

THE JONGLEI CANAL PROJECT: A CASE STUDY ON WATER SECURITY IN SOUTHERN SUDAN



BY
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A THESIS PRESENTED IN PARTIAL COMPLETION OF THE REQUIREMENTS OF
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THE JONGLEI CANAL PROJECT
A Case Study on Water Security on Southern Sudan

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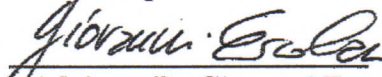
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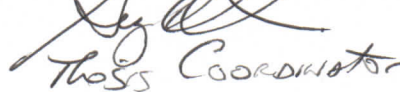
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Abstract

The purpose of this study is to facilitate a deeper understanding of issues surrounding water security in Southern Sudan. The issue examined in this paper pertains principally to the current water security issues affecting the Jonglei Project Area (JPA) in Southern Sudan. Further, this study examines the effects these issues have on overall water security throughout all the riparian states along the Nile. .

The approach taken in the examination of this topic is an in-depth analysis of the history and policies that have effected the JPA and the Nile at large. This is accomplished using an empirical policy and historical evaluation technique.¹

The study demonstrates that the policies and practices to date surrounding the JCP and the Nile river have been almost uniformly designed to maximize development potential and profit for Egypt and Northern Sudan without regard for environmental sustainability and long-term water security for non-Arab southern riparian states. Further, this study examines alternative approaches to development in the JPA that promote economic growth, while providing positive social and environmental outcomes for the populace who work in those regions.

¹ Pal, (2006).

ACKNOWLEDGEMENTS

Like any endeavour of this magnitude, credit for its completion falls invariably to more than simply the individual with his name on the cover. I hope in this page to be able to grant acknowledgment to all those who have helped me over the past two years.

I would like to begin by thanking my advisor throughout this entire endeavour: Dr. Giovanni Ercolani. His instruction, advice and reassurances throughout this project were invaluable.

Also, I would be remiss if I did not thank my editor Albert Mannard for in his own words “the inestimable amount of help he has provided over the last decade, teaching the author everything he now knows about life, love, war, literature, art, food, music, geography, history, politics, literature, mathematics, the economy, hockey, video games, tantric sex, and the care and feeding of that baby orang-utan we ended up eating after it was electrocuted by a giant eel.” I wish I could say he was exaggerating, but that orang-utan was scrumptious...

Of course nothing I do would have any meaning whatsoever without the love and support of my beautiful wife who puts up with way more than she should have to (just look at the last paragraph). She has always been by my side encouraging me through my professional and personal life.

My final thanks go out to my military colleagues with whom I served in Sudan with UNMIS. These experienced and professional men and women were a great help in supporting my research while in Sudan and acting as my surrogate family while I was away from my own.

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CHAPTER 1

Introduction: Project Overview

1. Statement of the Problem

Sudan is the largest country in Africa and as such is subject to a tremendously diverse climate. Sudan has three distinct climate zones ranging from desert in the northern regions gradually shifting to semi-desert in the central states and becoming forest in the South. (Faldalla, 2007:1)

The diverse climate is complimented by an equally diverse ethnic make-up; the Northern regions of the country are dominated by a variety of Arab tribes while the Southern states are populated by predominantly African tribes such as the Dinka, Nuer and Shilluk. These two distinct ethnic groups were historically separated by a vast swampland located in south-central Sudan known as *El-Sudd*, which aptly translates in English to ‘The Barrier.’

This vast swampland remains an integral part of the Nile River basin, linking the Ugandan White Nile and the Sobat River in addition to several other tributaries to the largest and most important river system on the continent, which flows North through the desert lands of Northern Sudan and Egypt and finally empties into the Mediterranean Sea.

The Nile has given life to the desert communities of North-East Africa for millennia and its flow remains critical to the livelihood of both Egypt and Sudan. Numerous projects and policies have been undertaken over the past century to improve the flow consistency of Nile waters as well as control its annual floods. These initiatives have taken the forms of reservoirs, canals and dams constructed throughout its length, although most notably within the borders of Egypt and Northern Sudan. These projects and programs have succeeded in ‘taming’ the Nile and allowed for large-scale agricultural projects to take shape and flourish in what would

otherwise be a lifeless desert.

These successes, however, have fostered what equates to an unquenchable thirst for greater access to the waters of the Nile by northern riparian states, leading to development projects further up the Nile in water-rich regions such as Uganda and Southern Sudan.

Several of these projects, such as the Owen Falls Dam and Jonglei Canal, have caused great consternation in East Africa due to the perception that they principally favor Egypt. These perceptions are furthered by Egypt's historical assertion to ownership of the waterway under the presumption that, "The Nile is Egypt and Egypt is the Nile" (Hornstein, 1999: 294). This dubious belief was further codified through the 1929 Nile Waters Agreement and firmly cemented through the 1959 Nile Waters Agreement (NWA) signed between Sudan and Egypt. This agreement acknowledges the existence of the other eight (8) riparian states but not their natural right to any specified portion of the Nile flow. This agreement currently remains unchanged, notwithstanding the current post-colonial and autonomous nature of the region compared to the quite different situation that existed when the NWA was ratified half a century ago.

Further, the realities of geography, climate change, and desertification throughout the Nile River Basin have added a degree of urgency to the need for sustainable and peaceful water resource development in Southern Sudan.

Certain particularly controversial issues, such as the *Jonglei Canal Project* and *1959 Nile Waters Agreement*, have become constant *flashpoints* between Arabs and black Africans. Some of these tensions were manifested in the Juba riots of April 1974, which left many dead and imprisoned. These schemes also served as rallying cries for the Sudanese Peoples Liberation Army/Movement (SPLA/M) leadership during the over 20-year civil war that ended in 2005

with the signing of the Comprehensive Peace Agreement (Johnson, 2006: 195) leading to the current uneasy peace.

So important were these issues that they were addressed by the late president of Southern Sudan John Garang deMabior in his Doctoral thesis at Iowa State University in 1981: *Identifying, Selecting and Implementing Rural Development Strategies for Socio-Economic Development in the Jonglei Project Area – Southern Region, Sudan.*

The embers of conflict in the region of the Nile and in particular the Jonglei Canal project continue to manifest themselves in the media through editorial contributions of Southern journalists who see Khartoum as a pawn of the “evil government in Cairo” (Jing, 2006) bent on leaving the South bereft of its key natural resource if independence comes to the region in the 2011 referendum.

The task of improving the efficiency of the Nile remains a noble challenge for the states along its banks. That said, initiatives within the Jonglei Project Area (JPA) can in no way be undertaken lightly given the current volatile political climate, not to mention the potential ecological and socio-economic implications of any drastic shifts in water resources. These factors become the roots of the problem to be examined in this paper.

2. The Purpose of the study

This study intends to examine *The Jonglei Canal Project, The 1959 Nile Water Agreement and The Nile Basin Initiative* and their impact on water security in the *Jonglei Project Area (JPA)*. The paper will take a critical look at the positive and negative water security implications of these issues and weigh them against each other in addition to incorporating certain concerns regarding climate change and sustainable development that dominate the region in a manner too significant to simply discard.

The study will conclude by recommending possible alternative strategies to water security development in the *JPA* that meet the basic economic realities of development, while balancing environmental and societal concerns. It should be noted as well that this paper does not intend to pull punches with respect to the grim realities of the current situation in Southern Sudan and the potentially drastic measures that will be required to not only provide those riparian communities a clean, consistent and sustainable resource, but serve to raise the development standard of the region so as to be a competitive force in East Africa and the continent at large.

3. Conceptual Framework

The conceptual framework of this study is grounded in Dr. Malin Falkenmark's work on water security and its interconnectedness with many other facets of human security in general (Falkenmark, 1990: 176). She asserts that water has a central role in the biosphere, which makes it relevant to several other large issues confronting humanity such as "desertification, water scarcity-related conflicts, waterlogging of mismanaged agricultural lands, forest die-back, eutrophication, and fish kill, to mention a few" (Falkenmark, 1990: 177).

The critical nature of this study is inspired by Falkenmark's notion of the "complexity of water vs. simplicity with which it is being addressed" (Falkenmark, 1990: 177). She feels that the seriousness and multi-faceted nature of water issues has led most social scientists to oversimplify many of the concerns in order to make them seem less complex and more digestible analytically. This has, in turn, led to short-sighted and insufficient approaches to dealing with water security, most notably in the developing world, where both the will and expertise for solving these challenges are at a premium.

It is within this frame of mind that the thesis attempts to take the issue of water security

seriously and contribute to its study through in-depth analysis of policies affecting the *JPA* and their potential risks and benefits to Southern Sudan.

Overall contextual framework of the study

The Certification of Training in Peace Support Operations (COTIPSO) offered through The United Nations Peace Operation Training Institute is purposefully designed to grant students the liberty and flexibility to examine particular facets within the field for which they have a personal interest.

Being a civil engineer turned political scientist, the field of water has been one in which I have had a deep interest from the very beginning of my formal post-secondary education. This interest was further focussed in my fourth-year undergraduate project, which consisted of a preliminary design of a water treatment plant for Canadian Forces Base Suffield, Alberta. This design project was completed under the tutelage of my project advisor at the time, Dr. Philippe Lamarche.

My interest in water issues was further honed during my Master's Degree thesis, which examined water security pertaining to groundwater management within the agricultural sector in India. This work was completed under the guidance and advice of Dr. Alejandro Palacios.

Water security is a cross-cutting issue within human security - since its absence can have severe direct and indirect impacts on several inter-connected areas such as health, personal, political, environmental and conflict security to name only a few. With the growth of third world populations, the expansion of inter-state conflict and the realities of climate change being acknowledged by even the most vehement sceptics of the past, the world is on the cusp of a new generation of conflict centred on control and exploitation of scarce regional resources. In the case of North Africa, this resource can be stated almost uniquely as *water*. Water security is

further defined and discussed at length in Chapter 2 of the study in order to provide the reader an accurate contextual understanding of this pivotal concept.

i. Potential significance of the study

Sudan, like many other countries in North and Central Africa, is in the middle of a water crisis. This has fuelled significant policy action from certain of its governments, each with varying success. With the growth of industrialization and population in Sudan, the water problems in the region are likely to get worse before they get better. It is for this reason that a study of this nature is so important. This study discusses the effectiveness of national and international schemes aimed at resolving Sudan's water management issues within the *JPA*. The conclusions gleaned from this investigation endeavour to provide those concerned with information leading towards a more viable strategy to develop and conserve water resources within the region - so as not to undertake potentially short-sighted solutions that will harm Sudan's social, economic and environmental sustainability over the long term. Further, these conclusions provide insight into the level of the Sudanese government's commitment to the water security of its population (specifically *Southern Sudan*). This is an issue of paramount importance, largely due to the profound global impacts associated with a country so vast in size with a largely rural, isolated and dispersed population.

4. Background information on Sudan

General

The nation of Sudan is a country whose history spans millennia and whose people have

contributed to profound works of philosophy, religion and culture. It would be impossible and arrogant to attempt to synthesize the story of this nation in only a few pages and this will certainly not be the case here. Rather, the intent of this background profile is to provide the reader with general information on the areas of Sudan that have direct relevance to the study. It will examine various geographical, political and social characteristics of the state and its people that will serve to compliment the case study examined later on in the work.

Geographic

Sudan is the largest country in Africa (Appendix A). It has a total area of 2,505,810 square kilometres that is subdivided into 2,376,000 square kilometres of land and 129,810 square kilometres of water. Comparatively speaking, it is slightly less than five times the size of France. Nine countries border Sudan: The Central African Republic (1,165 km), Chad (1,360 km), Democratic Republic of the Congo (628 km), Egypt (1,273 km), Eritrea (605 km), Ethiopia (1,606 km), Kenya (232 km), Libya (383 km) and Uganda (435 km). It has approximately 853 kilometres of coastline, all of it on the Red Sea. Climate and terrain vary greatly in Sudan depending on the region – the climate varies from tropical in the South to arid desert in the North. Similarly, terrain can vary greatly depending on the region, from alluvial clay plains in the South to sand dunes in the North. Further, mountainous regions dominate the far South, Northeast and West (CIA World Factbook, 2009).

The climate and terrain of a given region has a direct relation to the quantity and quality of water that exists within. Water in the coastal regions can be abundant such as in Port Sudan; this, however, is tempered by the high saline concentration in much of the water (notably groundwater) extracted. As well, water in the interior, predominantly from the Nile River Basin, is considered to be of generally high quality. However, ready water availability in the Northern

regions of Sudan does not extend for more than a few kilometres from the Nile River, while water in the Southern Nile River Basin is abundant but due to lack of municipal infrastructure requires great pains for locals to access (Fadlalla M.H, 2007: 3).

Political

The political history of Sudan extends as far back as the first Egyptian Dynasty in 2900 B.C., when the pharaohs led military expeditions into Nubia in search of slaves. For the purposes of brevity, however, this portion of the paper will begin in 1821 (Clammer P.,2008: 21).

In 1821, the Turkish-Egyptian Condominium began in Sudan. This was precipitated by the invasion of Sudan by Egypt's proxy ruler at the time, Muhammed Ali Pasha. After the conquest, little interest was shown by Egypt in Sudan with the exception of its single most valuable export: slaves. This export was eventually outlawed by General Charles Gordon Pasha; a British Royal Engineer who was appointed Governor General of Sudan in 1877 until his resignation in 1880. He would return in 1881 to fight the Mahdiah uprising (Fadlalla M.H, 2007: 43).

In 1882, Muhammad Ahmad ibn Abdallah, later to be known as Al Mahdi, led a revolt against the Turko-Egyptian Condominium, leading to an eventual overthrow of the administration, the sacking of Khartoum and the brutal murder of Gordon on 28 January 1885.

The period of the Mahdiah endured until September 2nd 1898, when Lord Herbert Kitchener summarily defeated the late Mahdi's army (known as the *Ansar*) at Omdurman. This defeat was followed by General Sir Francis Reginald Wingate's defeat of the Khalifa himself with the remainder of his *Ansar* army at Om Debreikat on 25 November 1899 (Fadlalla M.H, 2007: 45).

These events began the Anglo-Egyptian period in Sudan, with Lord Kitchener appointed as its Governor General. The British government in Sudan imposed protectionist policies in the South, restricting Arab traders from travelling to the region. This was intended to (and did) lay the groundwork for the eventual establishment of two separately administered regions: the North, being an Arab colony, and the South as part of the East African colonies already in Britain's possession.

After the Second World War, the bankrupt British Empire began the wholesale of its colonies through rapid independence initiatives, and Sudan was no exception. With rumblings of dissent already evident, Britain granted Sudan independence on January 1st 1956.

A coalition government was formed prior to independence between the Mahdists and the Umma Party. This uneasy partnership continued until 17 November 1958, when a military coup was staged by Lt. Gen. Ibrahim Abbud, forming the Supreme Council of Armed Force (SCAF). This government held for a short time until elections were held restoring a civilian elected government.

On May 25th 1969, Colonel Jaafar Muhammad Nimeiri staged another military coup with other officers calling themselves the Revolutionary Command Council (RCC). Nimeiri held power until 6 April 1985, when he was overthrown in yet another military coup led by Lt. Gen. Abd ar Rahman Siwar adh Dhahab. During the Nimeiri regime, he succeeded in imposing several controversial policies including the *Sharia* Law in September 1983. These policies fuelled enormous unrest in the Christian South, leading to growing violence and civil unrest in the region (Fadlalla M.H, 2007: 54).

The Transitional Military Council lasted until 1986 when it turned power over to a coalition government formed by Sadiq al Mahdi composed mainly of the Umma, DUP and NIF

parties. The inability for this weak coalition to reach consensus led to one more military coup, which was led by Sudan's current President: Colonel-General Omar Hassan Ahmed al Bashir on June 30th 1989.

Throughout the period beginning in 1983, Southern Sudan had descended into civil war with the North. The Sudanese Peoples Liberation Army (SPLA) and Sudanese Peoples Liberation Movement (SPLM) issued their manifesto from Ethiopia and began several assaults on government garrisons in the South (Johnson, D.H., 2006: 198).

War in Sudan continued until 9 January 2005, when the warrior-scholar leader of the SPLA, John Garang, and Omar al Bashir signed the Comprehensive Peace Agreement, ending the civil war and inviting the United Nations into the country to monitor security until the referendum in 2011 on the independence of Southern Sudan.

Social

Sudan currently supports a population of approximately 40,218,456 (July, 2008 estimate). The modern Sudanese population is predominantly a mix of North African Arabs who constitute 39% of the population (mostly in the North) and African blacks that are 52% of the population (CIA World Factbook, 2009).

The Arabs in Northern Sudan are members of various tribal groups spread throughout the region. The majority of Sudanese Arab tribes find their origins in the Bedouin who perpetually travelled the desert centuries ago. Since then, scores of Arab tribes have developed and spread throughout the Sudan, each with its own vibrant and dynamic history.

The African tribes of Sudan are equally captivating, comprised of a variety of African ethnic groups from the Nubians in Northern Sudan, to the Nuban tribes in Kordofan to the ancient tribes of the Dinka, Nuer and Shilluk in the South to name but a few.

With respect to religion, the vast majority of the population (70%) is Muslim, with minorities of Christians (5%) and Animists (25%), the last two of which dominate the southern regions with Islam being the more common religion in the North. Sudan has Arabic as its official language in the North and English as its official language in the South. Additionally, Sudan is home to several other tribal languages, each with innumerable dialects. These include Nubian, Ta Bedawie with diverse Nilotic and Nilo-Hamitic dialects (Fadlalla M.H., 2007: 22).

The '1-1-56' line (named after the date of Sudanese independence) was established by British Royal Surveyors prior to independence and further codified in the Addis Ababa Agreement of 1972. The line serves as the demarcation between Northern and Southern Sudan. It starts at the 12th parallel in the East and ends at the 9th parallel in the West with a pattern somewhat following natural terrain features and state borders. Several attempts have been made by various Northern governments since independence to re-draw the border area, re-locating oil and mineral resources from southern states to the north. These attempts have necessarily met with great friction from the Southern governments and on numerous occasions led to violence (Johnson D.H., 2006: 44).

CHAPTER 2

Review of Key Terms and Concepts

Before embarking on the case study examined in this work, it is worth taking the time to examine a number of key concepts and terms that are fundamental to the clear understanding of what this study intends to put forth.

This chapter contains a discussion on a number of themes that dissect the mechanics of the Nile River Basin as well as general water security issues in Sudan. These topics have been segregated into three main threads: (1) Research on the Nile; (2) The Science of the Nile River Basin in Southern Sudan; and (3) Current and Potential Water Security Issues in Southern Sudan.

1. Research on The Nile

The Nile River represents one of the most important and complex sources of water in Africa and the world. The reality of its importance, however, is rarely fully understood, in particular its nature and the fragile stability its water provides. This section of the work will take a brief look at the geographic significance of the Nile, the key political agreements that regulate its flow, as well as the key stakeholders in its management.

a. The Importance of the Nile

The Nile River is a composite of several tributaries that flow north and join at various points, with its final confluence being in Khartoum where the Blue and White Niles meet (Appendix B).

The Blue Nile is fed principally by the Dinder and Rahad rivers, which flow from the Ethiopian highlands. The White Nile originates in East Africa and is fed by Lake Victoria, in addition to the mountain tributaries of Rwanda, Uganda and Burundi. The White Nile also receives water at the confluence of the Sobat and Bahr al Ghazal in Southern Sudan at *El-Sudd*. It is in this region that much of the water from the White Nile is lost to transpiration and evaporation due to the swamplands of the area and their slow currents. The total area of the swamplands of *El-Sudd* varies between 5,000-8,000 square kilometres; the swamplands lose an estimated 14 billion cubic metres of water annually due to evaporation (Garang J.M.,

1981: 47).

From the confluence of the Blue and White Nile in Khartoum, the river system continues North through the desert lands of Egypt, emptying out into the Mediterranean Sea. The Nile's entire length stands at 6,671 km, 60 % of which is located in Sudan (Fadlalla M.H., 2007: 22).

The Nile has a yield of over 84 billion cubic metres annually. Most of this water is used by Egypt as the primary irrigation source for vast agricultural networks along its banks. Sudan utilizes a very small proportion of the total water from the Nile due to the restrictions imposed by the Nile Water Agreement of 1959 (Garang J.M., 1981: 261).

b. The Nile Water Agreements

The second *Nile Waters Agreement (NWA)* was signed on November 8th 1959 between The United Arab Republic (Egypt) and Republic of Sudan. This agreement replaced the 1929 Nile Waters Agreement that was signed between the two states when Sudan was a Condominium of the United Kingdom and Egypt (the only two key stakeholders in North Africa at the time). The original agreement “defined Egypt’s ‘acquired rights’ as 48 billion cubic metres per annum, with only 4 billion allocated to the Sudan – a total of 52 billion out of a mean flow of 84 as measured at Aswan. The remaining 32 ran to waste in the sea” (Howell P.P., 1983: 286).

The tenets of the 1929 agreement were renegotiated to a certain degree in the 1959 agreement with marginally more water being allocated to Sudan in addition to stipulations for equal sharing of any additional water that could be harnessed through future development projects. The 1959 agreement (Appendix D) – using the same maximum Nile flow data from Aswan – allocated 55.5 billion cubic metres (bcm) to Egypt with 18.5 bcm

for Sudan. The remaining 10 bcm was assumed to be lost to evaporation from Lake Nassir and Lake Nubia (Nicol A., 2003: 19).

In real terms, however, “Sudan is now utilizing about 14.6 bcm of its share of the Nile water for irrigation, of which 9.5 bcm are from the Blue Nile, 1.7 bcm from River Atbara, 1.8 bcm from the White Nile and 1.6 bcm from the River Nile.”²

c. The Jonglei Canal Projects

In brief, the intent of *The Jonglei Canal Project (JCP)* is to divert water from the slow-moving *El-Sudd* through a narrow canal that bypasses the swampland to the East.

The purpose of the canal is to harness the large amount of water that flows into Sudan from East Africa through this swamp and rapidly channel it through the canal as opposed to letting it follow its slower natural path through the marshes and wetlands of the *Sudd*, causing much of the water to be lost to transpiration and evaporation en-route North (Johnson D.H., 2006: 47).

In accordance with the 1959 *NWA*, the additional water that this project would yield would be split evenly between Egypt and Sudan upon completion.

d. Key Stakeholders

When examining the Nile, there are two principle states that monopolize its flow: Egypt and Sudan. This interpretation, however, ignores the eight (8) other riparian states along its banks and within the basin.

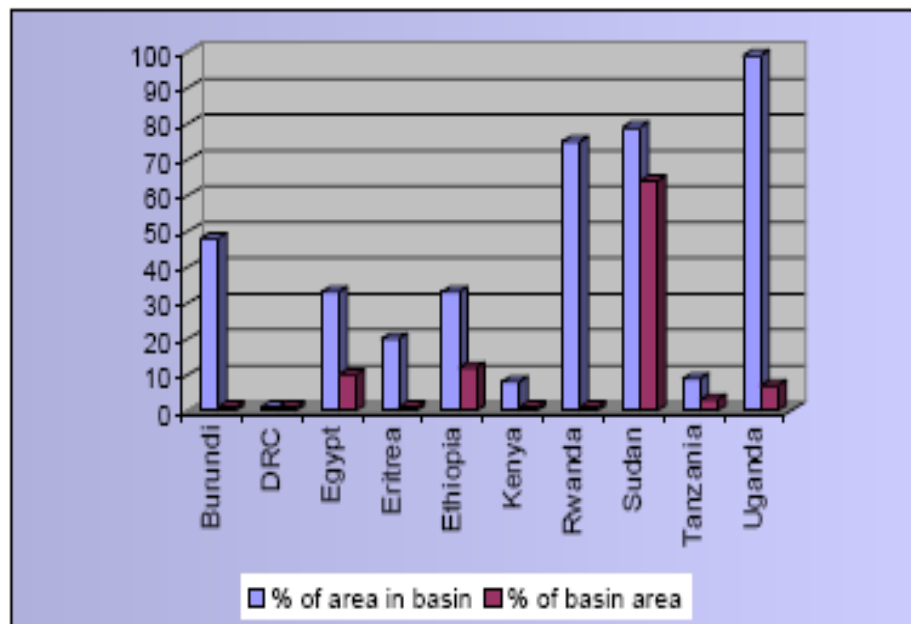
The majority of these ‘other’ states occupy the source water regions of the Nile. While they currently do not have any legal rights to the Nile waters, their countries remain its

² NDDCU, (2006), p. 9

primary source. Certain countries such as Uganda and Burundi have large areas of their country within the basin (Figure 2.1), but little if any right to the water within. This remains an issue of contention between these East African and the North African states.

These factors notwithstanding, Egypt remains the key stakeholder with respect to the Nile River, with the remaining riparian states playing roles that vary from marginal to none at all.

Figure 2.1: Proportions of basin area within each state and the extent of state contributions to the basin area



Nicol A., (2003), p. 7

2. The Science of the Nile River Basin in Southern Sudan

It stands to reason that the engineering and science that underlies the Nile is both dynamic and complex. It is not the aim of this portion of the study to fully explain all these concepts, but rather to present a general survey of certain fundamental terms that are incorporated into the study in order to facilitate a deeper understanding of the issues examined.

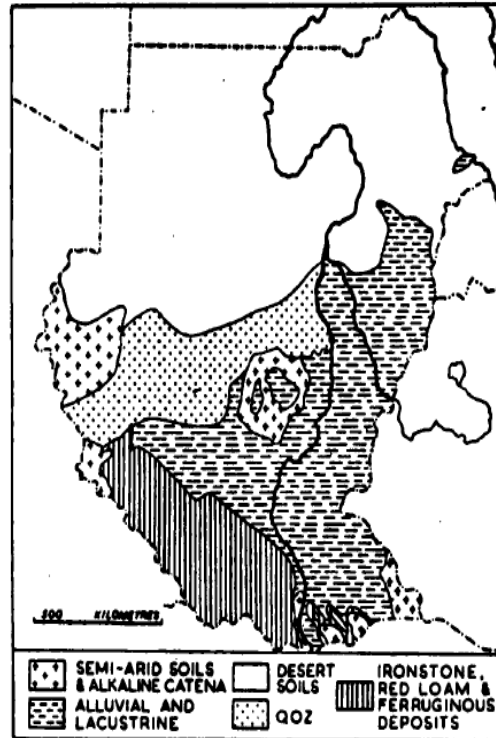
a. Soil Characteristics and Waterlogging

While it may seem bizarre to discuss the characteristics and hydrological properties of soil in Southern Sudan, it remains a critical discussion point with respect to the overarching thesis. The relevance of these factors will become clearer in this section and be made crystalline through the case study of the *Jonglei Project Area* in Chapter 4.

Sudan as a whole is home to five principle varieties of soil: (1) desert; (2) Qoz (rolling dunes) (3) semi-arid; (4) alluvial/lacustrine; and (5) lateritic soils (Figure 2.2). The soils discussed in this portion of the paper will be those prevalent in the *JPA*.

The principle soil type surrounding the Nile and *JPA* is of the alluvial/lacustrine variety. This soil is characterized as a clay soil that comes from the deposits left along the Nile from its tributaries. The Southern Clay Plains as they are commonly known in the region are vast and extend not only along the Nile tributaries but also throughout the majority of Southern Sudan (Garang J.M., 1981: 47).

Figure 2.2 – Soils of Sudan



Garang, J.M.,(1981), p. 38

The characteristics of the soil have been best described as consisting of “heavy, dark grey to chocolate clays...rich in fertility” (Garang J.M., 1981: 40). Negative aspects of the soil, however, are its poor drainage qualities and difficulty to work manually. These factors are what currently lead to the prevalence of waterlogging in the region during the rainy season.

Waterlogging occurs when soil becomes saturated with water, typically due to monsoons or rainy seasons in tropical regions. When these high volumes of water saturate the soil, minerals (i.e. various chlorides) held in the soil are dissolved and unable to drain or leach away from the soil, causing contamination. Further, excessive water can have fatal consequences for low-water crops due to the drowning of their root systems.³

These agricultural challenges, however, can be overcome, as was noted by the

³ de Sherbinin, A., (1996), p. 318

International Land Development Consultants (ILACO) who conducted a study in 1979. It found waterlogging problems could be solved through construction of surface drainage systems or by deep soil ripping and ploughing (Garang J.M., 1981: 41).

b. Flooding and Drought

Annual flooding and sporadic droughts are part and parcel to life along the Nile in Southern Sudan. The rainy season that occurs mainly between May and September bring high water levels to the regions around the *Sudd* and throughout the Southern Clay Plains region. As mentioned previously, the poor drainage quality of the soil, combined with the flatness of the terrain, create large amounts of flooding in the region that effectively stunts agriculture and trade for the duration of the season. Roads become impassable and any meaningful agriculture becomes next to impossible.

As detrimental as the rainy season can be in the region, the dry season can be equally difficult. “Over the past 40 years rainfall in the region has fallen by 30 percent” (Brown O., 2007: 1143). This trend has been proven by droughts that have recently occurred in the region that have lasted several years. During particularly drought-stricken years, the soil has become nearly impossible to cultivate due to nearly non-existent moisture content. The absence of any real irrigation in the region makes access to Nile water during the drought periods impractical when combined with the oppressive heat of the period and the long distances that need to be travelled.

The trials and torments of annual floods and droughts have been mollified in the Northern regions of Sudan as well as in Egypt, where dams and reservoirs have brought year-round consistency to the flow of the Nile. In addition, vast irrigation networks linked to these reservoir and dam systems have made access to Nile water for any use easy and

abundant. As shown previously, this is not the case in Southern Sudan, which still suffers the full brunt of seasonal droughts and floods.

c. Cattle Herding, Fishing and Agriculture

In Southern Sudan, cattle represent one of the most profound and valuable aspects of traditional life. Cattle are both a measure of wealth and status in traditional Southern communities and large herds are highly coveted.

However, the animals themselves represent a severe destructive force in the region, both environmentally and economically. Because of the over 37 million head of cattle (Fadlalla M.H., 2007: 123) in Sudan, grazing lands are often given very harsh treatment by frequent burning by nomadic herders, which gradually robs the soil of nutrients. “The inhabitants of these zones are constantly on the move in search of better pastures. They mostly utilize their animals in their living state, milking them and letting their blood but hardly ever slaughtering them. Their cattle are consequently thin and poor, and the herds are much too large for the scanty grazing” (Falkenmark M., 1976: 67). Dr. Garang has attributed this phenomenon to the “cultural constraints” of the tribes in the region that preclude them from using cattle as draught animals or as “capital that can be converted into money to buy new inputs” (Garang J.M., 1981: 78).

Agriculture in the region is largely a subsistence-based endeavour. Due to the difficult soil conditions in the region and the near total absence of mechanization, agriculture is restricted to small family farms with few large-scale farming operations (Garang J.M., 1981: 79).

Fishing is a comparably smaller industry, restricted in majority to young boys and women. Further, the task of fishing is generally conducted “only occasionally and when

there is a need and natural conditions are favourable” (Garang J.M., 1981: 79).

These realities on the ground are counterintuitive to the natural success factors in the region, which include a naturally rich and nutritious soil as well as ready access to water courses that have a year-round natural abundance of fish.

d. Desertification and Climate Change

While climate change and desertification can be considered two distinct issues facing Sudan, they remain so inter-linked that it would be impossible to discuss one without the other.

Desertification is a phenomenon that has been grossly misunderstood over the past decades. The United Nations Convention to Combat Desertification (UNCCD) has defined the issue as “not the natural expansion of existing deserts but the degradation of land in arid, semi-arid, and dry sub-humid areas. It is a gradual process of soil productivity loss and the thinning out of the vegetative cover because of human activities and climatic variations such as prolonged droughts and floods.”⁴ What this means to Southern Sudan is that, in addition to the Sahara expanding at a rate of over a mile per year, large swaths of land throughout and beyond the Sahel belt in the region are becoming desert due to over cultivation and poor land management practices (Brown O., 2007: 1143).

The natural and man-induced causes of desertification are being further compounded by the rapid onset of climate change in Africa. Over the past 40 years, rainfall in the region has fallen by 30 %; in addition, scientists predict that, by 2050, sub-Saharan Africa will suffer an additional 10 % decline of rainfall in its interior⁵. Further to rainfall decline, the African continent will also experience a general warming of its climate in drier sub-tropical regions

⁴ FAQ, UNCCD (www.unccd.int/knowledge/faq.php)

⁵ FAQ, UNCCD (www.unccd.int/knowledge/faq.php)

such as Southern Sudan. These realities will serve to further exacerbate the already fragile living conditions in the region.

The impacts of these realities have not eluded African leaders, who have become increasingly vocal on the issue. It was noted by Basil Ikouebe of Congo-Brazzaville that “the irony in the fact Africa, the region least responsible for global green house gas emissions (the average African produces less than a twentieth of the emissions of the average American), is likely to be the worst affected” (Brown O., 2007: 1142) by climate change.

As a result, desertification and climate change are gaining popularity as root causes of present and potential future conflict in the region of Southern Sudan. “Climate change is now being re-cast as a threat to international peace and security” (Brown O., 2007: 1141) most notably by a group of 11 high-ranking American officers that described the phenomenon in April 2007 as a ‘threat multiplier,’ further complicating concerns such as water scarcity and food insecurity (Brown O., 2007: 1142).

This theory has manifested itself in Southern Sudan with the migration of Arab nomadic tribes in search of greener pastures in Southern Sudan. Disputes have emerged between the sedentary tribes of the region and the nomads over access to water and grazing land for cattle, which has occasionally resulted in violence. These issues are compounded by the reality that people in the region are “already living on the edge” and “face severe droughts and other environmental disasters.”⁶

3. Water Security Issues in Southern Sudan

It is clear to the author that a great deal of what has previously been discussed has significant

⁶ UNCCD, (2008), p. 21

relevance to water security and could have been included in this section. This being said, these issues were segregated as such in an effort to maintain a clearer flow to the work. It should, however, be noted that water security is applicable to several of the topics discussed above including agriculture, drought and waterlogging among others.

It is difficult to discuss water security without a clear definition of ‘security’ in general. This is somewhat difficult to obtain, since countless definitions of the term currently exist within the academic community. This being said, it is still necessary to frame the term properly within the study so as to give the reader a clear understanding of the overarching context of how the term is perceived. Within this frame of mind, the definition that will be used in this study is that put forward by Arnold Wolfers, who states that, “Security, in any objective sense, measures the absence of threats to acquired values, in a subjective sense, the absence of fear that such values will be attacked” (Collins A., 2007: 3). This definition was selected because of its ease in translating itself into an accurate definition of water security simply by substituting the word ‘values’ for ‘water,’ which gives the reader a clear starting point for this section as well as a concise interpretation of what ‘security’ and ‘water security’ are understood to signify in this study.

a. What is Water Security?

In addition to the previous definition put forward on water security, it is also worth noting one of the primary documents that has continued to shape and carry this issue into the 21st Century. On Wednesday, March 22nd 2000, a delegation of various ministers hosted by the government of the Netherlands met in The Hague and signed a document entitled *Ministerial Declaration of The Hague on Water Security in the 21st Century*. The goal of the ministers was “to provide water security in the 21st Century.” [citation?] The three-page

document defined water security as the assurance “that freshwater, coastal and related ecosystems are protected and improved; that sustainable development and political stability are promoted, that every person has access to enough safe water at an affordable cost to lead a healthy and productive life and that the vulnerable are protected from the risks of water-related hazards.”

Further, the declaration outlined the basic challenges in meeting this goal: (1) Meeting Basic Needs; (2) Securing the Food Supply; (3) Protecting Eco-systems; (4) Sharing water-resources; (5) Managing risk; (6) Valuing Water; and (7) Governing Water Wisely. In light of what has been previously discussed, it becomes quite evident that these are all challenges faced by Southern Sudan with respect to the Nile River Basin and more specifically the *JPA* - what is not known is how Sudan specifically will overcome these challenges.

b. Why is Water Security Important

The quintessential question that must be addressed prior to going any further in this study is: Why is water security important?

Water is the one of the fundamental building blocks for survival on this planet. Second only to breathable air in the list of essential elements to life, access to and protection of this resource becomes a priority to humanity, its absence terrifying to the point of being a cause for war.

The United Nations projects that, by 2050, the world’s population will grow to approximately 8.9 billion people (UNDESA, 1999: p. 5). This represents a nearly 33 % growth from current 2008 values. With water stress currently being experienced in countries with some of the highest population densities and population growth rates (Appendix F), it is inevitable that water will continue to become less readily available and more sought after

as a resource for commercial, industrial and domestic use.

These current and growing concerns are why studies such as this one become so important to the future of peace and security in the 21st Century. Without a firm and progressive understanding of the necessary steps required to effectively manage, share and protect water resources throughout the world, this resource risks becoming a severe causal factor for future conflict and instability.

CHAPTER 3

RESEARCH METHODOLOGY

The research question in this study is:

How effective are current policies in maximizing the efficiency of water usage in the *Jonglei Project Area*, while ensuring overall water security and sustainability in the region? Further, what (if any) policy actions and/or adjustments are required to improve the current situation?

The purpose of the study is:

This paper intends to examine various issues within the *Jonglei Project Area (JPA)* and their impact on water security. The paper takes a critical look at the positive and negative water security aspects affecting the region in order to suggest alternative approaches in overcoming the challenges affecting Nile water management in the *JPA*. This is achieved by following the three procedural steps below:

1. Identification of the main factors affecting water security in the *JPA*.
2. Evaluation of the present and future impacts of these water security factors
3. Recommending alternative policy strategies to Nile water management in the *JPA* that maximize development potential in the region, while mitigating negative environmental and socio-economic impacts.

a. The Research Methodology

The researcher aims to investigate various water security policies and realities affecting the *JPA*. Further, this investigation provides insight into the impacts these policies, programs and initiatives have with respect to the provision of economically, socially and environmentally sustainable solutions to Southern Sudan's development challenges.

The type of reasoning employed throughout this study is empirical analysis. This form of reasoning is defined as follows:

Empirical Analysis. This method analyzes policy in relation to impacts and effects, costs and administration. Further, it looks not at what might be the *likely* effect of policy X, but what was the actual effect. Impact questions can be about the direct intended impact, unintended consequences on other targets, or surveys of client satisfaction (Pal L., 2006: 19). In the context of this paper, this facet of the research approach will be slightly modified to address impacts of the JCP. Since the project has not yet been completed, this aspect of the study will examine impacts that have resulted from the conceptual plan for the canal project over the years in addition to some of the potential benefits and drawbacks that could result.

Impact evaluation. This method focuses on “evaluating outcomes.” This approach is crucial to determining whether a program is successful or not in the context of its intended effects. Impact evaluation takes the program as the independent or causal variable and attempts to isolate its effect from other influences in the environment (Pal L., 2006: 19).

Pal goes on to describe the next steps of the process: “Having determined a program theory, impact evaluation goes on to look at actual causal chains by examining the programs effects. Impact evaluation tries to isolate causes and effects, but this is no easy task since any single cause or effect is (or may be seen to be) intimately bound to numerous other causes and effects” (Pal L., 2006: 292).

The strategy used within the framework of both evaluation methods is *meta-analysis*. This will consist of a review of “existing literature on a specific program, treating each evaluation study as a single case” (Pal L., 2006: 293). This strategy will be applied to all analysis methods throughout the research project in order to allow for consistency in format and structure.

The case study in this work will focus primarily on examining and evaluating general

strategies undertaken that affect water security development in the *JPA* namely: *The Jonglei Canal Project, The 1959 Nile Water Agreement and Nile Basin Initiative*. Additionally the study will incorporate secondary *causal factors* affecting the region's water security such as *culture* and *environment*.

b. The Data Needed and the Means for Attaining the Data

This study focuses mainly on one policy, one initiative and one uncompleted project. These were issues undertaken wholly or in part by the Sudanese government in the area of sustainable water resource development. For this reason, further data collection focuses on retrieving information relating to the specific project and policy undertaken by the aforementioned group.

The primary sources of information used in this work are found through secondary sources, included several books and peer-reviewed journal articles included in the reference section of this paper.

During the course of the research in location, informal interviews were conducted with certain locals in the area about their thoughts and concerns about the *Jonglei Canal Project* and *1959 Nile Waters Agreement*. Unfortunately, due to time restrictions and limited mobility in the region at the time of writing, not enough interviews could be given so as to provide input that would be more than anecdotal in nature.

2. The Specific Treatment of the Data

This study suggests alternative approaches to overcoming the challenges affecting water management in the *JPA*. This is achieved by following the three procedural methodological steps, indicated in the research methodology section.

a. The first step. The first step is to identify of the main issues and policies affecting water security in the *Jonglei Project Area*.

i. The data

The majority of the data from this portion is collected from published data already in the public domain. In addition, government websites and literature are used as sources of information regarding programs and policies concerning water policy and development.

ii. The treatment of the data

Through an exhaustive data collection initiative, all pertinent information regarding water development initiatives in the *JPA* is uncovered. The information is categorized and associated with one of the two particular elements studied in this paper. The case study is in turn summarized, through which each issue is examined vis-à-vis impact and process.

b. The second step. The second step evaluates the present and future impacts of these water related issues and policies.

i. The data

The information gathered in this portion is both qualitative and quantitative. It is taken from a variety of credible and published bodies and sources. The data gives a clear picture of the actual impact of these issues on both the resource itself as well as on several other factors previously mentioned.

ii. The treatment of the data

Using the above data, a detailed analysis will be produced for each issue in the case study in order to give a clear perspective on the exact impacts on water security.

c. The third step. The third theme is the giving of recommendations on alternative policy

strategies to Nile water management in the *JPA* that maximize development potential in the region, while mitigating negative environmental and socio-economic impacts to the region.

i. The data

This step incorporates the data and analysis recovered from the first two steps. This information provides the framework for the final analysis of the water policies affecting the *JPA*, allowing the researcher to provide viable options for alternative methods of addressing the issue.

ii. The treatment of the data

Using the information from the previous steps, a macro analysis is completed. This is accomplished by examining the analysis from the individual elements of the case study in order to draw out linkages that are then synthesized and incorporated into crosscutting policy recommendations.

3. Potential Gaps in the Research

In any research based on a case study approach, there exists the likely possibility of ignoring salient details on the issue that are not fully addressed in the case studies selected. While the researcher tries to avoid this eventuality through careful selection of policies, initiatives and projects to study, this does not eliminate the distinct possibility of inadvertent omissions.

With this in mind, the findings gleaned from this study should be interpreted within the context of the case study examined – not taking into account the possible complimentary issues that may collectively contribute to other factors affecting water management within Sudan at large.

CHAPTER 4

CASE STUDY: WATER SECURITY IN THE JONGLEI PROJECT AREA

Introduction

This chapter will examine water security issues in Southern Sudan by taking a case study approach to the events and realities affecting the *JPA* situated within Upper Nile and Jonglei

states. The study examines three dominant schemes that have and/or will have direct and indirect impacts on the water security situation of the communities living in and around the *JPA*.

These three aspects are (in order of examination):

- a. The 1959 Nile Waters Agreement;
- b. The Jonglei Canal Project; and
- c. The Nile Basin Initiative.

Following the detailed analysis of each area, general conclusions will be drawn that will lead to the macro analysis and recommendations put forward in Chapter 5 of this paper. These recommendations will contribute to the overall body of knowledge relevant to the region and provide at best guidance or at worst a starting point for any policy and practice adjustments the government could implement.

The 1959 Nile Waters Agreement.

Introduction.

The current Nile Waters Agreement was signed into law on November 8th 1959. The details of this agreement have already been put forward in Chapter 2 of this paper in addition to the agreement itself being included in the annexure. This portion of the paper will examine the

mechanics of the agreement in order to effectively illustrate two overriding flaws within the document, these being:

1. The Nile Waters Agreement of 1959 being unfairly biased towards the United Arab Republic (Egypt); and
2. The document's failure to include the other riparian states in the Nile River Basin that have equal if not greater claim to the waters of the Nile than the two original signatory republics.

These two points will be made abundantly clear and serve to demonstrate that this document is wholly obsolete within the *JPA*, Southern Sudan and East Africa at large.

Discussion and Analysis.

The bias in the 1959 Nile Waters Agreement becomes clear within the first paragraph of its *Section 1*. The United Arab Republic states in the agreement their "acquired right" to 48 billion cubic meters (bcm) of Nile Water annually. This constitutes over 57% of the Nile's total water yield of 84 bcm. What this 'right' means in real terms is that 57% of the Nile's water production is not up for negotiation or sharing; it belongs to Egypt – period. Where or when Egypt was given this 'right' remains unclear (although the 1929 Nile Water Agreement is cited as a precedent – a document so unfair to Sudan it makes the present treaty seem benevolent in comparison).

Of the remaining water of the Nile, Sudan is apportioned 18.5 bcm with Egypt receiving and additional 7.5 bcm for a total of 55.5 bcm (10 bcm is left, which is lost to evaporation).

In addition to the substantially smaller allotment of water given to Sudan through the agreement, there is an annex to the agreement which goes slightly further. Annex 1 of the agreement stipulates that the Republic of Sudan was obliged to sell 1.5 bcm to Egypt annually

for a period that extended until November of 1977. This annex essentially reduced Sudan's total water access by slightly over 8% for the first 18 years of the treaty. It is difficult to accurately quantify to what extent this clause was detrimental to the development potential of the region over that time but it is fair to assume that negative effects were incurred.

This need for Sudanese water by Egypt was stated as being for the purposes of national agricultural irrigation projects. This becomes an almost comical justification when one considers the comparative needs of Sudan with respect to fostering agricultural development contrasted against the highly developed Egyptian agricultural sector.⁷

The inequity of this agreement continues when one examines the wording of development initiatives to increase water yield of the Nile. As a result of the agreement, Egypt has the right to begin construction projects within Sudan that serve to increase the yield of the Nile. While this seems like a tenet of the agreement that favours Sudan, further scrutiny reveals otherwise.

The Egyptian government is required to give two years' notice of its projects and receive approval from the government of Sudan. Once these two matters are resolved, construction can begin unhampered. Once construction is completed, Sudan is entitled to 50% of the additional waters the project will yield, *provided* they pay for their share of the project, amounting to 50% of the total cost.

It stands to reason, based on respective GDPs, that Egypt has a far greater capacity for capital projects that increase water yield and that Sudan is substantially less likely to have the ability to readily pay for such projects in any timely fashion. These factors thus favour Egypt, since through the agreement it can build and control water projects outside its borders and reap 100% of the benefits, provided its partners remain bereft of any means to buy in.

⁷ <http://www.fao.org/ag/agl/aglw/aquastat/irrigationmap/index.stm>

The second element of the *Nile Waters Agreement* discussed is its complete disregard for the *eight* other riparian states along the Nile and its various tributaries. The first paragraph of the preamble best describes the overall theme with respect to any other state that would lay claim to the Nile water. The agreement sees Nile water development as a means for “full utilization of its water by the Republic of Sudan and the United Arab Republic.” [citation?]

The document does, at certain points, acknowledge the possibility of other states laying “claim” to a portion of the Nile. This acknowledgement is tempered, however, by stating that the two signatory states would be willing to “negotiate” with said claimant but from a “unified” position established prior to entering negotiations. This stipulation harkens back to the first criticism of the agreement.

It behoves Egypt to ensure that Sudan is on side prior to any negotiations for two principle reasons: the first being that over 60% of the Nile River Basin is in Sudan (compared to Egypt that has less than 10%), making the Sudan a primary stakeholder from the point of view of sheer geographical ownership of the watercourse; the second aspect being that the other riparian states in the Nile River Basin are *African* and not Arab states. To not have a unified voice in these negotiations may risk division between African and Arab Sudanese, leading to Egypt’s potential loss of a valuable water resource monopoly.

This being said, should such an event occur, Egypt has worked into the NWA a contingency to mitigate water loss as well as provide further incentive for Sudan to oppose water sharing with other riparian states. Should another state make a successful claim to the Nile waters, the share it receives will be “deducted from the shares of the two Republics in equal parts, as calculated at Aswan.” The unfairness of this stipulation is best explained through the following example:

Hypothetical Event 1: Uganda makes a claim for 10% (7.4 bcm) of the Nile's water

Hypothetical Event 2: The claim is accepted and Uganda is granted 7.4 bcm annually.

Consequence: The amount is deducted equally from the two Republics:

Egypt: 55.5 bcm – 3.7 bcm = 51.8 bcm (6.67 % decline in yield)

Sudan: 18.5 bcm – 3.7 bcm = 14.8 bcm (20.0 % decline in yield)

Through the previous example it becomes fairly clear that, purely based on proportionality, this agreement is wholly unfair and meant to hamstring the Sudanese government to reject any such claim based on how much they stand to lose relative to Egypt.

Conclusions.

It is worth reiterating the last point about *African* and *Arab* interests within the two Republics and whose interests are truly being catered to. One only has to compare Northern and Southern Sudan's proportions of irrigated land to gain a clear understanding where most of the Sudanese Nile water is going. Southern Sudan is nearly totally without large irrigation schemes; these are reserved for the North. This factor goes to the heart of the 1959 NWA; the agreement is itself one that was drafted *by* Arabs, *for* Arabs and holds no benefit for the South. This obsolete document serves now only as a mechanism to further ostracize and disenfranchise the Southern Sudanese from their brethren in greater East Africa and prevent them in having a controlling voice in what amounts to an inalienable riparian right of its people.

The Jonglei Canal Project

Introduction

The *Jonglei Canal Project (JCP)*, first proposed in 1901, was intended to be one of the first projects initiated after the signing of the *1959 Nile Waters Agreement*. As stated in Chapter 2 of this paper, the purpose of the canal was to “reduce evaporation losses from the White Nile as it moved through the Sudd, thereby increasing water supply to the North (and Egypt)” (Nicol A., 2003: 20). When completed, the canal would serve as a means to divert water from the Bahr el Jebel swamps and link up with the junction of the Sobat and White Nile at Al-Ganal, a small

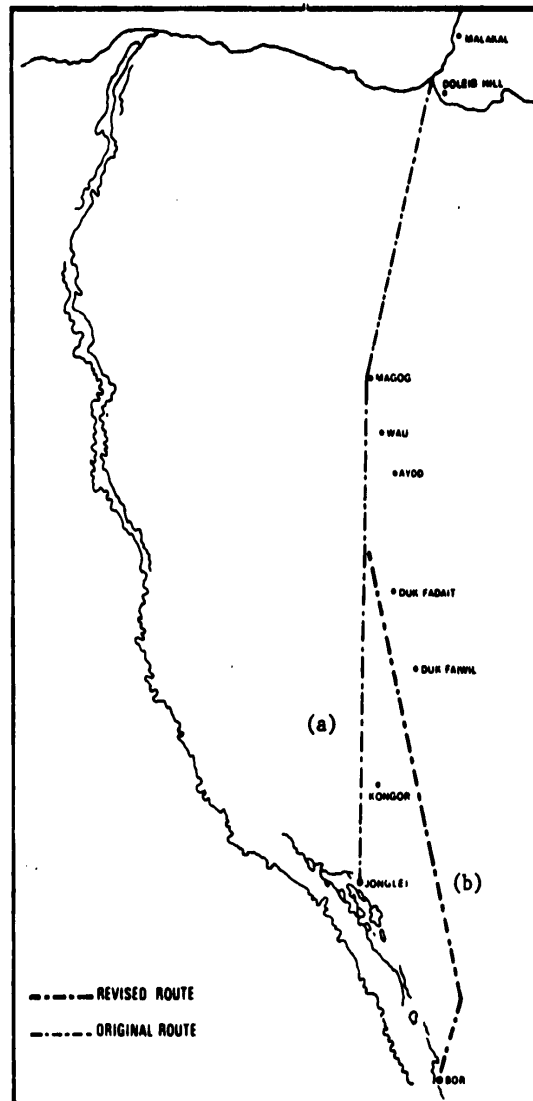
town south of Malakal.

In April of 1974, official plans for construction of the Jonglei Canal were announced. The High Executive Council (Southern Regional Government, 1972-1983) agreed ‘not to oppose’ them. This ascension by the South led to “public demonstrations against the plans in Juba which ended in the shooting of demonstrators and the arrest or flight of Regional Assemblymen opposed to the canal” (Johnson D.H., 2006: 195).

The canal itself was designed to have an average capacity of 25 million m³ per day, with a total length of 360 kilometres and slopes varying from 7.0 to 12.5 cm/km. The width of the canal would vary between 28 to 50 meters with a depth ranging from 4 to 7 meters. Plans included four designated crossing points in addition to motorized ferries. Lastly, the canal would be navigable by river craft and include an all-weather road along its East bank. The canal would thus serve to reduce the route from Juba to Malakal by 300 kilometres (Figure 4.1) - (Howell P.P., 1983: 291).

Construction of the canal began in the early 1980s; however, digging the main canal was halted in 1983 due to the outbreak of civil war. The first phase of the project intended to increase overall Nile water yield by some 4.4 bcm annually, with phase two of the project including additional storage at Lake Albert creating an expected 7.6 bcm per year as measured at Aswan (Nicol A., 2003: 12).

Figure 4.1: The Jonglei Canal (a) Old and (b) Final Versions



Garang J., (1981), p. 49

Discussion and Analysis

At the point of the publication of this paper, the *JCP* remained incomplete and thus impossible to analyse from the perspective of its actual impact on the region. However, the project itself and its mechanics have had significant impacts on Sudan including acting as a partial catalyst to the 1983 Civil War in the region (Nicol A., 2003: 20). The project itself, however, remains rife with conspiracy theories and nefarious plots surrounding its true purpose

and overall intent. These factors have coloured a great deal of the documentation on the issue, making it challenging to separate fact from fiction in several cases. It can be easily understood, given the large amount of misinformation surrounding the project, how many in Southern Sudan remain in great distrust of the project and have repeatedly refused to endorse it in any form.

At its core, the project has many positive and negative factors that are proven and valid. The positive factors tend to revolve around economic development and industry, while the negative points pertain to culture and the environment. The question then becomes: Do the positive development factors of the canal outweigh its negative environmental and cultural impacts?

Positive Aspects of the Jonglei Canal Project

As stated in the introduction, the construction of the canal will improve mobility and commerce throughout the region by introducing a navigable channel as well as an all season road through the region. It cannot be argued that such improvements to what is currently at best seasonal road infrastructure would drastically ameliorate the overall quality of life in the region. Simply from a food security perspective, these routes would allow for cheaper and more plentiful import and export of food and goods to Upper Nile and Jonglei State during the rainy season when food is very limited and prohibitively expensive.

A relevant anecdotal example regarding development pertains to the difficulty in procuring construction materials such as cement, sand, gravel and cinder blocks in the region. All these materials have to be brought into the region by barge at an enormous cost, as these materials cannot be quarried locally. The dry season prices for materials currently stand at \$30 for a bag of cement, \$15 for a bag of sand, \$10 for bag of gravel and \$4 for a cinder block (all prices in USD and attained from average market prices in Malakal). These represent prices

100% higher than the prices for similar materials in Khartoum - also keeping in mind that during the rainy season, material prices can go up by an additional 50% when the materials are available at all. These realities, when combined with the average salary of a Southerner in the region of approximately \$2 (USD) a day, make any development in the region challenging to the point of impossibility.

From a hydrologic cycle point of view, studies have also shown that the construction of the Canal “will relieve many areas downstream which over the last 20 years have been subjected to severe flooding, and at the same time ‘increase the potential for riverain grazing to be uncovered during the dry season” (Howell P.P., 1983: 288). In addition, the Nile loses 50% of its total flow when passing through the *Sudd*. This represents an enormous waste when one considers the overall water stress of the country and generally poor water management practices in the south.

Lastly, the benefits to agriculture cannot be understated with respect to the *JCP*. The implementation of the canal will allow for large irrigation projects throughout a region that is presently limited to subsistence farming due in large part to limited water availability. When combined with agricultural mechanization and the rich natural alluvial soils of the region, the success of any large scale farming projects become very favourable with the produce yielded easily and cheaply transported and sold throughout the *JPA* because of the increased mobility created by the canal (Garang J.M., 1981: 151).

Negative Aspects of the Jonglei Canal Project

While there is a great deal of good that can come of the canal, it has been shown quite conclusively that the social and environmental impacts of this project will drastically change the

landscape and traditional lifestyle of the region.

When the project was begun in the 1970s, a great deal of land was required for the actual construction of the canal. The government at the time appropriated these lands from the tribal communities who resided upon them. This land now belongs to the government and to date no compensation has been given to those tribal groups. This has led to a great deal of frustration on the part of Southerners and fostered a great deal of distrust of the true intentions of those mandated with its construction (Johnson D.H., 2006: 135). In simple terms, this matter has led to a great deal of bad press for the proponents of the project and this view will likely continue until the land issues are resolved.

A second negative aspect of the project is the fact that the project itself has been plagued by misinformation and propaganda used for various political aims. There were two versions of the *JCP* (Figure 4.1). The first version designed a canal system that would have a capacity of 55 million m³/day. Studies conducted found that the environmental and social impacts of such a project would be too severe and a second version of the project was drafted that reduced the canal capacity to 25 million m³/day, mitigating the environmental impacts (Howell P.P., 1983: 300). “While the approach in the 1940s was to ensure that the Equatorial Nile Project did not disturb the existing economic and social structure of the area, in the 1970s the approach [was] 'development without destruction'. The canal [would] provide an important infrastructure for economic and social mobilization of the vast human, land and animal resources of the area” (Howell P.P., 1983: 288). To this day however, there remains confusion on the actual details of the project and which impacts are associated with which version of the project. This *real* issue is compounded by many other less valid claims surrounding the canal project, including the importation of Egyptian peasants to the *JCP* for the purpose of establishing farms as well as the

overarching belief that Egypt will not live up to its promises to the South (Garang J.M., 1981: 54).

The last factor notwithstanding, the *JCP* has also to deal with several problems associated with its likely environmental impacts. The construction of the canal would lead to a draining of the *Sudd* to a certain degree. The impact of such an occurrence would be the drying out of lands typically inundated partially or fully depending on the season. This would cause a change in the availability of fish in certain seasons as well as force a change in the grazing habits of cattle throughout the *JPA*. The cause of the former is obvious while the cause of the latter would be due to the migration and death of critical grasslands typically used by cattle herders to feed their animals. It should be noted, however, that it has been speculated that with the drying out of partially inundated land, the canal would also make available new land that was previously under water year-round (Howell P.P., 1983: 299). Lastly, the most recent studies that led to the revision of the project to its current form have largely mitigated its negative environmental impacts, as previously stated.

Perhaps the single most severe impact the canal will have within the *JPA* will be in the area of social and cultural shifts. As noted in the section on the positive impacts of the canal, it will likely accelerate development in the region, so much so that underlying fears exist that this development will come at the cost of the traditional cultural and social values of local people. With the introduction of large-scale irrigation and farming, traditional occupations such as the herding of cattle as well as subsistence farming and fishing may no longer be considered a viable enterprise for locals. This could lead Southerners to abandon these traditional occupations and become employees on large farming projects resulting from the canal. Dr. John Garang has noted that such a shift could present some very real challenges to the region and recommended

that while shifts of this sort can be positive, they must occur gradually and incorporate the traditional values of the people (Garang J.M., 1981: 54).

Conclusion

In examining the Jonglei Canal Project, various aspects of the endeavour have been clarified within the context of its *real* benefits and drawbacks. This project has the potential to yield great wealth for the region if it is conducted in concordance with its latest design. It will drastically alter the economic landscape of the JPA, bringing development, industry, trade and mobility to the region. However, with these benefits the risk will be run of losing many of the traditional habits that have defined the people of the region for millennia. Garang has suggested that, if the project is carried out in a careful and methodical manner, the fundamental elements of Southern Sudanese culture can be adapted to the new landscape to be brought about through the JCP. He has noted that this can only be done if incorporated into the project is “an appropriate rural development strategy” that he believed had not yet been put forward (Garang J.M., 1981: 220).

The Nile Basin Initiative

Introduction

The single overarching environmental factor affecting development in the *JPA* currently and in the future is climate change. In terms of any real action, Sudan has done little more than the rest of the world in addressing this global phenomenon. However, Sudan has been successful in drafting several national policy studies and programs to address some of the manifestations of climate change in Sudan such as watershed management, drought and desertification. The most relevant policies are noted below in chronological order⁸:

- The Desert Encroachment Control and Rehabilitation Programme (DECARP) 1976
- The National Workshop on Control of Desertification (1991)
- The Sudan Comprehensive National Strategy (1992 - 2002)
- The 5 Year Plan for Combating Desertification (1993)
- The National Forum for Preparation of the National Action Programme (1998)

While several of these programs have been very ambitious (the Sudan Comprehensive National Strategy in particular, which included plans for forest conservation, irrigation schemes and soil conservation), “implementation has been largely unsuccessful” due in large part to political instability and lack of financial capital.⁹

Perhaps one of the most promising initiatives that currently exist that has the greatest hope of mitigating climate change through greater water security in the *JPA* is the *Nile Basin Initiative (NBI) Act of 2002* (Appendix E). This document was assented to on October 11th 2002 by all the riparian states in the Nile Basin with the exception of Eritrea, which was at war with Ethiopia at the time.

The *NBI* has a vision of achieving “sustainable socio-economic development through the

⁸ GOS, Sudan National Report to the Conference of Parties on the Implementation of the UNCCD, (1999), p. 3

⁹ http://www.nilebasin.org/index.php?option=com_content&task=view&id=22&Itemid=114

equitable utilization of, and benefit from the common Nile Basin water resources.” Its main objectives are: (1) To develop the Water resources of the Nile in a sustainable and equitable way to ensure prosperity, security and peace for all its people; (2) To ensure efficient water management and the optimal use of the resources; (3) To ensure cooperation and joint action between the riparian countries, seeking win-win gains; (4) To target poverty eradication and promote economic integration; and (5) To ensure that the program results in a move from planning to action.¹⁰ In addition to the signatories, the NBI has financial and political support from various international bodies such as the World Bank, Global Environmental Facility, UNDP, UNOPS and several Western donor countries such as Canada and the UK.

Since its inception, the NBI has had several real successes in water security initiatives in the Nile River Basin such as the West Delta Irrigation Infrastructure Development Project (Egypt; 2004-2007) and the Irrigation and Drainage Project (Ethiopia, 2007). The NBI has also initiated a series of concurrent projects under the umbrella title of the Shared Vision Projects (SVP).¹¹

Discussion and Analysis

With respect to consensus-based international initiatives, The Nile Basin Initiative represents one of the primary schemes currently in place with the potential to help develop the *JPA*. Insofar as practical progress made by this group, its main effort has been supporting and implementing the ‘Shared Vision Projects (SVP).’ These represent a series of eight projects addressing various issues concerning the Nile Basin. They include training initiatives, environmental action, power trade, agricultural development, water resource planning and management, confidence building and socio-economic development.¹²

¹⁰ <http://webapps01.un.org/dsd/partnerships/public/partnerships/1013.html>

¹¹ <http://www.nilebasin.org>

¹² http://www.nilebasin.org/index.php?Itemid=116&id=28&option=com_content&task=view

The SVP has offices in every signatory country with each country being the lead office on one of the specific eight projects. The projects are consensus-based and aim to incorporate the opinions of all nations within the Nile Basin. The SVP concluded in early 2009 with general successes in the areas of policy development and capacity building. However, the fact remains that these sorts of successes do not translate to tangible results on the ground. The policy developments accomplished through the NBI's SVP focus on recommendations to the participatory riparian states. They have certainly assisted in the raising of awareness in civil society and government but real implementation of such policy recommendations have yet to be universally adopted by all the riparian states. In the case of the *JPA*, progress in all the areas addressed in the SVP remains marginal.¹³ This is primarily due to the spending priorities of the Government of Sudan and their specific spending priorities following (and perhaps leading towards) civil war.

Conclusion

The *Nile Basin Initiative* has accomplished much since its inception in February 1992. The organization has conducted workshops, published academic studies, developed policy recommendations, awarded post-graduate bursaries as well as contributing to growth in water resource expertise within the region. This being said, the *NBI* remains a think tank with few political teeth. It cannot enforce policy on nation states and remains very reliant on foreign assistance to stay operational. Further, the consensus-based approach of the *NBI* in addition to its incorporation of numerous socio-economic and geo-political factors into its thinking process makes achieving universal agreement and rapid implementation very difficult in most cases.

The *NBI* nevertheless remains one of the best hopes for equitable water development in Southern Sudan, adhering to the spirit of Dr. John Garang's philosophy of conscientious

¹³ http://www.nilebasin.org/index.php?option=com_content&task=view&id=22&Itemid=114

development incorporating culture and maintaining effective stewardship of the environment.

The question remains, however, as to whether the Nile Basin hydrological system will be able to remain sustainable in addition to not becoming a catalyst for further conflict in the interim.

CHAPTER 5

MACRO ANALYSIS AND RECOMMEDATIONS

1. Introduction

Through the three issues examined previously, several conclusions were drawn out with respect to the various challenges facing water security within the *JPA*. These challenges are broad and in several cases quite severe. They represent some of the key obstacles hampering sustainable resource management of Nile Basin water in Sudan. This chapter begins with a macro-analysis of the issues previously discussed. This analysis draws out some of the root causes of the case study conclusions based on common linkages and respective impact severity. From this analysis, recommendations for alternative approaches to resolve the issues facing The Nile Basin in the state are suggested.

2. Macro-Analysis of Case Study Policies

There are several factors that affect water security in the *JPA*, as has been shown through the previous case study. This portion of the paper establishes the root causes of these issues and presents the interconnected nature of many of the biggest challenges facing the *JPA* with respect to water security.

National and International Approaches to Water Security Management in the JPA.

One of the key factors negatively affecting water security in the *JPA* is the disjointed manner by which it is dealt with both at the national and international levels. This challenge to water management has been illustrated in all three of the schemes examined in the case study.

These studies illustrated the cultural and political issues within riparian governments that prevent a coherent and unified approach to dealing with this resource. While riparian states have made great strides in drafting policy advice through the Nile Basin Initiative, these documents carry little effective weight in leading to meaningful change in Sudan. This is due to the Nile Basin being subject to the Nile Waters Agreement of 1959, as discussed in the first portion of the study, which effectively gives Egypt a monopoly on its control. This has led to the Egyptian (and thus Arab-Sudanese) governments having the choice of whether or not to adhere to policy recommendations by other riparian states.

While several states have taken proactive initiatives as previously discussed, these are not necessarily states that are in situations of severe water stress (i.e. Uganda) or states that are of a geographical size to effect large-scale watershed improvement (i.e. DRC). Further, states that remain large and water stressed, such as Egypt and Sudan, have no policies governing Nile water management outside the antiquated Nile Water Agreement of 1959.

Egyptian and Northern Sudanese vs. Southern Sudanese Interests

The common thread throughout the NWA and JCP schemes examined in this work have been the more than obvious favouring of the rich land-owning Arab (Egyptian and Sudanese) community over the poor and under-represented Southern Sudanese community with respect to policy. From the Arab traders that ventured to the South in the hunt for slaves, to the British Empire's catering to Egyptian interests during the condominium period and continuing today with President Bashir's intentional stifling of the Comprehensive Peace Agreement through covert destabilisation efforts in the South

(i.e. General Gabriel Tang Ginye's incursion into Malakal in late February 2009 resulting in 57 fatalities and the disintegration of the Joint Integrated Units in the region)¹⁴ – few if any genuine efforts have been made by the Government of Sudan to account for the interests of the non-Arab cross section of its population. This has followed as illustrated in this study in the field of water security as well.

This study has shown that the South has constantly suffered from under-development in the area of water resources, which has in turn led to the lack of overall development in the fields of agriculture, irrigation and availability of clean water. This becomes unavoidably clear when one examines the abundance of water in Southern Sudan comparatively to the North, where water is scarce yet irrigated agricultural schemes along the banks of the Nile flourish.

The institutionalized attitude of the Sudanese government to ignore the South has justifiably fuelled a great deal of mistrust, which has in turn led to the Southern refusal to endorse positive development initiatives such as the Jonglei Canal Project. While the benefits of this project remain to be seen and its potential cultural back-blast is very real, it nonetheless remains a singular positive hope for development in the South as well as a first step to mending burnt bridges between the two solitudes of Sudan in addition to providing sustainable water security to the region.

3. Recommendations

Based on the observations of this study, one could easily draw out some very strong and serious recommendations for the Governments of Sudan, Egypt and the other riparian states to foster greater water security in the *JPA*. These would likely be:

1. Annul the Nile Waters Agreement of 1959 and re-draft a binding

¹⁴ <http://www.sudantribune.com/spip.php?article30316>

agreement that incorporates all riparian states, giving proportionate allocation of the Nile based on geography, while also including stipulations that recognize Southern Sudan as a region that requires special consideration as a distinct economic and cultural group.

2. Fund the Jonglei Canal Project through an inclusive process with the South, ensuring that all voices are heard and that Southern Sudan receives all the benefits it is entitled to with respect to Egypt's revised canal plan.
3. Give the Nile Basin Initiative a larger mandate with respect to managing the Nile Basin by making its policy findings legally binding to all riparian states. This could be a stipulation in the revised NWA mentioned in the first recommendation.

While these would be the ideal recommendations put forward by the study, the author is not so naïve as to assume that the geo-political realities of the region would allow them to occur any time in the near future.

The more pragmatic approach to resolving the most immediate issues surrounding water security in Southern Sudan would revolve around some form of the second recommendation mentioned above. It is the belief of the author that the Jonglei Canal Project stands as the single greatest hope to achieve total water security in the South in order to finally give Southerners the chance for economic development that they so rightly deserve. Further, the project would serve as a catalyst to build trust between Afro-Arab and Southern Sudanese, which has not as yet had any meaningful chance to develop.

This idea, however, would be the farthest thing from being achievable without an enormous collaborative effort from the Southern Sudanese, Northern Sudanese and Egyptian governments. There would likely also have to be enthusiastic financial support from the international community as well as its willingness to serve as an honest broker between the three key parties. The *NBI* could serve as a starting point for this initiative since it already has the involvement of all the aforementioned stakeholders and contributors.

Additionally, significant information campaigns would have to be initiated throughout the *JCP* and Southern Sudan at large to sell the benefits of this project and reassure the tribal communities in the region that they stand to benefit from its success. This leads into the more complex aspect mentioned by Dr. Garang of an ‘effective rural development strategy’ as well as the incorporation of traditional Southern Sudanese values in what would certainly be a paramount shift in the economic paradigm of the region. This would be a challenge equal to (if no greater than) the actual construction of the canal. This would be doubly difficult in many ways due to the incongruence of current Sudanese cultural practices compared to those necessary to maximize the economic development potential of the canal.

Cattle herding, subsistence farming and traditional fishing would be replaced by beef ranching, mechanized farming and commercial fishing. Transportation of goods to the region would become less expensive and thus increase trade and trading habits. Growth in regional wealth would lead to lifestyle changes and greater social and geographic mobility. All these factors would combine to create a paradigm that could drastically improve the standard of living for the region but simultaneously stifle the

centuries-old traditions of the regional tribal communities. This was a problem to which Dr. Garang himself was not able to offer an absolute solution and the author of this study does not presume to have the answer either. These factors, however, are very real and must be addressed in order to reach an equitable and lasting solution to water security in the Jonglei Project Area.

4. Conclusions

The expertise and will required to address water security in the Jonglei Project Area and to succeed is enormous and perhaps beyond what Sudan is currently capable of achieving given its current political climate and structure. That said, it is hoped that the conclusions, recommendations and proposal this paper has produced will in some way positively contribute to the issue as a whole. Further, it is hoped that this study will foster potential in creating further dialogue to deal with the challenges of water security and management in the JCP. The recommendation of this study are meant as a second beginning, following in the very profound and brilliant work of the late Dr. John Garang. It is the author's belief that the proposal provides real options that attempt to offer integrated solutions to the water security challenges previously discussed. Further, while the proposal may not provide a total solution, it nonetheless represents a positive step in resolving this significant economic, social and environmental challenge.

Through all that has been examined in this work, it starts to become evident that water security along the Nile likens to a zero-sum game when addressed disjointedly. Population in the region continues to grow, while resources become increasingly scarce with little being done to control either. These facts equate to a region unable to provide its inhabitants with effective security from exploitation of its most valuable resource.

Further, these issues are exacerbated by the cultural incompatibilities of riparian states and their inability to compromise on issues fostering *mutual* water security as opposed to the *national* equivalent. This attitude will remain the key obstacle to any meaningful resolution to water conflicts until such time as those stakeholders accept the self-evident reality that the Nile is not a body of water that can be appropriated nationally, only secured cooperatively.

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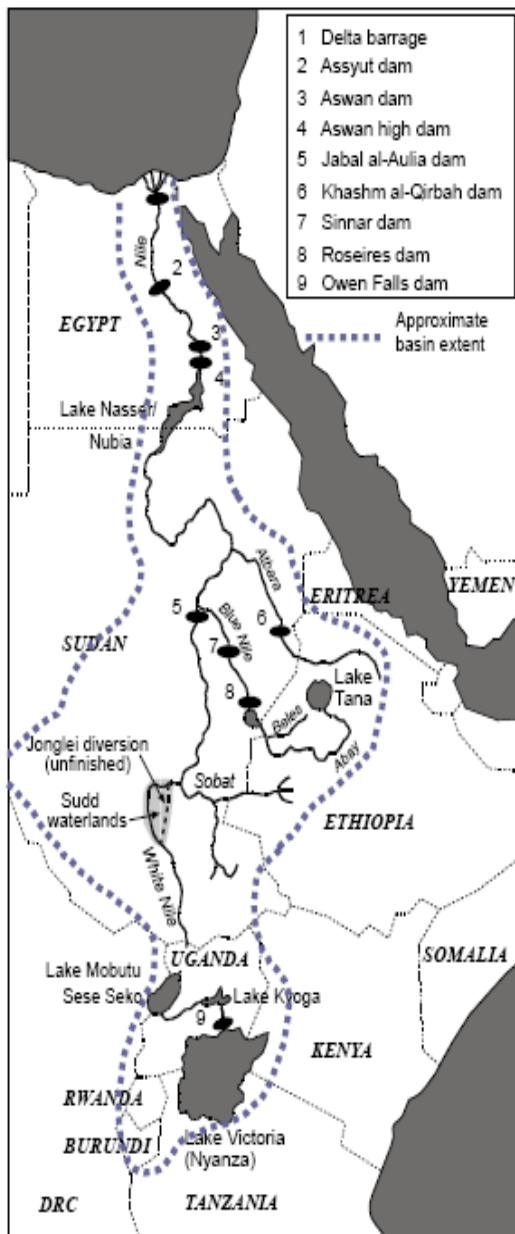
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Appendix A – Regional Map of Sudan



Encyclopaedia Britannica (2009)



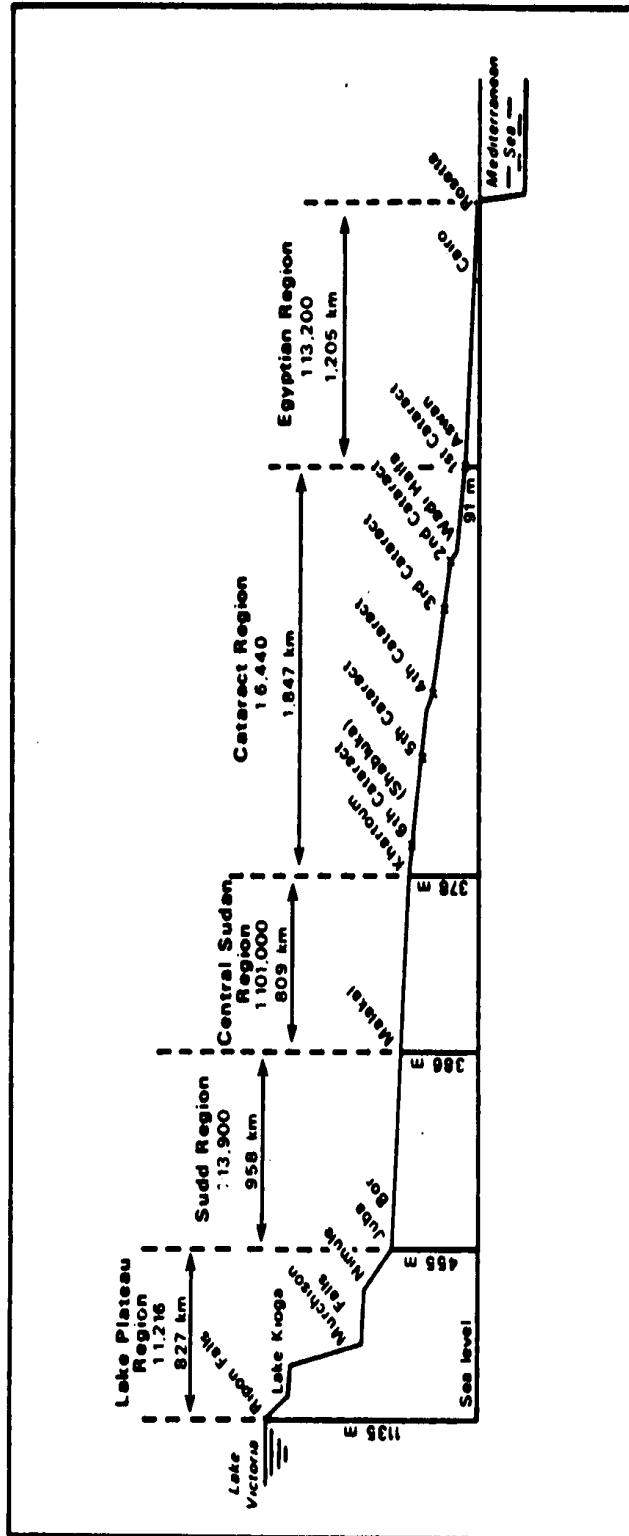
the Nile River Basin



Encyclopaedia Britannica (2009)

Nicol A., p. 7 (2003)

Appendix C - Slope of the Nile River from Lake Victoria to the Mediterranean Sea



Garang J. (1981), p. 48

Appendix D – Text of the 1959 Nile Water Agreement

[Translation¹ - Traduction²]

No. 6519. AGREEMENT³ BETWEEN THE REPUBLIC OF THE SUDAN AND THE UNITED ARAB REPUBLIC FOR THE FULL UTILIZATION OF THE NILE WATERS. SIGNED AT CAIRO, ON 8 NOVEMBER 1959

As the River Nile needs projects, for its full control and for increasing its yield for the full utilization of its waters by the Republic of the Sudan and the United Arab Republic on technical working arrangements other than those now applied:

And as these works require for their execution and administration, full agreement and co-operation between the two Republics in order to regulate their benefits and utilize the Nile waters in a manner which secures the present and future requirements of the two countries:

And as the Nile waters Agreement concluded in 1929⁴ provided only for the partial use of the Nile waters and did not extent to include a complete control of the River waters, the two Republics have agreed on the following:

First

THE PRESENT ACQUIRED RIGHTS

1. That the amount of the Nile waters used by the United Arab Republic until this Agreement is signed shall be her acquired right before obtaining the benefits of the Nile Control Projects and the projects which will increase its yield and which projects are referred to in this Agreement; The total of this acquired right is 48 Millions of cubic meters per year as measured at Aswan.
2. That the amount of the waters used at present by the Republic of Sudan shall be her acquired right before obtaining the benefits of the projects referred to above. The total amount of this acquired right is 4 Millions of cubic meters per year as measured at Aswan.

Second

THE NILE CONTROL PROJECTS AND THE DIVISION OF THEIR BENEFITS BETWEEN THE TWO REPUBLICS

1. In order to regulate the River waters and control their flow into the sea, the two Republics agree that the United Arab Republic constructs the Sudd el Aali at Aswan as the first link of a series of projects on the Nile for over-year storage.
2. In order to enable the Sudan to utilize its share of the water, the two Republics agree that the Republic of Sudan shall construct the Roseires Dam on the Blue Nile and any other works which the Republic of the Sudan considers essential for the utilization of its share.

-
1. Translation by the Government of the United Arab Republic.
 2. Traduction du Gouvernement de la République arabe unie
 3. Came into force on 12 December 1959, in accordance with article 7.
 4. League of Nations, *Treaty Series*, Vol. XCIII, p. 43.

The net benefit from the Sudd el Aali Reservoir shall be calculated on the basis of the average natural River yield of water at Aswan in the years of this century, which is estimated at about 84 Milliards of cubic meters per year. The acquired rights of the two Republics referred to in Article "First" as measured at Aswan, and the average of losses of over-year storage of the Sudd El Aali Reservoir shall be deducted from this yield, and the balance shall be the net benefit which shall be divided between the two Republics.

4. The net benefit from the Sudd el Aali Reservoir mentioned in the previous item, shall be divided between the two Republics at the ratio of $1\frac{1}{2}$ for the Sudan and $7\frac{1}{2}$ for the United Arab Republic so long as the average river yield remains in future within the limits of the average yield referred to in the previous paragraph. This means that, if the average yield remains the same as the average of the previous years of this century which is estimated at 84 Milliards, and if the losses of over-year storage remain equal to the present estimate of 10 Milliards, the net benefit of the Sudd el Aali Reservoir shall be 22 Milliards of which the share of the Republic of the Sudan shall be $14\frac{1}{2}$ Milliards and the share of the United Arab Republic shall be $7\frac{1}{2}$ Milliards. By adding these shares to their acquired rights, the total share from the net yield of the Nile after the full operation of the Sudd el Aali Reservoir shall be $18\frac{1}{2}$ Milliards for the Republic of the Sudan and $55\frac{1}{2}$ Milliards for the United Arab Republic.

But if the average yield increases, the resulting net benefit from this increase shall be divided between the two Republics, in equal shares.

5. As the net benefit from the Sudd el Aali (referred to in item 3 Article Second) is calculated on the basis of the average natural yield of the river at Aswan in the years of this century after the deduction therefrom of the acquired rights of the two Republics and the average losses of over-year storage at the Sudd el Aali Reservoir, it is agreed that this net benefit shall be the subject of revision by the two parties at reasonable intervals to be agreed upon after starting the full operation of the Sudd el Aali Reservoir.

6. The United Arab Republic agrees to pay to the Sudan Republic 15 Million Egyptian Pounds as full compensation for the damage resulting to the Sudanese existing properties as a result of the storage in the Sudd el Aali Reservoir up to a reduced level of 162 meters (survey datum). The payment of this compensation shall be affected in accordance with the annexed agreement between the two parties.

7. The Republic of the Sudan undertakes to arrange before July 1963, the final transfer of the population of Halfa and all other Sudanese inhabitants whose lands shall be submerged by the stored water.

8. It is understood that when the Sudd el Aali is fully operated for over-year storage, the United Arab Republic will not require storing any water at Gebel Aulia Dam. And the two contracting parties will in due course, discuss all matters related to this renunciation.

Third

PROJECTS FOR THE UTILIZATION OF LOST WATERS IN THE NILE BASIN

In view of the fact that at present, considerable volumes of the Nile Basin Waters are lost in the swamps of Bahr El Jebel, Bahr El Zeraf, Bahr el Ghazal and the Sobat River, and as it is essential that efforts should be exerted in order to prevent these losses and to increase the yield of the River for use in agricultural expansion in the two Republics, the two Republics agree to the following:

1. The Republic of the Sudan in agreement with the United Arab Republic shall construct projects for the increase of the River yield by preventing losses of waters of the Nile Basin in the swamps of Bahr El Jebel, Bahr el Zeraf, Bahr el Ghazal and its tributaries, the Sobat River and its tributaries and the White Nile Basin. The net yield of these projects shall be divided equally between the two Republics and each of them shall also contribute equally to the costs.

The Republic of the Sudan shall finance the above-mentioned projects out of its own funds and the United Arab Republic shall pay its share in the costs in the same ratio of 50% allotted for her in the yield of these projects.

2. If the United Arab Republic, on account of the progress in its planned agricultural expansion should find it necessary to start on any of the increase of the Nile yield projects, referred to in the previous paragraph, after its approval by the two Governments and at a time when the Sudan Republic does not need such project, the United Arab Republic shall notify the Sudan Republic of the time convenient for the former to start the execution of the project. And each of the two Republics shall, within two years after such notification, present a date-phased programme for the utilization of its share of the waters by the project, and each of the said programmes shall bind the two parties. The United Arab Republic shall at the expiry of the two years, start the execution of the projects, at its own expense. And when the Republic of Sudan is ready to utilize its share according to the agreed programme, it shall pay to the United Arab Republic a share of all the expenses in the same ratio as the Sudan's share in benefit is to the total benefit of the project; provided that the share of either Republic shall not exceed one half of the total benefit of the project.

Fourth

TECHNICAL CO-OPERATION BETWEEN THE TWO REPUBLICS

1. In order to ensure the technical co-operation between the Governments of the two Republics, to continue the research and study necessary for the Nile control projects and the increase of its yield and to continue the hydrological survey of its upper reaches, the two Republics agree that immediately after the signing of this Agreement a Permanent Joint Technical Commission shall be formed of an equal number of members from both parties; and its functions shall be:

a) The drawing of the basic outlines of projects for the increase of the Nile yield, and for the supervision of the studies necessary for the finalising of projects, before presentation of the same to the Governments of the two Republics for approval.

b) The supervision of the execution of the projects approved by the two Governments.

c) The drawing up of the working arrangements for any works to be constructed on the Nile, within the boundaries of the Sudan, and also for those to be constructed outside the boundaries of the Sudan, by agreement with the authorities concerned in the countries in which such works are constructed.

d) The supervision of the application of all the working arrangements mentioned in (c) above in connection with works constructed within the boundaries of Sudan and also in connection with the Sudd el Aali Reservoir and Aswan Dam, through official engineers delegated for the purpose by the two Republics; and the supervision of the working of the upper Nile projects, as provided in the agreements concluded with the countries in which such projects are constructed.

e) As it is probable that a series of low years may occur, and a succession of low levels in the Sudd el Aali Reservoir may result to such an extent as not to permit in any one year the drawing of the full requirements of the two Republics, the Technical Commission is charged with the task of devising a fair arrangement for the two Republics to follow. And the recommendations of the Commission shall be presented to the two Governments for approval.

2. In order to enable the Commission to exercise the functions enumerated in the above item, and in order to ensure the continuation of the Nile gauging and to keep observations on all its upper reaches, these duties shall be carried out under the technical supervision of the Commission by the engineers of the Sudan Republic, and the engineers of the United Arab Republic in the Sudan and in the United Arab Republic and in Uganda.

3. The two Governments shall form the Joint Technical Commission, by a joint decree, and shall provide it with its necessary funds from their budgets. The Commission may, according to the requirements of work, hold its meetings in Cairo or in Khartoum. The Commission shall, subject to the approval of the two Governments, lay down regulations for the organisation of its meetings and its technical, administrative and financial activities.

Fifth

GENERAL PROVISIONS

1. If it becomes necessary to hold any negotiations concerning the Nile waters, with any riparian state, outside the boundaries of the two Republics, the Governments of the Sudan Republic and the United Arab Republic shall agree on a unified view after the subject is studied by the said Technical Commission. The said unified view shall be the basis of any negotiations by the Commission with the said states.

If the negotiations result in an agreement to construct any works on the river, outside the boundaries of the two Republics, the Joint Technical Commission shall after consulting the authorities in the Governments of the States concerned, draw all the technical execution details and the working and maintenance arrangements. And the Commission shall, after the sanction of the same by the Governments concerned, supervise the carrying out of the said technical agreements.

2. As the riparian states, other than the two Republics, claim a share in the Nile waters, the two Republics have agreed that they shall jointly consider and reach one unified view regarding the said claims. And if the said consideration results in the acceptance of allotting an amount of the Nile water to one or the other of the said states, the accepted amount shall be deducted from the shares of the two Republics in equal parts, as calculated at Aswan.

The Technical Commission mentioned in this agreement shall make the necessary arrangements with the states concerned, in order to ensure that their water consumption shall not exceed the amounts agreed upon.

Sixth

**TRANSITIONAL PERIOD BEFORE BENEFITING
FROM THE COMPLETE SUDD EL AALI RESERVOIR**

As the benefiting of the two Republics from their appointed shares in the net benefit of the Sudd el Aali Reservoir shall not start before the construction and the full utilization of the Reservoir, the two parties shall agree on their agricultural expansion programmes in the transitional period from now up to the completion of the Sudd el Aali, without prejudice to their present water requirements.

Seventh

This agreement shall come into force after its sanction by the two contracting parties, provided that either party shall notify the other party of the date of its sanction, through the diplomatic channels.

Eighth

Annex (1) and Annex (2, A and B) attached to this Agreement shall be considered as an integral part of this Agreement

Written in Cairo in two Arabic original copies this 7th day of Gumada El Oula 1379, the 8th day of November 1959.

For the Republic
of Sudan:

(Signed) Lewa Mohamed TALAAT FARID

For the United Arab
Republic:

(Signed) Zakaria MOHIE EL DIN

Appendix E – The Nile Basin Initiative Act – 2002¹⁵

THE NILE BASIN INITIATIVE ACT, 2002.

ARRANGEMENT OF SECTIONS.

1. Short title.
2. Interpretation.
3. NBI to have capacity of a body corporate.
4. Financial provisions.
5. Immunities and privileges of NBI and its officials.

SCHEDULE

AGREED MINUTE NO. 7.

THE NILE BASIN INITIATIVE ACT, 2002.

An Act to confer legal status in Uganda on the Nile Basin Initiative, and otherwise give the force of law in Uganda to the signed Agreed Minute No. 7 of the 9th Annual Meeting of the Nile Basin States held in Cairo, Egypt, on 14th February 2002; and to provide for other connected or incidental matters.

WHEREAS, currently, there is no regional or international Treaty or Agreement among the riparian States of the Nile River Basin, namely, Burundi, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda, on cooperation in the utilization of the waters of the Nile River Basin;

AND WHEREAS the Government of the Republic of Uganda and the Governments of the other Nile Basin States at the meeting of their Council of Ministers held in Dar-es-Salaam, Tanzania, on 22nd February, 1999 established a “Transitional Institutional Mechanism of the Nile Basin Initiative (NBI)”, pending the conclusion of a “Cooperative Framework Agreement”, based on a vision “to achieve sustainable socioeconomic development through equitable utilization of, and benefit from, the common Nile Basin water resources”;

AND WHEREAS the Government of Uganda and the Governments of the other States at the 9th annual meeting of their Council of Ministers held in Cairo, Egypt, on 14th February, 2002, adopted “Agreed Minute No. 7” of that meeting to, among other things, “invest the NBI. on a transitional basis, with legal personality to perform all of the functions entrusted to it, including the power to sue and be sued, and to acquire or dispose of movable and immovable property;

AND WHEREAS following the ratification by the Republic of Uganda of the Agreed Minute No.7, it is necessary to give legal effect in Uganda to the provisions of that Agreed Minute No. 7;

¹⁵ <http://www.nilebasin.org/>

DATE of ASSENT: 11th October 2002.

Date of Commencement: 1st November 2002.

Now, THEREFORE, BE IT ENACTED by Parliament as follows:

1. This Act may be cited as the Nile Basin Initiative Act, 2002.

2. In this Act, unless the context otherwise requires—

“Agreed Minute No. 7” means that part or portion of the minutes of the annual meeting of the Council of Ministers of the Nile Basin States held in Cairo, Egypt, on 14th February, 2002 and set out in the Schedule to this Act;

“Minister” means the Minister responsible for Water;

“Nile Basin Initiative” or “NBI” means the transitional arrangement established by the Nile Basin States at the meeting of their Council of Ministers held in Dar-es-Salaam, Tanzania, on 22nd February, 1999, to foster cooperation and sustainable development of the Nile River for the benefit of the inhabitants of those countries;

“Nile Basin States” means the States of Burundi, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda;

“Nile River Basin” means all the area forming the basin of the Nile River.

3.

(1) The NBI shall have the capacity, within Uganda, of a body corporate with perpetual succession, and with power to acquire, hold, manage and dispose of movable and immovable corporate property, and to sue and be sued in its own name.

(2) The NBI shall have the capacity, within Uganda, to perform any of the functions conferred upon it by and under the Agreed Minute No. 7, and to do all things, including borrowing, that are, in the opinion of the Nile Basin States or the appropriate organ of the NBI, necessary or desirable for the performance of those functions.

(3) Subsection (2) of this section relates only to the capacity of the NBI as a body corporate, and nothing in that subsection shall be construed as authorising the disregard by the NBI of any law, or anything affecting any power of the NBI conferred by any law.

4.

(1) There shall be charged on and paid out of the Consolidated Fund, without further appropriation other than this Act, all payments required to be made from time to time by the Government of Uganda under the terms or provisions of the Agreed Minute No. 7.

(2) Subject to article 159 of the Constitution of the Republic of Uganda, for the purposes of providing any sums required for making payments under this section, the Minister responsible for finance may, on behalf of the Government, make such arrangements as are necessary or raise loans by creation and issue of securities bearing such rates of interest and subject to such conditions as to repayment

redemption or otherwise as the Minister thinks fit; and the charges and expenses incurred in connection with their issue shall be charged on and issued out of the Consolidated Fund.

(3) Any moneys received by the Government under the Agreed Minute No. 7 shall be paid into and form part of the Consolidated Fund, and shall be available in any manner in which the Consolidated Fund is available.

5.

(1) The NBI, its staff and officials shall enjoy, within or Uganda, such privileges and immunities as are necessary for their functions.

(2) The privileges and immunities referred to in subsection (1) of this section shall be in accordance with the provisions of the Diplomatic Privileges Act. 1965, Act No. 2 of 1965.

SCHEDULE

AGREED MINUTE NO.7

6. LEGAL STATUS OF THE NILE BASIN INITIATIVE (NBI)

The Ministers of Water affairs of the Nile Basin Countries, referring to the provisions of the signed Agreed Minutes of their meeting in Dares-Salaam on 22 February 1999 establishing a Transitional Institutional Mechanism of the Nile Basin Initiative (NBI), pending the conclusion of a Cooperative Framework Agreement to advance the Nile Basin Strategic Action Program in realization of the Shared Vision for the Nile Basin, “to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile Basin water resources”;

Invest the NBI, on a transitional basis, with legal personality to perform all of the functions entrusted to it, including the power to sue and be sued, and to acquire or dispose of movable and immovable property;

Recall that organs of the NBI include: the Council of Ministers of Water Affairs of the Nile Basin Countries (Nile-COM), which provides policy guidance and makes decisions on matters relating to the NM; the Technical Advisory Committee (Nile-TAC), which renders technical advice and assistance to the Nile-COM; and the Nile Basin Secretariat (Nile-SEC), which renders administrative services to the Nile-COM and Nile-TAC; x

Decide that NBI shall enjoy in the territory of each Nile Basin State the legal personality referred to above and such privileges and immunities as are necessary for the fulfilled of its functions;

Confirm that the headquarters of the NBI is situated at Entebbe, Uganda;

Confirm that the Executive Director of the Nile-SEC is the principal executive officer of the NBI;

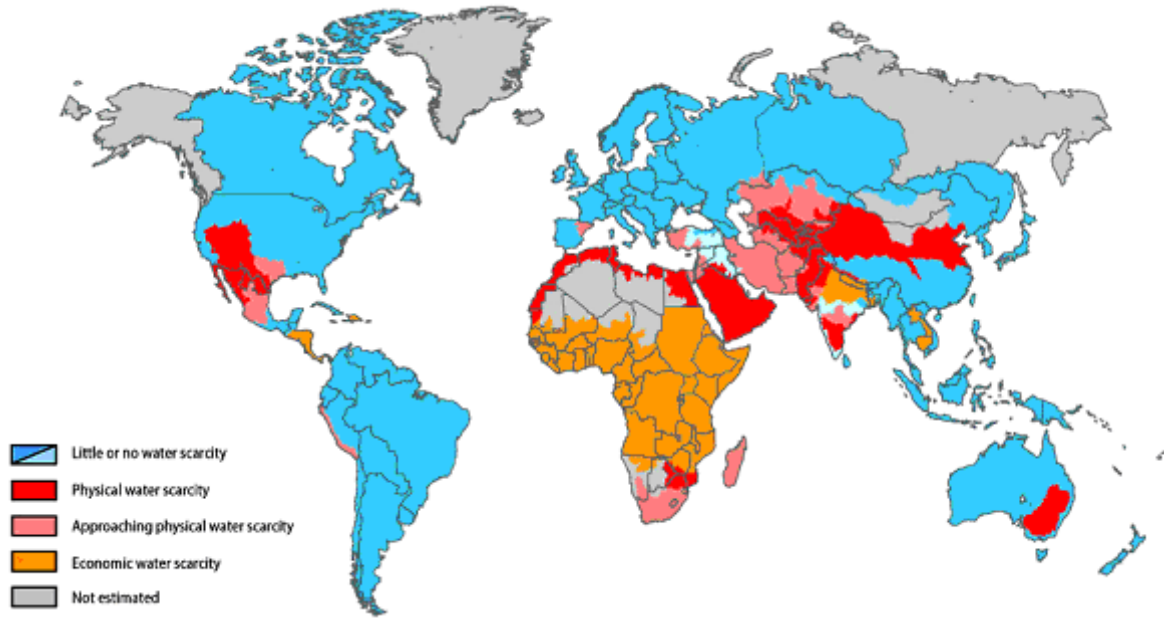
Decide that the Executive Director, staff and officials of the NBI shall enjoy in the

territory of each Nile Basin State such privileges and immunities as are necessary for the fulfillment of their functions;

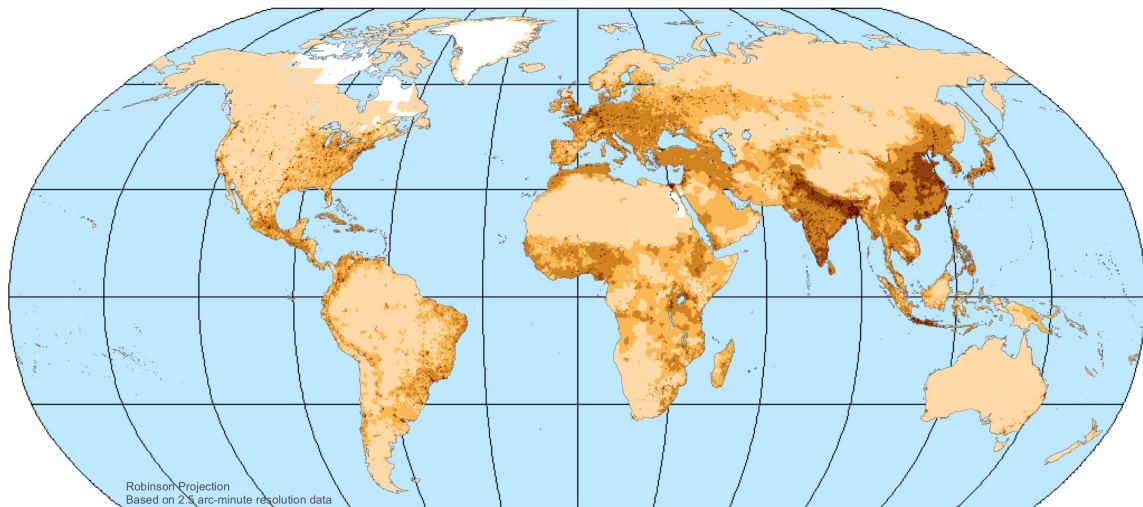
Confirm that a draft budget for each financial year is to be prepared by the Executive Director and approved by the Nile-COM on the recommendation of the Nile-TAC; that the resources of the budget are derived from annual contributions of the Nile Basin States and such other sources as may be determined by the Nile-COM; and that the contributions of the Nile Basin States are based on the budget as approved by the Nile-COM;

Confirm that the accounts of the NBI relating to each fiscal year are to be audited the following fiscal year by an internationally recognized auditing firm selected on the basis of competitive bidding and submitted to Nile-TAC/COM for its review and approval; and that the NBI is to follow procurement and financial management practices that conform with international practices with the addition of any specific requirements of individual funding institutions.

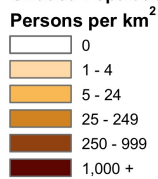
Appendix F - Areas of Physical and Economic Water Scarcity and Population Density



Source: IMWI Report, Insights from the Comprehensive Assessment of Water Management and Agriculture, 2007, p. 8



Gridded Population of the World



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 Sources: Center for International Earth Science Information Network (CIESIN),
 Columbia University; and Centro Internacional de Agricultura Tropical (CIAT),
 Gridded Population of the World (GPW), Version 3, Palisades, NY: CIESIN,
 Columbia University. Available at: <http://sedac.ciesin.columbia.edu/gpw>.