grow. Many challenges face Nile Basin countries such as water storage, climate variability, population growth, poverty, malnutrition, very limited infrastructure and electricity gap. Cooperation among Nile Basin countries is essential to avoid conflict. Nile Basin offers opportunities such as conflict prevention, power production, food production, and multipurpose storage. Environmental sustainability aspects such as conservation of watersheds, soils, wetlands, lakes maybe achieved. Nile Basin Initiative provides potential win-win benefits from cooperative development.

Nile Basin faces sustainable, economic, political and integrated challenges and opportunities. From sustainability perspective key challenges are limited water resource management, degraded watersheds and wetlands, loss of biodiversity, and water quality deterioration. Benefits to the river maybe summarized as sustain flows, sedimentation and soil conservation, flood-drought management, improved ecosystem sustainability, water quality conservation. From economic point of view main

challenges are reducing water resources development costs. Opportunities from the river are increased productivity at basin scale, increasing water availability & productivity, significant available hydropower, agricultural production, transport, new markets for inputs and consumers, regional trade. From political perspective key challenges are regional relations and political economy impacts. Opportunities because of the river would be policy shift to cooperation and development. From integrated viewpoint major challenges are regional fragmentation. Benefits beyond the river are cooperative processes enable cross border cooperation, integration of regional infrastructure, regional trade, and growing consumer markets, broader regional cooperation and integration.

Appendix I: Nile River Basin Regional Documents

- Treaty between Ethiopia and the United Kingdom, relative to the frontiers between the Anglo-Egyptian Sudan, Ethiopia, and Eritrea. Signed at Addis Ababa 5 May 1902
- Exchange of Notes between the United Kingdom and Italy Respecting Concessions for a Barrage at Lake Tsana and a Railway across Abyssinia from Eritrea to Italian Somaliland. Signed at Rome 14 and 20 December 1925
- Exchange of notes between His Majesty's Government in the United Kingdom and the Egyptian Government in regard to the use of the waters of the River Nile for irrigation purposes. Signed 7 May 1929; in force 7 May 1929
- Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ethiopia amending the description of the Kenya-Ethiopia boundary. Signed at Addis Ababa 29 September 1949; in force 29 September 1949
- Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt regarding the construction of the Owen Falls Dam. Signed in Uganda and Cairo 30 and 31 May 1949; in force 31 May 1949
- Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt regarding the construction of the Owen Falls Dam. Signed in Uganda and Cairo 5 December 1949; in force 5 December 1949
- Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt regarding the construction of the Owen Falls Dam in Uganda. Signed in Cairo 16 July 1952 and 5 January 1953; in force 5 January 1953
- Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland (on behalf of the Government of Uganda) and of the Government of Egypt regarding co-operation in meteorological and hydrological surveys in certain areas of the Nile Basin. Cairo, 19 January, 28 February and 20 March 1950; Came into force on 20 March 1950, with effect from 1 March 1950. United Kingdom of Great Britain and Northern Ireland, Uganda, on behalf of Egypt
- Protocol to establish a tripartite standing committee on polluted waters. Signed at Brussels, on 8 April 1950; Came into force on 8 April 1950. Belgium, France and Luxembourg

- Agreement (with Annexes) between the United Arab Republic and the Republic of Sudan for the full utilization of the Nile waters. Signed at Cairo, on 8 November 1959; Came into force on 22 November 1959. 453 U.N.T.S. 63 (1963)
- Protocol to the Agreement between the United Arab Republic and the Republic of Sudan for the full utilization of the Nile waters concerning the Establishment of the Permanent Joint Technical Committee. Signed at Cairo 17 January 1960; in force 17 January 1960.
- Agreement on the Nile River Basin Cooperative Framework, opened for signature on 14 May 2010 in Entebbe, Uganda (not in force).

Appendix II: UN Convention on the Law of the Non-navigational Uses of International Watercourses - Articles 5 to 7.

Article 5: Equitable and Reasonable Utilization and Participation

1. Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.
2. Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.

Article 6: Factors Relevant to Equitable and Reasonable Utilization

1. Utilization of an international watercourse in an equitable and reasonable manner within the meaning of article 5 requires taking into account all relevant factors and circumstances, including:
 - (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
 - (b) The social and economic needs of the watercourse States concerned;
 - (c) The population dependent on the watercourse in each watercourse State;
 - (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
 - (e) Existing and potential uses of the watercourse;
 - (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
 - (g) The availability of alternatives, of comparable value, to a particular planned or existing use.
2. In the application of article 5 or paragraph 1 of this article, watercourse States concerned shall, when the need arises, enter into consultations in a spirit of cooperation.
3. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and

equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

Article 7: Obligation Not to Cause Significant Harm

1. Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States.

2. Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of articles 5 and 6, in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.

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