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Water Management and Decision-Making in the Nile Basin:

A Case Study of the Nile Basin Initiative

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science
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ABSTRACT

The management of international waterways presents riparian nations with a challenging set of political, economic, environmental, and geographic difficulties. Historically, the Nile Basin has exemplified many of these problems as witnessed by inter-basin conflict, devastating floods, crippling drought, and unstable political and economic development. Despite their tumultuous past the ten riparian nations of the Nile Basin established a supranational water management institution in 1999, the Nile Basin Initiative (NBI), in order to develop collective solutions to their common water related problems. However, serious challenges to the cooperative process threaten to derail the NBI and enflame underlying causes of conflict. This thesis seeks to determine how the NBI has affected water related decision making in the Nile Basin. This will be achieved by examining patterns of decision-making before and after the establishment of the NBI. Specifically, the impact of the NBI will be tested by examining patterns of decision-making within three measures of conflict, namely the allocation of water resources, the sharing of technical data and expertise, and the financing of water related projects and programs.

Chapter 1 Introduction

I. Problem Statement

The management of international waterways presents policy-makers with complex political, economic, and environmental challenges that are being amplified by exponential population growth, uneven economic development, and environmental degradation. In order to confront these challenges, many riparian nations chose to establish river basin institutions to collectively manage their shared water resources. This method of Integrated Water Resource Management has been employed with mixed success in the Rhine, Mekong, Indus, and several other basins.

The ten riparian nations of the Nile River have followed the international trend and engaged in an effort to collectively manage the Nile's water. The establishment of the Nile Basin Initiative (NBI) in 1999 marked the beginning of an unprecedented era of cooperation. Several previous efforts at cooperative water management were unable to deal with the Nile Basin's complex political, technical, economic, and environmental challenges. The NBI is a basin wide water management institution designed to mediate water related decisions and manage the Nile's resources in an equitable and sustainable manner. However, the tumultuous hydro-political landscape of the Nile Basin is wrought with serious challenges to this cooperative effort. It is the goal of this thesis to attempt to answer the question: Has the creation of a supranational water management institution,

the NBI, reduced the prior causes of conflict over shared Nile water resources between the ten riparian nations?

II. Introduction to Transboundary Water Management

During the 1990's scholars such as Gleick (1993), Homer-Dixon (1999), and Postel (1996) predicted that the exponentially growing human population would severely degrade the global environment and engage in warfare over access to freshwater resources. These "water wars" have yet to materialize and a substantial body of scholarly literature documents overwhelming evidence that cooperation is much more prevalent than conflict over freshwater resources (Wolf, 2003, Hamner & Wolf, 1997). However, the underlying causes and potential for conflict grow more pertinent daily as they are amplified by the ever increasing pressure population growth and economic development exert on limited freshwater resources.

The management of transboundary freshwater resources presents policy makers with a host of political, cultural, economic, and technological barriers they must navigate if conflict over already scarce freshwater resources is to be avoided. Currently, there are 261 watersheds that are shared by two or more countries. These transboundary watersheds drain 45.3% of the Earth's land surface, carry 60% of the global freshwater supply, and are home to 40% of the world's population (UNEP/OSU 2002, Wolf et al., 1999).

Scholarly works such as the 2001 article "Dehydrating Conflict" by Postel and Wolf identified a series of factors that contribute to water related conflict and suggest that a long-term process of cooperation is vital to the formation of a peaceful and prosperous watershed. International recognition of the problems facing transboundary waterways

has greatly increased the financial and technical support available to address transboundary water issues and acted as a catalyst for cooperation. This cooperative process has increasingly taken the form of river basin organizations that promote Integrated Water Resource Management. However, the cooperative management of international river basins has met with mixed success due to a host of technical, cultural, political, legal, and economic difficulties. Compounding these problems is the fact that it is often difficult to measure success in the management of shared waterways. Policy makers and scholars have struggled to define criteria with which to gage the success of river basin organizations and generate a replicable recipe for transboundary water management. Each basin's unique set of socio-political, economic, technical, and geographic conditions influence the cooperative process and the ability of a river basin organization to effectively manage freshwater resources.

III. Introduction to the Study Area

In the case of the Nile River Basin, the conflicting interests of upstream and downstream states have historically polarized relations and generated inter-regional tension that inhibited cooperative efforts. Interactions between the riparian nations have been historically characterized by mutual distrust, intimidation, and competition. For much of the post-colonial era the dominant water management paradigm was one of individual states unilaterally pursuing their own self-interests without regard for how their actions impacted their riparian neighbors. Several times during the 1980's and 1990's regional tensions nearly boiled over into full scale war and the prospects for peace and regional prosperity seemed scant at best.

The Nile River extends 6,700 km from its headwaters in Africa's tropical equatorial lakes to its exodus into the Mediterranean via Egypt's fertile delta. Its massive drainage basin covers 3,030,000 km² or 10% of Africa's land surface and is home to approximately 300 million inhabitants who hail from ten sovereign nations that encapsulate a myriad of cultures, ethnic groups, and ecosystems. Despite being the world's longest river, the average annual flow of the Nile (84 billion km³) is relatively small compared to other major rivers, 2% of the Amazon's annual flow (Taffesse, 2000, Pottinger 2004).

Table 1 Nile Basin Area within the Riparian Nations

Riparian State	Basin Area (km ²)	Basin Area (Percent)
Burundi	14,500	0.5
DRC	23,000	0.8
Egypt	300,000	9.9
Ethiopia & Eritrea	368,000	12.1
Kenya	55,000	1.8
Rwanda	21,500	0.7
Sudan	1,900,000	62.7
Tanzania	116,000	3.8
Uganda	232,000	7.7
Total	3,030,000	100

Source: Krishna, Raj (1988), "The Legal Regime of the Nile River Basin", in Starr, J.R. et al (eds). *The Politics of Scarcity: Water in the Middle East*. Boulder: Westview Press

The tumultuous political landscape of the Basin is typified by discord as seven of the riparian nations have recently been involved in internal or regional conflict and five of them are among the world's 10 poorest countries (Sadoff & Grey 2002). The extreme scarcity of water in large segments of the Nile basin also exacerbates inter-state conflict and exerts severe pressure on the river's ecological systems. The total population of the riparian nations is expected to explode from 245 million in 1990 to approximately 860 million by 2025 (Beyene & Wadley 2004, El-Fadel et al., 2003). This dramatic increase in population will inevitably add stress to the already scarce water resources of the Basin and could result in widespread famine, political destabilization, economic depression, environmental degradation and open conflict.

Table 2 Nile Basin Population Statistics

	Population (in millions 1990)	Population (in millions 2000)	Avg. Pop. Growth (%) 1995-2000
Ethiopia	49.2	66.4	2.9
Tanzania	27.3	39.6	3.6
Burundi	5.5	7.4	2.9
Uganda	18.8	27	3.4
Rwanda	7.2	10.2	3.4
Kenya	24	35.1	3.8
Sudan	25.2	33.6	2.8
Egypt	52.4	64.2	1.9

Source: Kliot, Nurit, *Water Resources and Conflict in the Middles East* (New York: Routledge, 1994), pp76-77

The central conflict in the basin is between the two main power brokers, Egypt and Ethiopia (Swain, 2002; Stroh 2003, Waterbury 2002). Egypt, the most downstream state, has greatly benefitted from the colonial British policy that made Egyptian interests paramount in the Nile Basin. However, Egypt is virtually devoid of rainfall and entirely dependent upon the nine upstream riparian nations for its Nile water resources. The rapid growth of Egypt's population and economy has increasingly strained its limited freshwater supply and led its government to embark on massive water infrastructure projects that have greatly increased the country's use of Nile waters.

On the other hand, Ethiopia, which provides approximately 86% of the Nile's flow utilized by Egypt, has tremendous agricultural and hydroelectric potential, but it currently uses only 1% of its hydrological resources before they flow downstream (Pottinger 2004, Waterbury 2002). Ethiopia's plans for large scale water-infrastructure projects to develop its massive hydro-electric potential and expand irrigated agriculture are a direct threat to Egyptian water security and have met with stern resistance and

hostile pronouncements (Mason et al, 2006; Stroh 2003, Waterbury 2002, Mohamoda 2003).

These competing interests combined with the relative scarcity of the Nile Waters and the lack of a basin-wide water rights agreement has led scholars such as Wolf and Waterbury to identify the Nile Basin as one the world's most conflict prone watersheds. Decades of mutual mistrust and open conflict have fueled this perception and hampered the formation of a comprehensive water rights agreement and a legal framework to manage the Nile's resources. Efforts to allocate the Nile's scarce water resources and promote integration and cooperation have been hampered by unilateral development projects, regional instability, divergent development strategies, environmental degradation, destructive natural disasters, rapid population growth, and extreme poverty. This plethora of problems has historically allowed the most downstream state, Egypt, to perpetuate its hegemonic political, economic, and militaristic dominance and impose its water policy objectives on upstream nations.

The 1990's saw a dramatic shift in the political and diplomatic milieu of the Nile Basin. The overthrow of the Ethiopian socialist dergue, independence of Eritrea, end of the Sudanese Civil War, and the cessation of hostilities among the Equatorial Lakes nations politically stabilized the Basin and paved the way for a new attempt at comprehensive basin-wide cooperation over shared Nile Water resources. Never has the potential and need for regional cooperation in the Nile basin been greater. The impending population boom multiplied by high expectations for economic development will stretch the basin's already scant hydrological resources to the breaking point. The governments of the ten Nile states have slowly recognized their interdependence and

realized that collective development and regional cooperation could bring mutual benefits at a level that outweighs the benefits independent development strategies offer. In 1999, nine riparian nations (Burundi, Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda), with diplomatic and financial assistance from the World Bank, the United Nation Development Program (UNDP), and the Canadian International Development Agency (CIDA), took the initiative and utilized this new spirit of cooperation to create the Nile Basin Initiative (NBI). Eritrea, having never approved the Nile River Basin Action Plan, joined as an observer.

The NBI is the most promising attempt in a series of efforts to create a comprehensive basin-wide integrated water management strategy that dates back to the unsuccessful colonial British Century Storage Scheme. The NBI has adopted a holistic approach to river resource management. It represents the culmination of cooperative efforts to create a basin-wide institution designed to establish a comprehensive water resource management strategy, provide a forum for conflict resolution, and coordinate mutually beneficial development projects. The stated goal of the NBI is to “achieve sustainable socioeconomic development through the equitable utilization of, and benefit from the common Nile Basin water resources (www.nilebasin.org).” The NBI website lists the following as its primary objectives:

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
5. To ensure that the program results in a move from planning to action

The establishment of a river basin organization with these goals would be expected to have a significant impact on the distribution of water, access to financing, and sharing of technical data in the Nile Basin. Before the NBI, Egypt effectively controlled the development of the Basin's water resources by threat of intimidation, blocking financial approval via its influence with the World Bank and African Development Bank, and asserting the validity of colonial and post-colonial treaties that bestow Egypt with the lion's share of Nile Waters (Swain 1997, Allan 1999, Waterbury 2002). This thesis utilizes water related projects, programs, and agreements generated by the riparian nations as evidence for the establishment of patterns of decision making in the Pre and Post NBI periods. This evidence will be used to determine the impact of the NBI on prior sources of conflict, namely the allocation of water resources, sharing of technical data and expertise, and the funding for water related projects and programs.

IV. Methodology

The goal of this thesis is to determine whether the creation of the NBI has reduced the prior causes of conflict over shared Nile water resources. This is to be achieved by analyzing the Pre and Post-NBI patterns of decision-making amongst the riparian nations through the examination of the following variables.

1. Allocation of water resources
2. Access to financing
3. Sharing of technical data and expertise for water related development projects

It is hypothesized that the NBI has increased the equitable allocation of water resources and access to financial resources for water related infrastructure improvements. Hypothetically, the NBI has achieved this by altering the water decision making arena from the Pre-NBI paradigm of individual nations formulating independent and sometimes incongruent water management strategies to a more integrated democratic regional policy forum designed to create a basin wide management strategy by standardizing and democratizing the process of decision-making.

Integration theory, specifically Neo-Functionalism, will provide the theoretical framework. According to Neo-Functionalist theorist Ernst B. Haas, the political integration of independent nations as a "...process whereby political actors in several distinct national settings are persuaded to shift their loyalties, expectations and political activities toward a new center, whose institutions possess or demand jurisdiction over the

pre-existing national states” (Nelson and Stubb 2003, 145). This process often begins with small collaborative efforts over non-controversial issues. Neo-Functionalism predicts that as collaborative efforts expand, cooperative momentum builds and drives the integration into deeper more complex arenas. As this process unfolds, nations shift from state centric thinking to collective decision making. According to Schmitter, “regional integration is an intrinsically sporadic and conflictual process, but one in which, under conditions of democracy and pluralistic representation, national governments will find themselves increasingly entangled in regional pressures and end up resolving their conflicts by conceding a wider scope and devolving more authority to the regional organizations they have created” (Schmitter 2002).

This thesis does not intend to be a comprehensive test of Neo-Functionalism. This is a specific test focused on the process of water related decision making. The general assumption being, that multi-lateral decision making acts as an indicator of cooperation and integration and unilateral decision making is an indicator of conflict and political discord. This test of Neo-Functionalism will serve as the theoretical framework with which to analyze the impact of the NBI on the decision-making process in the Nile Basin.

This thesis will adopt a descriptive single case study methodology that is embedded rather than holistic. A holistic case study would attempt to explain the hydro-political dynamics of the Nile Basin using an approach that would be universally applicable to other shared watercourses. This thesis is embedded because it examines the over-arching case (the NBI) and employs four-subunits (Egypt, Ethiopia, Sudan, and the Equatorial Lakes Nations) with which to further analyze the interplay between the Nile Basin’s players. The measures of cooperation and conflict employed in this thesis are

designed to capture the unique climate of Nilotic hydropolitics. A time-series pattern-matching method will be used to present evidence for the presence or absence of patterns in decision-making behavior amongst the ten riparian nations in the Pre and Post-NBI (before and after 1999) periods. The research design employs a primary study question and independent and dependent variables that logically link the data to the variables and establish criteria for interpreting the findings (Yin 29, 1984).

This thesis will answer the following research question: Has the creation of the Nile Basin Initiative (NBI) reduced the prior causes of conflict over shared Nile water resources between Egypt, Ethiopia, Sudan, and the Great Lakes Nations? This author hypothesizes that the creation of the NBI has increased cooperation among the member states. The creation of the NBI will serve as the independent variable. Evidence for the independent variable will be presented by first cataloging the events that have shaped the history of Nile water management and then identifying the type of decision making process (Unilateral, Bi-lateral, Multi-Lateral) the riparian nations used to make the following kinds of decisions – treaties, agreements, projects and programs, all concerning the water resources of the Nile Basin and requiring the inclusion of at least one riparian nation or colonial power.

The dependent variable is designed to measure conflict and cooperation in decisions made by the riparian nations. The dependent variable will summarize the content of the decisions and how they impacted the following three measures of conflict and cooperation:

Table 3 Measures of the Dependent Variable

<u>Measures of Conflict and Cooperation</u>	<u>Data Sources</u>
Decisions impacting the allocation of water resources amongst the 9 riparian states or colonial powers: Unilateral, Bi-lateral, or Multilateral	Freshwater Dispute Database, Historic Documents, National Water Strategies NBI Project Documents, Scholarly Literature on Hydrology and Hydro-Infrastructure
Decisions involving the sharing of and access to technical data or expertise concerning water resources: Unilateral, Bi-lateral, or Multilateral	NBI Project Documents, Scholarly Literature on Water Infrastructure Improvements and Hydro-Politics
Decisions impacting the financing of water-related projects. (e.g., cooperation in obtaining finance; blocking one riparian state from getting finance): Unilateral, Bi-lateral, or Multilateral	NBI Project Documents, World Bank and African Development Bank Documents, Press Reports, Scholarly Literature on Hydro-politics,
(Anecdotal only) Mutual trust or mistrust amongst riparian nations.	Press Reports and Ministerial Quotations

These three indicators are my attempt to capture the dynamic content of water related decisions made in the Nile Basin from 1892 to 2008. The presence of these three indicators in water related decisions will be used to delineate patterns of hydro-decision making. Although no attempt at weighting these decisions is attempted, it is universally recognized that decisions affecting the allocation of water resources continue to be the most controversial of the three indicators.

This information will be compiled into a database, using Microsoft Access, that will aide in organizing the data and constructing graphs and tables that will display the number and type of decisions listed above. These graphs will aide in creating graphs that illustrate the patterns of pre and post-NBI decision making. Only agreements and

projects concerning the national governments of the ten riparian nations and the preceding colonial powers will be included. All ten riparian nations will be studied, but the six nations in the Equatorial Lakes region, Burundi, Democratic Republic of the Congo, Kenya, Rwanda, Tanzania, and Uganda, will be collectively analyzed and referred to as the Equatorial Lakes Nations, while Egypt, Ethiopia, and Sudan will remain independent data units. Eritrea, whose only connection to the Nile is a small shared border with Ethiopia on a tributary to the Nile, the Tekeze River, is excluded due to its lack of involvement in Nile water management. This study's primary focus is on the Anglophone countries. The three Francophone countries (Rwanda, DRC, and Burundi) are included in the study and grouped together with Uganda, Kenya, and Tanzania in the Great Lakes Nations, but French documents are not utilized. The focus on the Anglophone counties should not significantly alter the results of this study because the Francophone countries are minor players in the redistribution of Nile Waters due to their peripheral dependence on the Nile courtesy of an abundance of alternate freshwater resources within their boundaries and their marginal contribution to and impact on the overall Nile flow.

The data sources for this study include but are not limited to project documents from the NBI and the Lake Victoria Development Program, national water management strategies, pertinent scholarly literature, press releases, and reports from international donor agencies (World Bank, FAO, UNDP) and Non-Governmental Organizations. NBI project reports will provide invaluable information as to how the NBI is addressing these problems. Oregon State University also has compiled the transboundary Freshwater Dispute Database that will be used as a catalogue of major water related treaties and

agreements from 1882 to 1994. This and the existing body of scholarly literature will provide the information with which to determine if the NBI has reduced the prior causes of conflict over shared Nile water resources. These sources will provide valuable evidence that will allow for the analysis of the impact of the NBI on decisions affecting the allocation of water resources, sharing of technical data and expertise, or financing for water related projects and programs.

In the next two chapters I will present evidence for the establishment of patterns in water related decision making during the Pre and Post NBI periods (before and after 1999). First I test the independent variable by presenting evidence chronologically and documenting decisions according to type (unilateral, bi-lateral, or multi-lateral). This will allow me to describe the pattern of decision making by chronologically tracing the types of water related decisions made from the advent of British suzerainty (1888) to the present (2007).

Next, I will present evidence for each measure of the dependent variable by documenting how each water management decision affected the allocation of water resources, sharing of technical data and expertise, and access to financing. The measures of the dependent variable will be organized according to type (unilateral, bi-lateral, or multi-lateral) and compiled into graphs.

Finally, in Chapter 4, I will utilize the evidence presented in Chapters 2 and 3 and summarize the patterns of evidence into a comprehensive assessment of water related decision making in the Nile Basin that will allow me to identify the impact of the NBI on conflict and cooperation.

Chapter 2: The Pre-Nile Water Management Developments

Introduction

The following chapter is divided into three sections. The first two sections presents evidence to establish the Pre-NBI pattern of decision making by documenting the type (unilateral, bi-lateral, or multilateral) of decisions made by the riparian nations and colonial powers in the form of infrastructure projects and water related agreements. The Pre-NBI period is divided into two distinct periods of decision making, the Colonial and Post-Colonial. This division is necessary due to the transition of power from the European colonial powers to independent African nations that transformed the decision making process. The final section details how the decisions impacted the measures of the dependent variable (allocation of water resources, sharing of technical data and expertise, and access to financing).

I. The Colonial Era

For millennia, various internal and external forces have molded the evolution of water resource management in the Nile Basin. The patterns of water management and utilization in the Nile Basin have shifted according to the environmental and political circumstances. The dynamic interplay between humanity and the environment has shaped the course of the river and the lives of countless Nile denizens. The Ancient rulers of Egypt, Nubia, and Ethiopia employed complex irrigation and canal systems, but were still at the mercy of environmental fluctuations and endured devastating floods and crippling droughts. These harsh experiences emblazoned into the mentalities of future water managers a desire to harness the waters of the Nile.

The blockade of Confederate ports by the Union Navy during the American Civil War (1861-65) effectively severed the British Empire's source of cotton thereby damaging the profitable British textile industry. The British occupation of Egypt in 1882 can be seen as a response to this event as Great Britain moved to compensate for the loss of the American cotton supply by expanding irrigated agriculture in the Nile Basin and securing the strategic Suez Canal (Allan 1999). In 1898 the British defeated a French expeditionary force sent to secure the source of the Nile River. The British responded to this threat to their prized African colony by mobilizing efforts to protect the headwaters of the Nile. The British summarily expanded their colonial possessions during the late 19th and early 20th centuries to include the territories of the modern nations of Kenya, Sudan, Tanzania, and Uganda. Eventually, the British African colonial possessions

included the entirety of the Nile basin, excluding Ethiopia and small areas around the Equatorial Lakes. Repeated British attempts to colonize Ethiopia were unsuccessful as they were unable to defeat the native Ethiopians in their rugged homeland and secure the source of the Blue Nile. Despite their failure to unify the Nile Basin the British embarked on a hydraulic infrastructure campaign not seen since the pharaohs. According to Tafesse “The British colonial forces came out with a full-fledged plan of controlling and harnessing the waters of the Nile by employing various water regulation mechanisms, including damming, canalization, and diversions” (2002, 34)

Fueled by an influx of highly skilled engineers from recently completed water projects in the Indian subcontinent, Britain unilaterally embarked a hydrologic mission to expand irrigated agriculture and control the flow of Nile waters to Egypt (Allan 1999). They constructed a series of barrages and small dams at Asyut (1902), Zifta (1903), Esna (1909), Nag Hammadi (1930), and Edfina (1951) and brought large tracts of land under cultivation in their Egyptian and Sudanese colonies including the enormous Gezira Cotton Scheme (Tafesse 2002). The most important infrastructure project during the colonial period was the Old Aswan Dam in southern Egypt. Constructed by Great Britain from 1892 to 1902, the Old Aswan Dam was designed to provide flood protection and over year water storage. The Dam’s initial 1 billion m³ (BCM) storage capacity was soon shown to be insufficient to accommodate the seasonal flood and the dam was raised twice in 1912 and 1937 increasing the storage capacity to 5.1 BCM (Shahin 2002). Even with this increased capacity the Old Aswan Dam was incapable of protecting Egypt from the Nile’s floods and regional droughts and the dream of providing Egypt with reliable water security went unfulfilled.

The British also unilaterally constructed two dams in their Sudanese colony, the Sennar in 1925 and the Jebel Aulia in 1937. The Sennar Dam on the Blue Nile was built 350 km downstream of Khartoum just south of the confluence of the Blue and White Nile Rivers with the blessings of the Egyptian colony (Shahin 2002). It served the dual purposes of providing irrigation waters to feed the large and highly profitable Gezira cotton scheme and providing 1 BCM of water storage for Egypt. The Gezira (Island) Irrigation Scheme was constructed just south of Khartoum in the fertile land between the White and Blue Nile. The Scheme has expanded from approximately 100 hectares (ha) in 1912 to over 420,000 ha by 1970 and continues to provide Sudan with a valuable cotton export crop (Tafesse 2002). The Jebel Aulia Dam, designed to provide Egypt and Sudan with water storage, had an initial storage capacity of 3.5 BCM. However, the annual deposition of silt by the Blue Nile flood has dramatically reduced this capacity and rendered the Jebel Aulia virtually defunct (Nicol 2003). Financing for these infrastructure projects were a unilateral British venture, as no other riparian power was a significant party to the financing of the period's infrastructure projects. These mutually beneficial projects and the British colonial power structure, which favored the two most downstream colonies, intermeshed Egyptian and Sudanese interests and forged a hydrologic alliance between Egypt and Sudan that was legitimated by a succession of agreements and treaties.

The first of these water related agreements were between by Great Britain on behalf of its colonies and other European and African powers. Great Britain made agreements with Ethiopia in 1902 and Italy in 1891 and 1925 that established the supremacy of British interests by ensuring the undiminished supply of water to Sudan

and Egypt. These agreements severely restricted development of the Blue Nile and permitted limited Italian infrastructure projects which were never realized. Agreements were also reached with Belgium in 1894 and the Congo in 1906 that established spheres of influence and prevented the Congolese from constructing any work that would diminish the flow of the White Nile (Nicol 2003, 19).

The most influential agreement of the colonial period was a bi-lateral water rights agreement signed between the newly independent Egypt and Great Britain of behalf of its Sudan, Kenya, Tanganyika, and Uganda colonies in 1929. The objective of this treaty was to ensure the unimpeded flow of the Nile to Egypt. This treaty bi-laterally allocated 48 BCM of the annual flow of the Nile to Egypt and 4 BCM to Sudan with no other colony receiving water allocation. Egypt also received the entire flow of the Nile during the low flow period from January to July and assurance that no water project that would diminish the flow of the Nile's water to Egypt would be constructed without Egyptian permission (Wichelns et al, 2003; Lowi, 1993; Mageed, 1994). This legitimated the Egyptian stranglehold on the flow of the Nile at the expense of upstream riparian powers. The 1929 Agreement also provided the legal basis for Sudan to construct the Sennar and Jebel Aulia Dams. The obvious beneficiaries of the agreement, Egypt and Sudan, continue to assert the validity of the agreement, while the other riparian nations claim it to be invalid due to the fact that their colonies at the time and their interests were not represented.

In 1949 Egypt and the British colony of Uganda reached an agreement over the construction of the Owen Falls Dam at the source of the Victoria Nile. This agreement required the dam be jointly operated by Egyptian and Ugandan engineers and essentially

ensured the use of the dam would promote Egyptian interests (Mohamoda 2003). Completed in 1950, Owen Falls raised the level of Lake Victoria by 3 m, provided Uganda with 150 MW of hydroelectricity, and regulated the flow of the Victoria Nile (Shahin 2002). Later, a bi-lateral 1952 agreement between Egypt and colonial Uganda increased the storage of water in Lake Victoria and diminished the flow of water through Owens Falls.

The British were also responsible for developing the first comprehensive water management strategy. In 1902 the famed British hydrologist William Garstin developed an unprecedented basin-wide develop scheme designed to regulate the flow of the Nile with the aim of maximizing the flow of water to Egypt and promoting British economic interests. This so-called Century Storage Scheme was comprised of four primary projects:

- (1) An over-year storage reservoir at Lake Albert in Uganda (combined with water regulation on Lake Victoria)
- (2) A diversion canal designed to carry water around the Sudd swamps (the Jonglei Canal)
- (3) Over-year storage in Lake Tana Ethiopia at the source of the Blue Nile
- (4) An additional seasonal storage reservoir on the Main Nile in the region between the Atbara and Wadi Halfa (northern Sudan)

(Whittington 2004, p. 4)

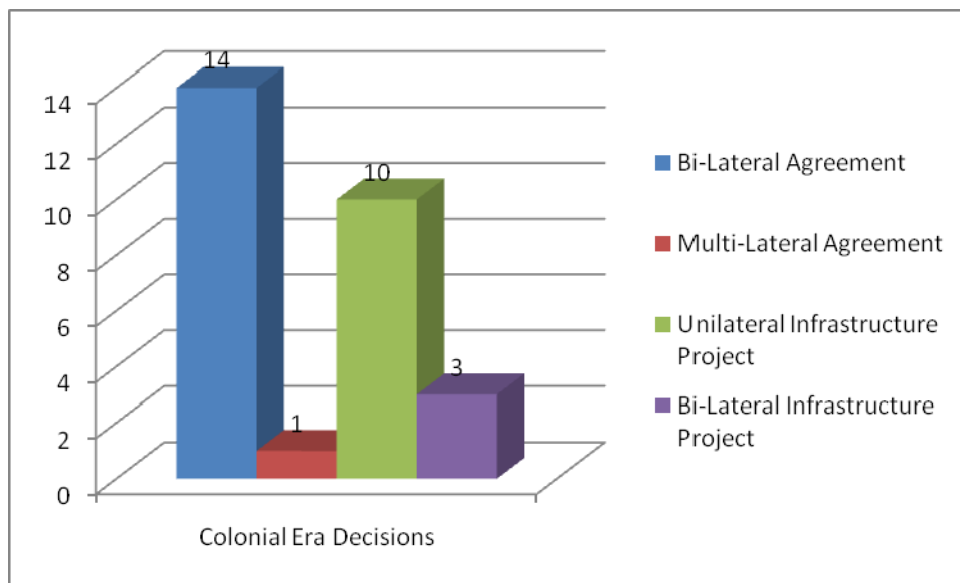
The combination of over-year storage in the Equatorial Lakes and Ethiopian Highlands and the water savings from by-passing the Sudd swamps were designed to

provide an adequate and controllable supply of water for Egypt to meet its burgeoning population and increase irrigated agriculture. Although none of its four main components were ever completed, the British Century Storage Scheme has profoundly impacted the water management of the Nile by providing the first comprehensive basin-wide water management strategy. Despite the Scheme's obvious bias towards Egyptian interests, experts such as Waterbury and Whittington assert its value as a strategy for maximizing water availability.

The hydrologic and political developments of the Colonial Era continue to profoundly influence Nile water management. Many of the current roadblocks to cooperation are deeply rooted in British colonial traditions from this time period (Allan, 1999; Collins, 1990, Beyene & Wadley 2004, Elhance 2000). The primacy of Egyptian interests in British colonial water policy and the exemption of Ethiopia set a legal precedent that has allowed Egypt to claim the lion's share of the Nile waters at the expense of the very country that provides 86 percent of the resource. The current socio-economic disparities of the Nile Basin can also be partially attributed to the colonial era. Britain's preoccupation with developing the Egyptian economy at the expense of its upstream territories established Egypt as the regional hegemon and subjugated the interests of the upstream nations (Allan 1999). This has resulted in a dearth of technical expertise and financial resources with which to develop upstream water resources.

A categorical examination of the total water related decisions made by the riparian powers during the Colonial Era effectively reveals a pattern of unilateral infrastructure development and bi-lateral agreements. The graph below includes all Pre-NBI decisions and major infrastructure projects that included at least one colonial power.

Figure 2.1 Colonial Era Decisions



A strong tendency toward bi-lateral agreements and unilateral infrastructure projects clearly illustrates the Colonial Period's water management paradigm. Every decision, save for Ethiopia's abandoned Lake Tana development project, included by Great Britain on behalf of its colonies or by Egypt's Pro-British monarchy that lasted until the Nasserite Revolution of 1956. During the colonial period, water was unilaterally allocated by Great Britain, often with the support of the pro-British Egyptian Monarchy. Only minor water concessions were made to Italy and Britain's Uganda colony for the Owens Falls Dam. The sharing of technical data during the colonial period was largely dictated by British colonial interests who viewed this information as proprietary and vital to Egyptian security. However, the British set an important precedent by creating the first basin-wide water management plan (The Century Storage Scheme). This water management strategy was designed to maximize the flow of water to Egypt, but it also exemplified the interconnectedness of the entire Nile Basin and transformed the mindset

of Nile water managers. The sole multi-lateral agreement was a tripartite 1906 treaty between Great Britain, France, and Italy that paved the way for the Italian invasion of Ethiopia, hardly an example of cooperation of over shared Nile water resources.

During the Colonial period, Great Britain established a pattern of unilateral hydrologic development by constructing a total of 6 major infrastructure projects designed solely to benefit its economic interests in Egyptian and Sudanese agriculture. British hydrologic interests were legitimized via 12 agreements with European and African powers that solidified Britain's legal claim to the Nile Waters and ensured the undiminished flow of waters to the productive fields of Egypt and Sudan. These colonial agreements established a pattern of unilateral and bi-lateral decision making that was continued by Egypt after it gained independence in 1922 (Collins 1990). The Colonial Era set the stage for Egypt and its hydro-political ally Sudan, to dominate water management in the Post- Colonial Era.

II. The Post-Colonial Era

I. Egypt and Sudan

After shedding the yoke of British imperialism, an independent Egypt perpetuated its hydrologic dominance and asserted its historic and legal rights, as established by Egypt's established pattern of water usage and legitimized under British colonial rule, to an uninterrupted flow of vital Nile waters (Elhance, 1999, Tafesse 2000). According to Tesfaye Tafesse's article *The Hydropolitical Perspective of the Nile Question*, "the Egyptians inherited the colonial-era mentality after independence pursuing the same protectionist policy." The current hierarchy of power echoes the British colonial system and many existing conflicts were forged during that period.

Despite its vulnerable geographic location as the most downstream nation, Egypt has historically been the dominant force in the basin. Egypt is virtually devoid of precipitation, save for a small area on the Mediterranean coast, and derives 95% of its water resources from the Nile River (El-Fadel 2002, Wichelns et al 2003). Egypt's heavy dependence on the Nile has necessitated the intertwining of its water development strategy with national security policy. In a 1979 speech, then President Anwar Sadat poignantly asserted the importance of water in Egyptian foreign policy by announcing "the only issue that would prompt Egypt to declare war again would be water. Sadat's threats were not directed at Israel, but at Ethiopia, where the majority of Egypt's Nile waters originate" (Dinar 2002). In order to compensate for its geographic vulnerability and maintain its control of the Nile Waters, Egypt exploited the asymmetrical power

structure of the Nile Basin via its economic, military, and political dominance over the other riparian nations.

On several occasions, Egypt threatened the use of military force to stop upstream Nile development (Tesfaye 2006, Tafesse 2000, Collins 2002, Waterbury 2002, Arsano 1997, Bulloch & Darwish 1993). According to Stroh, Egyptian dominance in the basin was so overwhelming that:

“Egypt was able to enforce its will without having to take into consideration the interests of the other states due to its military, political, and economic supremacy. Egypt’s political and military dominance lent a certain credibility to repeated warnings of military intervention and made it a realistic option for Egyptian politicians.”

Egyptian hegemony has been reinforced by the inability of other riparian nations to successfully develop their hydrological resources due to civil war, regional conflict, natural disasters, and a lack of international financing. Egypt has been the primary beneficiary of the extended instability of other riparian nations. While the other riparian nations were engulfed in civil war, Egypt was developing its water resources and funneling support to the very rebel groups that they were battling (Stroh 2002, Tesfaye 2006). These subversive actions greatly angered the other riparian nations, but allowed Egypt to maintain its supremacy and continue constructing massive water infrastructure projects.

The Egyptian hydropolitical strategy is also built upon the series of colonial and post-colonial agreements that legitimated Egyptian water rights. The bi-lateral 1929 Agreement remained unchallenged until 1959, when an Egypt independent of the

decadent pro-British Monarchy was preparing to realize its dream of water security by building the Aswan High Dam (Collins, 1990; Swain 2002). The overthrow of the pro-British Monarchy in Egypt in 1952 and the establishment of Colonel Gamal Abdel Nasser's government ushered in a new era in the history of Nile water management. Almost immediately after rising to the Presidency, Nasser began planning a massive water infrastructure project on par with the Great Pyramids and Suez Canal. Nasser's government disliked the Century Storage Scheme because it placed the control of the Nile reservoirs in foreign hands. Nasser's plan involved building a new dam at Aswan south of the Old Aswan Dam that would be large enough to capture the annual Blue Nile flood, secure an adequate water supply in times of drought, and provide cheap abundant hydroelectricity for economic development.

The project immediately encountered stern resistance from the newly independent Sudanese government who believed it to be in violation of the 1929 Nile Water Agreement. The Sudanese also seized the opportunity to protest the invalidity of the 1929 Agreement by arguing that the colonial agreement was forced upon them by the British government and unfairly gave Egypt unilateral authority of the Nile's waters (Whittington 2004). Sudan pushed for a new more favorable water rights agreement, but the new Egyptian government would not concede and insisted the 1929 Agreement was valid. Egypt continued planning construction efforts and tensions reached their zenith from 1956-58 as threats of military action were exchanged and Egyptian troops were relocated to the Sudanese border. However, civil war broke out in the Sudan in late 1958 and a regime more favorable to Egyptian water rights came to power in northern Sudan

which signed a new water rights agreement in 1959 that paved the way for the Aswan High Dam (Waterbury 2004).

The 1959 Treaty for the Full Utilization of the Nile between Egypt and the Sudan had four primary components. First, it bi-laterally allocated water to Egypt and Sudan without consideration for other riparian powers. National water quotas were established by Egypt and Sudan with the estimated the annual flow of the Nile at 84 BCM. Egypt was allocated 55.5 BCM with Sudan receiving 18.5 BCM, and 10 BCM lost to evaporation from the scorching desert sun and seepage in the Aswan High Dam's reservoir, Lake Nasser/Nubia (Waterbury, 1979; El-Fadel, 2003). In addition to dividing the entire flow of the Nile between them, Egypt and the Sudan agreed to develop a unified view when negotiating with other riparian nations, thereby officially marrying Egyptian and Sudanese water interests (Waterbury 1997). This hydrologic alliance dominated Nile water management until relations between the two nations soured in the early 1990's.

The third component of the 1959 Agreement was the institutionalization of Egyptian-Sudanese cooperation via the creation of the Permanent Joint Technical Commission on the Nile (PJTC). This institution was charged with three primary tasks:

1. To monitor the discharge at all storage sites to ensure the release of the agreed upon allocation.
2. To negotiate the reduction of discharges in the event of prolonged regional drought.
3. To commission and supervise the engineering for any joint water related infrastructure improvements

Mohamoda 2003, p. 13

Since its creation, the PJTC has functioned almost uninterrupted through times of political turmoil and environmental uncertainty (Waterbury 2004). This bi-lateral technical sharing reinforced the Egyptian-Sudanese hydro-alliance and further segregated the upstream riparian nations. The Treaty's final component established the legal right for Egypt to pursue the Aswan High Dam that dramatically altered the hydrology of the Nile and international politics and for Sudan to construct the Roseires and Khashm el-Girba dams. The 1959 Treaty profoundly influenced the future of Nile water management and utilization. It set a post-colonial precedent for bi-lateral cooperation at the exclusion of the other riparian nations.

The Roseires Dam was constructed from 1961-66 on the Blue Nile 120 km from the Ethiopian border and 630 km southeast of Khartoum (Shahin 2002). Once built, it supplied Khartoum with hydroelectricity and created a reservoir with a total storage capacity of 3.0 BCM that was aimed at providing water for the Managil and Rahad expansions of the Gezira Scheme (Tafesse 2002). The dam was raised in 1984 which increased its storage capacity to 6.8 BCM (Nicol 2003).

The Khashm-el-Girba Dam, located adjacent to the Eritrean border, was completed in 1964 with a storage capacity of 1.3 BCM. This reservoir was designed to serve the Haifa Irrigation Scheme built to compensate 90,000 Nubians displaced by the flooding of Lake Nasser/Nubia. The viability of the dam was immediately threatened by siltation and by 1980; silt from the Ethiopian Highlands had reduced the dam's capacity by 35 percent (Shahin 2002, Nicol 2003).

A 30,000 man construction crew labored for over 10 years to build the Aswan High Dam, located in the extremely arid desert of southern Egypt 50 km north of the

Sudanese border and approximately 5 km south of the Old Aswan Dam. The exact location was chosen at a relatively narrow stretch of the river that also featured bedrock that would minimize seepage and erosion. Construction officially began in 1960 and the first phase of the project was completed in 1964, which allowed the giant reservoir, Lake Nasser, to begin filling. Construction was completed on July, 21 1970 and the dam became fully operation within the year (Hassan 2000).

The Aswan High Dam is a pyramidal rock fill dam composed primarily of granite blocks, sand, and a core of impermeable clay. The amount of material that went into the dam's construction is equivalent to 17 great pyramids (Hassan 2000). The dimensions of the completed dam stand at a gargantuan 3,600m in length, 984m in width at the base, 40m in width at the crest, and 111m in height. A complex network of high tension 500kv power lines was constructed to carry the Aswan High Dam's 2,100 Megawatts (MW) of electricity across the country. In case of high water, 30 emergency sluices were constructed to divert the flow into holdings ponds. (Hassan 2000).

Figure 2.2 Aerial View of the Aswan High Dam



Picture courtesy of: http://www.intute.ac.uk/sciences/worldguide/html/image_2108.html

The construction of the Aswan High Dam flooded a gigantic section of the Nile Valley south of the site. This created Lake Nasser, then the world's largest reservoir, which extends 480 km southward through Egypt and northern Sudan and covers an area of 5,250km². 83% of the lake lies within the borders of Egypt and the remaining 17% lies in the Sudan, where it is called Lake Nubia. When the reservoir finally filled its capacity of 9 BCM in 1976 it was large enough to be the world's 20th largest lake, approximately three times the size of the Great Salt Lake (Shahin 2002).

The Aswan High Dam greatly benefited the Egyptian economy by providing cheap and abundant hydroelectricity and protecting the nation from flood and drought. It also provided the agricultural sector with a constant year round supply of water, thereby increasing cultivated land in Egypt by 30% and transforming marginal farmland into highly productive fields. This constant water supply made it possible for farmers to harvest three times per year instead of twice, significantly increasing agricultural output and water demand. The cultivation of more water intensive crops, such as wheat, cotton, and grapes, greatly increased as did the profits from exporting these valuable crops (Tarek 2004). Farmers have greatly benefited from the Aswan High Dam and are free to tap into irrigation canals as they please without paying user fees or taxes on the waters they utilize. However, the Aswan High Dam has also deleteriously impacted the environment. Soil salinization and riverbed erosion have greatly increased since the Dam's construction due to the loss of the annual flood which previously flushed the soil and deposited nutrient rich silt.

The Aswan High Dam and the 1959 agreement were met with a chorus of discord from upstream riparian nations who insisted the treaty is invalid and that they have the

right to utilize the water resources within their borders (Waterbury, 1997; Howell & Alan 1994, Taffesse 2000, Swain 2002). Another result of the 1959 Treaty was the dismissal of the basin-wide management approach pioneered by the British Century Storage Scheme. Plans for comprehensive basin-wide management fell to the wayside as a new Egyptian-Sudanese power structure that stressed state-centric decision-making and inter-basin intimidation became the paradigm. This system allowed Egypt and Sudan to impose their will by manipulating the political and economic arenas to their favor, largely at the expense of the upstream riparian powers (Whittington & Haynes 1985, Allan 1999, El-Fadel 2003, Waterbury 2002, Swain 1997).

Egyptian and Sudanese claims to a valid legal entitlement of Nile waters stem from the 1959 bilateral water rights agreement. Beyene and Wadley, in their article entitled *Common Goods and the Common Good: Transboundary Natural Resources, principled Cooperation, and the Nile Basin Initiative*, provide a detailed analysis of the historic aspect of the Nile Basin's legal regime during the colonial and post-colonial eras. They conclude that the majority of the era's treaties, including the 1959 agreement, fail to be binding for a multitude of reasons. First, "[these] agreements fail to accommodate all the riparian countries of the basin. They are isolationist, reflecting the colonial policy of divide and rule". Secondly, they were created to favor British colonial interests in Egypt and Sudan and allow these nations to unilaterally pursue their interests at the expense of non-consulted nations. Finally, the absence of distributive justice and "the Egyptian protectionist policy embedded with inherited colonial-era mentality" makes these treaties unacceptable to any riparian other than Egypt and Sudan. The obvious bias towards downstream interests and lack of any notion of fairness or equity has crippled the validity

of the bi-lateral 1959 water rights treaty in the eyes of the international community and revealed the need for a comprehensive multi-lateral treaty (Beyene & Wadley 2004, Allan 1999, Collins, 1990).

Upstream dissatisfaction with the hydro-political status quo was amplified by the inauguration of an Egyptian project to expand irrigated agriculture in the desolate Sinai Peninsula. The idea to divert the flow of the Nile eastward into the Sinai Peninsula was first envisioned by Theodore Herzl, founder of the Zionist movement, in 1903, and reborn as a goodwill gesture towards Israel after the signing of the Camp David Peace Accords in 1978 by Egyptian President Anwar Sadat as the North Sinai Agriculture Development Project (NSADP). Officially launched by President Sadat in 1976, its goal was to expand irrigated agriculture and relieve crowding in the Nile Valley (Bleier 1997, Collins 2000). Unofficially referred to as the el-Salaam or Peace Canal, the first phase of the NSADP was completed in 1997. Comprised of a series of underground water pipelines capable of diverting 160 million cubic meters per second (MCM) to the Suez Canal region for municipal, industrial, and agricultural use, the NSADP has consumed untold amounts of water in the name of desert reclamation. Egypt anticipated that it could provide adequate water to the NSADP without violating the terms of the 1959 Agreement. However, years of low precipitation led to lower water availability and left Egypt looking for additional water savings in the swamps of southern Sudan.

In response to this need, Egypt and Sudan revisited the Century Storage Scheme which called for a diversion canal that would bypass the 30,000 km² of Sudd swampland in southern Sudan in order to increase the flow of the White Nile. The Jonglei Canal was to be the first phase of an Egyptian-Sudanese Master Water Plan that closely resembled

the Century Storage Scheme. The Canal was expected to save approximately 4.7 BCM annually from evaporation and improve navigation in the labyrinthine Sudd.

The project was launched in 1978 and 250 km of the planned 360 km were excavated by a French Company until attacks by the Sudanese People Liberation Army forced its abandonment (Swain 1997). Scholars such as Bruneo and Toope have suggested that the Canal played a significant role in the renewal of the Sudanese Civil War because the southern Sudanese “considered the scheme a pawn in the hands of the Northerners who seek to dominate the South and extract the advantages of the project without bearing its costs (Bruneo and Toope 2002, 126). This conflict forced Egypt and Sudan to postpone their hydrologic plans and pursue alternative infrastructure projects. However, the prospect of revisiting the Jonglei Scheme remains a high priority for Egyptian and Sudanese policy makers who cite the enormous water savings that could be achieved.

Regardless of scholarly criticism and political dissent, Egypt continues to assert the validity of the 1959 agreement and its right to utilize the 55.5 BCM allocation. The tone of numerous Egyptian press releases and official statements concerning Nile water rights remain unwavering in their support for and validity of the 1959 water rights agreement. In contrast, Upstream Nations have been equally persistent in its resentment and disregard for the contentious treaty (Ahmed, 1990; Mokonnen, 1997; Kendie, 1999; Mohamoda 2003). These competing viewpoints embody the broader water based conflict between upstream and downstream interests that threatens to tear the hope for cooperation and basin-wide prosperity out of the realm of possibility.

II. Ethiopia

Ethiopia, an independent nation in 1959, immediately rejected the validity of the treaty and the wisdom of placing a large reservoir in the southern Egyptian desert. Ethiopia was quick to point out that evaporation rates are much lower in the craggy canyons of the Ethiopian Plateau and that the British Century Storage Scheme also recognized the wisdom of over year storage in the Ethiopian Highlands. However, Ethiopian complaints fell of deaf ears as Egypt and Sudan bi-laterally imposed their will. To this day, Ethiopia disregards the treaty and points out the disparity of Nile water rights. For extended periods after 1959 Ethiopia was plagued by poverty, famine, and drought while the severely under-utilized hydrological resources of the Blue Nile flow downstream to make the desert bloom in Egypt (Allan, 1999, Godana 1985, Abate 1994).

Despite the fact that providing 86 percent of the main Nile's flow, having the largest untapped hydroelectric potential in the Basin, and suffering from devastating famine, Ethiopia utilizes only 1 percent or 0.65 BCM of the Nile waters annually and harnesses 0.2 percent of it hydroelectric potential (Taffesse 2002). Ethiopia's economic impotence is the direct result of a series of revolutions, civil wars, and concurrent natural disasters that drained the country's resources. Rapid population growth and rampant poverty have also placed a tremendous strain on the country's ecological systems and have resulted in extensive erosion and deforestation.

Ethiopia's geographic advantage and prospects for development constitute a serious threat to Egyptian water security (Swain 2002, Waterbury 2002). Ethiopia is

estimated to have an overall irrigated agriculture potential of 2.3 million ha in the Nile Basin, but currently irrigates only 8000 ha (Tafesse 2002). Egypt contends that Ethiopia has sufficient precipitation to eliminate the need for the expansion of irrigated agriculture and the required dams and reservoirs (Collins 2002). However, the legacy of drought and famine stemming from insufficient and unpredictable precipitation and its lack of facts on the ground to be used in negotiations with other riparian nations compelled the Ethiopian government to embark on a campaign of constructing low-cost micro-dams on the Blue Nile (Waterbury & Whittington 1998, Collins 2002, Whittington et al 2005). These small scale local projects, usually constructed using local labor and government equipment, provide insufficient capacity to combat extended drought and may rupture during intense flooding, but do are a viable short-term option for a country suffering from a dearth of financing and technical expertise. They are also a strategically ingenious, because, in case of invasion, it would be much more difficult to occupy hundreds of micro-dams than a few large dams (Waterbury & Whittington 1998). However, these micro-dams are usually poorly constructed and provide only meager protection from floods and droughts.

Ethiopia's lack of large scale hydraulic infrastructure projects on the Blue Nile is not due to a lack of planning. The Ethiopian Government commissioned the United States Bureau of Reclamation to undertake a study for potential development projects on the Blue Nile. Completed in 1964, this Blue Nile Master Plan identified 33 irrigation and hydro-electric projects including four dams with a planned storage capacity of 51 BCM and power generation potential of 38 billion kilowatt hours annually. This ambitious plan would have reduced the annual flow of the Blue Nile by

approximately 6 BCM, but it would have also provided significant flood and siltation protection for Egypt and Sudan. However, the only component of this plan ever to be realized was a small dam at Fincha that was constructed in the 1970's with a storage capacity of 0.6 BCM. The Ethiopians were unable to secure financing for the remaining projects as the United States mysteriously withdrew support for the proposal. Scholars such as Tafesse and Wondimneh suggest that the United States exploited Ethiopia's commanding geographic position to illustrate Egypt's hydrologic vulnerability and dissuade continued Soviet involvement in the Nile's hydropolitics (Tafesse 2002).

Ethiopia also attempted to harness the power of the Blue Nile in the late 1980's with the Tana-Beles Project. Officially launched in 1988 with the support of the Italian government, the project had the dual aim of increasing irrigated agriculture and hydro-power generation via a series of five dams. Egypt perceived a threat to its water security and vociferously objected to the project. The project came to an abrupt end with the advent of the Ethiopian Peoples Revolutionary Democratic Forces overthrew the Ethiopian Socialist government and dismantled the project (Tafesse 2002).

As Ethiopia's government has stabilized and its conflicts with Eritrea and Somalia ended, international support has increased (Swain 1997). Ethiopia has been slowly closing the economic and military gap between itself and Egypt. However, Egyptians enjoy positions of power in several influential international lending institutions, including the African Development Bank and World Bank, and have repeatedly used this influence to block Ethiopian water infrastructure projects (Tafesse 2000, Whittington & Haynes 1985, Allan 1999, El-Fadel 2003, Waterbury 2002, Swain

1997). As of 1999 Ethiopia's only hydraulic works on the Nile consisted of the small dam at Fincha, a run-of-the-river power station at the Blue Nile outlet, and an unknown number of microdams throughout the countryside.

III. The Equatorial Lakes Nations

The Equatorial Lakes nations, mostly colonial possessions in 1959, have also been vocal opponents of the bi-lateral 1959 treaty which ignores their claims on Nile waters. In February 2004, the Uganda Parliament endorsed a motion supporting the nullification of colonial treaties. One MP was quoted as saying “[the fact that] it has taken over 40 years for us (Ugandans) to rise up and seek to walk out of an enslaving colonial treaty is testimony to how casually we have taken our independence. The article also pleaded for Uganda to “publicize the unfairness of the colonial agreements to shame Egypt and Sudan into accepting new terms” (Kampala Monitor 2004). Extended periods of conflict that destabilized the Equatorial Lakes region combined with intimidation from Egypt made the development of the region’s Nile water resources virtually impossible.

The Equatorial Lakes Nations utilize approximately 0.5 BCM of the Nile waters annually and on average have more abundant water supplies than Egypt and Sudan (Tafesse 2002). The only significant hydraulic work in the region to date is the previously mentioned colonial era Owens Falls Dam at the mouth of the Victoria Nile in Uganda. The lack of hydraulic works in these countries can be contributed to the region’s abundant precipitation, history of violent conflict, and economic underdevelopment. The combination of these factors and the constant threat of Egyptian intervention created an environment where the Equatorial Lakes Nations were either uninterested or incapable of developing water related infrastructure projects.

Given that the Equatorial Lakes Nations only contribute 14% of the Nile's flow at Aswan, have abundant precipitation and alternate water sources, and their primary concern is the management of the Equatorial Lakes and not the hydropolitics of Cairo or Addis Ababa, they have unofficially formed a loose semi-autonomous sub-basin group that has acted independently of powerful downstream nations so long as the flow of the White Nile were not significantly diminished. The first of these efforts arose over the need to better understand the hydrology of the Equatorial Lakes.

The Equatorial Lakes nations achieved independence from European imperialists during the 1950's - 1960's. During the same time period, highly erratic precipitation led to floods, droughts, and famine that revealed the need to better understand the hydro-meteorological dynamics of the Nile basin. In 1961, acting upon this need, Burundi, Egypt, Kenya, Rwanda, and the Sudan asked the World Meteorological Organization and the Food and Agricultural Organization (FAO) to conduct a survey of the Lake Victoria basin. The survey, entitled Hydromet, was soon expanded to cover the entire Lake plateau and equatorial region. Ethiopia joined as an observer in 1971, but its extensive hydro-meteorological resources were not surveyed. While Hydromet did provide a building block for regional technical cooperation, basic training for technicians, a catalog of hydro-meteorological data, and a forum for discussion, it was unsuccessful in creating a viable basin-wide cooperative agreement. This failure was due in large part to Ethiopia's view that the project was dominated by Egyptian interests and concerned mainly with increasing the flow of the Nile to Aswan (Tamrat 1995, Collins 2002, Waterbury 1990). This suspicion exacerbated the mistrust between Egypt and Ethiopia that poisoned the cooperative spirit.

The Equatorial Lakes nations took a proactive cooperative step in 1977 when the governments of Burundi, Rwanda, Tanzania, and Uganda reached an agreement for the establishment of the Organization for the Management and Development of the Kagera River Basin, a major tributary of Lake Victoria. This organization unofficially began in 1969 as a technical council designed to identify potential projects and gather data, but the lack of technical and financial resources left the organization unable to follow through on its commitments. In 1971, the council was integrated with Hydromet which produced a 13 volume work which recommended the development of the Kagera River Basin Organization. This Organization identified several projects, including the Rusumo Falls multi-purpose project later implemented under the auspices of the NBI, but was unable to actualize its vision due to the political instability and civil wars that wreaked havoc on three of the four member nations and insufficient resources. The advent of more coherent and resourceful cooperative efforts led to the dissolution of the Kagera River Basin Organization in 2004.

Figure 2.3 Pre-NBI Projects

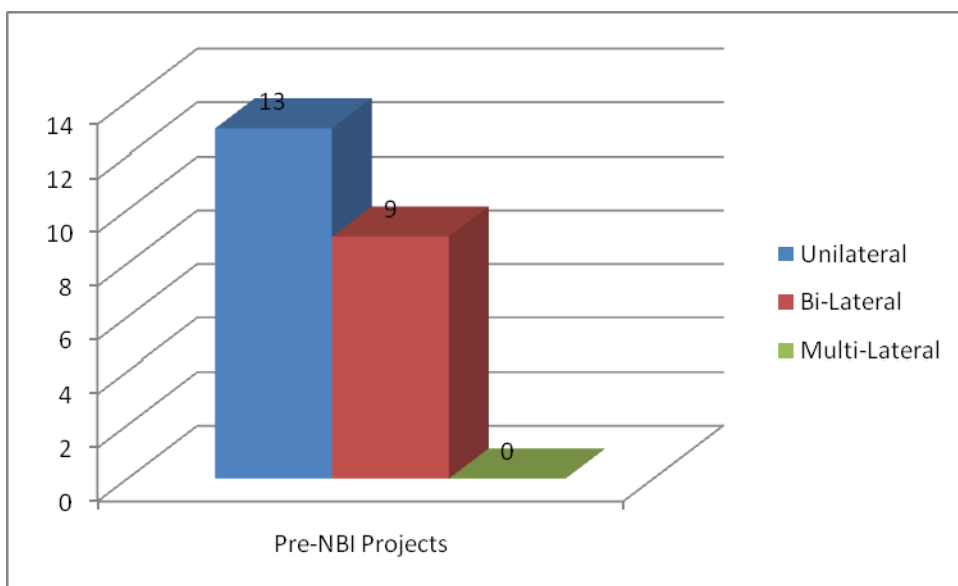
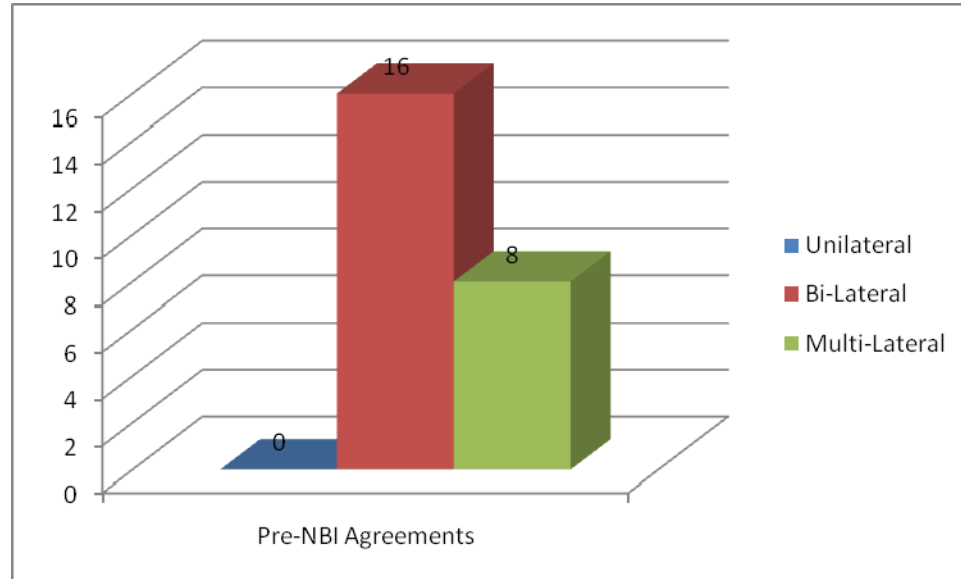


Figure 2.4 Pre-NBI Agreements



The above graphs illustrate the patterns of decision making in the Pre-NBI period. The strong Unilateral and Bi-lateral pattern of infrastructure development illustrates the general trend started by Great Britain. The early Post-Colonial period witnessed Egypt and Sudan bi-laterally impose their hydrologic designs on the other riparian nations as Ethiopia and the Great Lakes Nations experienced a tumultuous series of regional and internal conflicts that left them unable to develop any significant infrastructure projects. During this time Egypt and Sudan capitalized on their powerful position by constructing large infrastructure projects, including the Aswan High, Roseires and Kashem el-Girba dams, and solidifying their legal claims with the 1959 Treaty for the Full Utilization of Nile Waters. This bi-lateral pattern of decision-making continued until the early 1990's when relations between Sudan and Egypt soured and the other riparian nations politically stabilized. The disintegration of the Egyptian-Sudanese alliance disrupted the hydropolitical status quo and enabled the formation of increasingly egalitarian water

management institutions, such as TECCONILE, the Lake Victoria Environmental Management Program, and eventually the NBI.

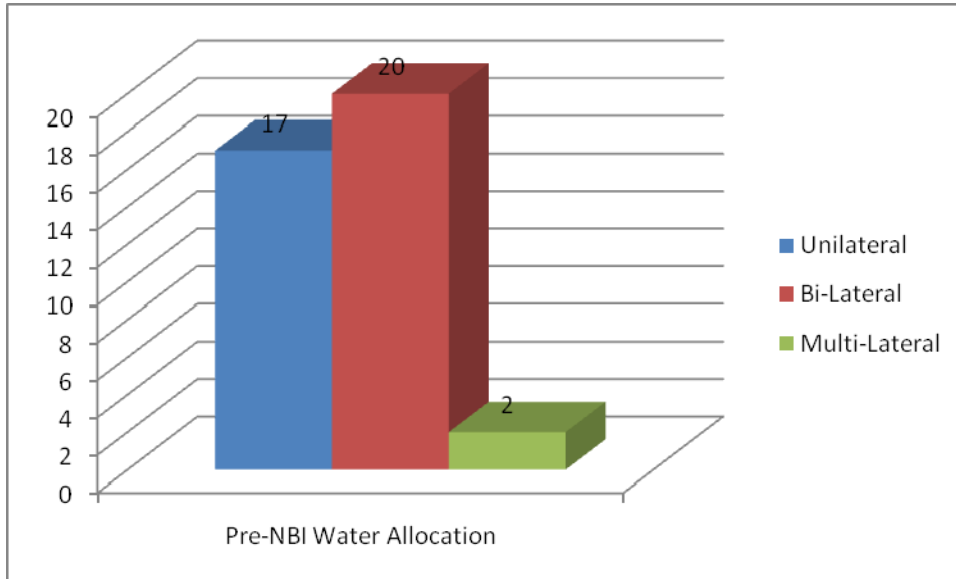
The Equatorial Lakes Nations were of particular importance in the development of previous attempts at basin-wide cooperation. They were the catalyst for the Hydromet Project and independently developed 3 cooperative efforts in the Pre-NBI period, the Kagera River Basin Organization, the Lake Victoria Environmental Management Project, and the Lake Victoria Water Resource Management Project.

Although there are a high number of multi-lateral, most of them were failed attempts at cooperation or colonial era agreements that are no longer recognized as valid. Bi-lateral decisions first by Great Britain and later by Egypt were the predominant type of agreements during the Pre-NBI period. Decision making during the Pre-NBI period was controlled by the British and Egyptians. Unilateral and Bi-lateral decisions were the norm as attempts at multi-lateral projects and programs were unsuccessful due to a host of problems.

III. Measures of Conflict in the Pre-NBI Period

Water allocation during the Pre-NBI period followed the general pattern of decision-making. Great Britain controlled Colonial era water allocation via bi-lateral agreements with other riparian powers and a campaign of infrastructure projects. Water allocation in the post-colonial period was dominated by Egyptian-Sudanese bi-lateralism, until the political schism ended this regime. However, the pattern of water allocation remained unchanged as Egypt and Sudan continued to assert the validity of the 1959 Agreement. Two of three instances of multi-lateral water allocation (the Century Storage Scheme and the Kagera River Basin Organization) were ineffective at creating a multi-lateral allocation of water resources due to regional conflicts and insufficient resources. The only active agreements concerning the allocation of water resources are the highly contentious 1929 and 1959 water rights agreements. These treaties were a disruptive force on the relations between the riparian nations due to lack of consideration given to the upstream states and the bi-lateral allocation of authority and the entire Nile flow to the two most upstream states, Egypt and Sudan.

Figure 2.5 Pre-NBI Water Allocation

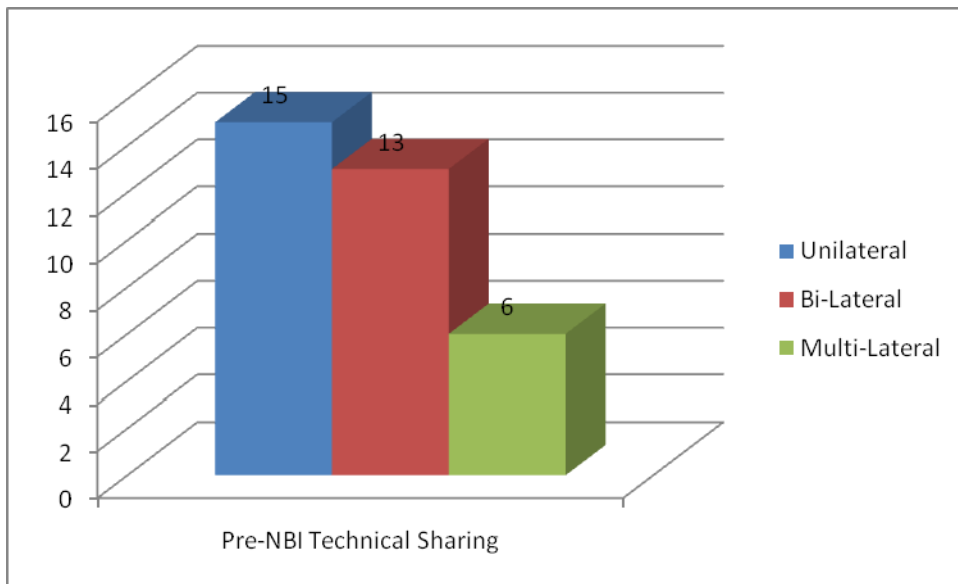


Overall water allocation was the most contentious of the three indicators of conflict during the Pre-NBI period. Great Britain established a downstream oriented power structure that allowed Egypt to manipulate the hydro-political landscape, often at the expense of upstream nations. Disagreements over the allocation of water resources generated by the downstream dominated water management paradigm were a constant source of tension between the riparian nations.

Patterns in technical sharing during the Pre-NBI period evolved along similar lines as the allocation of water resources. Unilateral British projects dominated the Colonial era; while the Post-Colonial period was characterized by bi-lateral technical sharing between Egypt and Sudan on a variety of projects. The only 2 instances of multi-lateral technical sharing that occurred before 1993 were the Hydromet survey (1967-1993) and the Kagera River Basin Organization (1977-2004). However, these institutions cannot be considered basin-wide due to the exclusion of Ethiopia from

Hydromet and due to the fact the Kagera River Basin Organization only included four of the six Equatorial Lakes Nations (Burundi, Rwanda, Tanzania, and Uganda) and was largely ineffectual due to regional political instability. The advent of the Nile 2002 Conference Series inaugurated a period of multi-lateral dialogue, planning, and 6 multi-lateral technical sharing efforts, including 3 attempts at basin-wide ventures and 3 amongst the Equatorial Lakes nations over the management of Lake Victoria. This new pattern of multi-lateral technical sharing was the result of an environment of growing trust and cooperation between the riparian states.

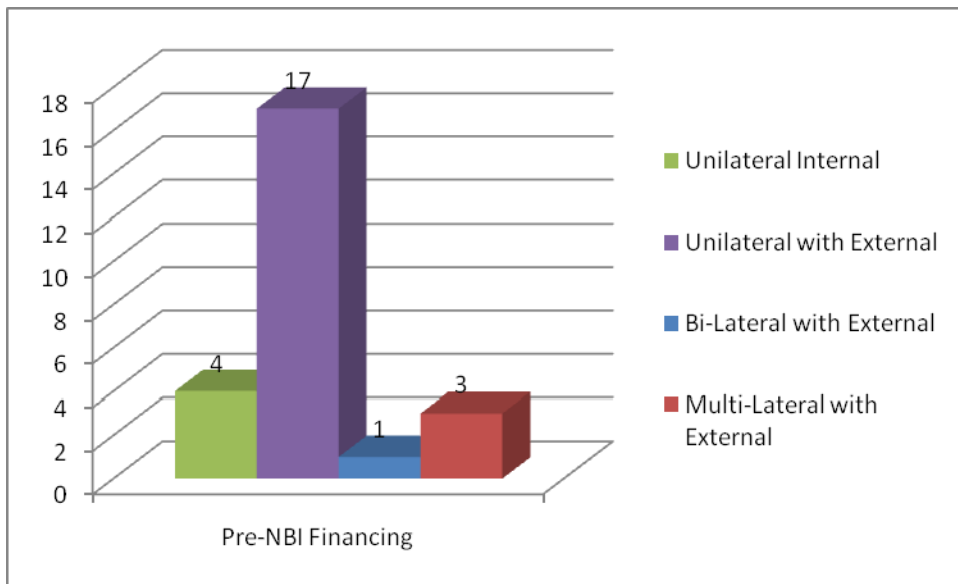
Figure 2.6 Pre-NBI Technical Sharing



The overall pattern of financing in Pre-NBI period reveals a strong tendency towards unilateral projects financed with international assistance. Great Britain provided the funding for a wave of Colonial Era projects within its African colonies. The post-colonial period was dominated by unilateral projects initiated by Egypt and Sudan and

funded with international assistance. Multi-lateral financing in the Pre-NBI period was confined to the Hydromet, Kagera River Basin Organization, and the Lake Victoria Water Resource Project in 1994. Unilateral financing clearly dominated the Pre-NBI period.

Figure 2.7 Pre-NBI Financing



The Pre-NBI period of water management was a turbulent upstream dominated paradigm. Great Britain established a pattern of unilateral decision making that was continued by Egypt and its hydropolitical ally, Sudan. The three measures of conflict presented in this section illustrate the unilateral and bi-lateral patterns of decision making that dominated the Pre-NBI period and amplified inter-basin tensions and mistrust.

Chapter 3: Post-NBI Water Management Developments

Introduction

The following chapter presents evidence in the same format as the previous chapter. First, water related decisions are cataloged chronologically and organized by type (unilateral, bi-lateral, or multilateral). Then, the measures of the dependent variable are employed and decisions are organized by type. Finally, the evidence is summarized and decision making patterns are identified.

I. The Post-NBI Period

The 1990's saw a sea change in the hydro-political status quo of the Nile Basin. The previously solid Egyptian-Sudanese alliance rapidly disintegrated after the Pro-Egyptian Sudanese Government was overthrown in 1989 by military coup led by General Omar Hasan al-Bashir and politically backed by Muslim Brother leader Hasan al-Turabi. Egypt, fearing an Islamist coup of its own, attempted to politically distance itself from the new Sudanese regime. Tensions between the two nations reached their peak in 1995 when Egyptian President Hosni Mubarak narrowly escaped an assassination attempt in Addis Abba. Egypt later implicated Sudan and Islamic extremists such as Osama bin Laden in the attack. These events shattered the bi-lateral hydro-alliance and created a more symmetrical power structure that allowed upstream nations to challenge Egypt's hydrologic hegemony.

Due to these changes in the hydro-political status quo, this author has created an artificial distinction between the Pre and Post NBI periods in order to determine the impact of the NBI on the causes of conflict in the Nile Basin. The creation of the Nile River Basin Action Plan in 1995 is used as the line of demarcation between the Pre and Post- NBI periods because this event marks the transition where the process of negotiation expanded beyond simple technical sharing and developed into a more dynamic water management scheme. The events immediately preceding the creation of the NBI have been included in the Post-NBI period due to the fact that the NBI is not an

isolated occurrence, but an inextricable element in a long-term cooperative process. Cooperative efforts prior to the 1990's were largely ineffectual due to the perception that they were skewed to serve the interests of downstream nations. Despite the inability of organizations such as Hydromet, the Kagera River Basin Organization, and the Lake Victoria Management programs to significantly alter the asymmetrical hydropolitical status quo, their failings allowed future cooperative efforts to refine the recipe for basin wide cooperation. They also opened lines of communication between the riparian nations, aided in establishing mutual trust, and enlisted the support of the international community. The following series of cooperative efforts extended the scope of collective action by creating technical sharing enterprises, communal funding mechanisms, and several multi-lateral agreements and projects that furthered the cooperative momentum and culminated in the projects and programs of the NBI.

The highly contentious issue of water allocation has continually plagued the cooperative process. Despite Egypt's reluctance to negotiate over the allocation of water rights, it has shown considerable will to promote supply augmentation and environmental restoration projects throughout the basin (Dinar 2002, Beyene & Wadley 2004). As Dr. Shlomi Dinar so poignantly points out "States cooperate when cooperation serves the interests of a dominant power, which takes the lead in cooperating arrangements and enforces compliance with the corresponding rules." In the case of the Nile Basin, Egypt, the military and economic hegemon, engineered Pre-NBI cooperative efforts to further its interests (Waterbury, 1990; Tafesse 2000, Dinar 2002). As Dr. Dinar once again points out:

“Egypt is interested in cooperating with other riparian nations over issues such as finding new sources of water, collecting data, and trading technology, but is not at all keen on cooperating to allocate the waters of the Nile evenly among the riparians – which is precisely what the other riparian countries favor.”

Egyptian willingness to cooperate over technical sharing and supply side development was a crucial factor in the establishment of a new basin wide cooperative effort. The Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE) emerged after the effective dissolution of the Egyptian-Sudanese alliance in 1992 with support from the Canadian International Development Agency (CIDA). Members included Egypt, Sudan, Tanzania, Uganda, Rwanda, and Zaire, while Ethiopia, Kenya, and Burundi, still skeptical of Egypt’s motives, participated as observers until their entry in 1994. A Council of Ministers of Water Affairs of the Nile Basin states (Nile-COM) was established to act as TECCONILE’s highest decision-making body and a technical advisory committee (Nile-TAC) was established to provide technical guidance. However, with several key states highly suspicious of TECCONILE’s motives and without a legal operational framework or collective action plan with which to build mutual trust and garner sufficient financial assistance to address the myriad problems affecting the Basin, TECCONILE seemed destined to succumb to the same fate as Hydromet and UNDUGU.

Then, in February 1995, the Council of Ministers, now including all riparian nations except Eritrea, approved the Nile River Basin Action Plan (NRBAP). Eritrea, which has a peripheral dependence on the one Nile tributary, did not approve the plan, but agreed to participate in the cooperative

process as an observer (Nicol 2003). The NRBAP inaugurated a series of mutually beneficial technical assistance projects, including programs concerning:

1. Integrated water resources planning and management
2. Capacity building
3. Training
4. Regional Cooperation
5. Environmental Protection

From 1993-99 the riparian nations made detailed preparations for financing and drafted policy guidelines for the NRBAP. In 1997, The World Bank, CIDA, and United Nations Development Program (UNDP) pledged their support and willingness to coordinate donor funding for further cooperative Nile Basin projects (Hefny & Amer 2004). As a result, the Nile Basin Initiative (NBI) was launched as a transitional institution in 1999.

The NBI represents the culmination of a half a century of long cooperative process and is the most promising cooperative effort to date in the Nile Basin. It includes all ten riparian nations and has considerable support from the international community. The NBI employs a similar power structure as TECCONILE with the Council of Ministers of Water Affairs of the Nile Basin States (Nile-Com) as its highest decision-making body and the Technical Advisory Committee (Nile-TAC) steering practical decision making. The NBI is designed to be a transitional mechanism that leads to the creation of a legally binding cooperative agreement that defines the equitable utilization of Nile waters and the responsibilities to cooperate in development and protection efforts.

Despite making significant gains and holding incredible promise, the cooperative process in the Nile Basin still faces a host of serious challenges it must overcome before the NBI attains its goal of “achieving sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin Water Resources” (NBI 2001), (Hefny & Amer 2004, El-Khodari 2002, Foulds 2002, and Swain 2002). Ethiopia, while an active member, is still a suspicious “lukewarm participant” that believes Egypt is using the NBI to occupy the other riparian nations while it unilaterally pursues water related infrastructure projects such as the Toshka Depression Project and Al-Salaam (Peace) Canal (Tesfaye 2006, Arsano 1997, Abraham 1997, Kendie 1999). This rift between upstream and downstream states centers around the differing expectations for cooperation, competing interpretations of riparian rights, and the struggle of allocating water resources (Swain 2002, Amer et al 2005, Waterbury 2002, Dinar & Alemu 2000).

The NBI may never have materialized without the steady influence of the Nile 2002 Conference Series. Beginning in February 2002 and running to the present day, the Nile 2002 Conference Series provided an open forum for the presentation and discussion of technical and political papers focusing on comprehensive cooperation from all ten riparian nations. According to Brunee and Toope, the Nile 2002 Conference Series “appears to have fostered genuine mutual leaning and the evolution of previously entrenched positions, thereby helping to create an environment in which the parallel TECCONILE, Nile River Basin Action Plan, and NBI processes could evolve”. The continuity of the participants has also aided in creating interpersonal dialogue extraneous

to the region's turbulent politics and opening a line of communication to the previously insulated Egyptian and Ethiopian camps.

Previous cooperative organization failed to generate basin-wide support or develop a legal framework for the continuation of cooperative action. The NBI has succeeded in gaining the support of all riparian nations and the international investment community. The signing of a cooperative framework agreement and the advent of the NBI resulted in an unprecedented wave of multi-lateral projects designed to build the foundations for a permanent basin-wide management institution by sowing the seeds of trust and interdependence amongst the riparian nations. After securing funding from international donors including the World Bank and the African Development Bank (ADB), the NBI launched an extensive portfolio of mutually beneficial trans-boundary projects. The creation of the NBI serves as the independent variable for this thesis, as it is hypothesized to be the catalyst for a multi-lateral transformation of the decision making process in the Nile Basin and an easing of tension over shared Nile waters. The content of Post-NBI projects and agreements will be analyzed and used to test the impact of the NBI. Specifically, the content of Post-NBI period decisions (Decisions made after the approval of the NRBAP in 1995) will be analyzed according to their impact on the allocation of water, sharing of technical data and expertise, and financing compared to the Pre-NBI decisions. This will provide valuable insight into how the NBI has affected the causes of conflict that plagued previous cooperative efforts.

The NBI reached a hallmark in 2001 that shifted the institution from the planning to the implementation phase. The endorsement of the Strategic Action Program (SAP) by all ten riparian nations and the first meeting of the International Consortium for

Cooperation on the Nile (ICCON), organized by the World Bank, vaulted the cooperative process into an unprecedented era of basin-wide multi-lateralism and initiated a portfolio of mutually beneficial projects. The first meeting of the ICCON was attended by ministers from all ten riparian nations, representatives from the World Bank, UNDP, and a host of other donor organizations, including the African Development Fund, the EU, the FAO, and the Global Environmental Facility, government representatives from Canada, Denmark, the Netherlands, Norway, Sweden, the United Kingdom, and the riparian nations themselves (Nicol 2003). This meeting secured \$120 million from the donor community over six to eight years for the implementation of SAP. This substantial sum was parlayed into the Nile Basin Trust Fund (NBTF), which has acted as the primary funding mechanism for the SAP. This collective funding mechanism is a significant development in the cooperative process in that it intertwines the financial interests of the riparian nations and creates a powerful incentive to cooperate and embark on collaborative projects. The NBTF is governed by the Nile-COM and is to date the only example of a multi-lateral funding mechanism.

The SAP contains a portfolio of projects and programs with regional implications designed to promote economic growth, build trust and confidence amongst the riparian nations, and reverse environmental degradation. It is divided into two complimentary components: the basin-wide Strategic Vision Program (SVP) and two subsidiary action programs, the Eastern Nile Subsidiary Action Program (ENSAP) and the Equatorial Lakes Subsidiary Action Program (NELSAP). According to the NBI website, “The SVP is comprised of grant based activities to foster trust and cooperation and build an enabling environment for investment.” (<http://www.nilebasin.org/aboutUsSvpSap.htm>). The SVP

is comprised of eight mutually beneficial projects funded primarily by the NBTF and the riparian nations:

Table 4 SVP Funding

SVP Project	Nile Basin Trust Fund	Riparian Nations Contributions	Total (in millions)
1. Applied Training Project	\$18.61	\$1.07	\$19.68
2. Confidence-Building and Stakeholder Involvement Project	\$5.00	\$0.00	\$5.00
3. Regional Power Trade Project	\$13.10	\$0.88	\$13.98
4. Shared Vision Coordination Project	\$5.38	\$4.43	\$9.81
5. Socio-economic and Benefits Sharing Project	\$9.36	\$0.77	\$10.13
6. Transboundary Environmental Action Program	\$39.00	\$4.00	\$43.00
7. Efficient Water Use for Agriculture Project	\$5.01	\$0.45	\$5.46
8. Water Resources Management Project	\$30.56	\$2.30	\$32.86
Total	\$126.02	\$13.90	\$139.92

Source: NBI homepage. <http://www.nilebasin.org/>

Each of these projects has addressed some of the Nile Basin's most fundamental water management problems such as the lack of trust amongst riparian nations, the dearth of technical data and expertise, environmental degradation, inefficient use of water in agriculture, and the lack of coordinated basin-wide water management planning. This portfolio of projects has built technical and institutional capacity, provided detailed plans for hydrologic integration projects and spread a variety of benefits across the Basin. The

SVP was intentionally composed of non-controversial mutually beneficial projects agreed upon by all ten riparian with the aim of solidifying the cooperative spirit amongst the riparian nations. The successful implementation of the SVP will establish a firm foundation for future cooperative efforts and demonstrate the willingness of the riparian nations to put their quarrels aside and find multi-lateral solutions to their collective problems. Thus far, the international donor community has embraced the SVP by providing over \$126 million and technical expertise for the training of future Nile water managers. All SVP Projects are funded by the multi-lateral NBTF and contributions directly from the riparian nations. The SVP's focus on non-controversial yet essential training and planning projects provided collective solutions to common problems thereby reinforcing riparian confidence in the multi-lateral decision making process.

The NBI created two Subsidiary Action Programs customized to meet some of the most essential water problems, the Nile Equatorial Lakes Subsidiary Action Program and the Eastern Nile Subsidiary Action Program (ENSAP). This sub-basin approach is due in large part to the fact that the Equatorial Lakes nations were more concerned with the management of the Equatorial Lakes, while the downstream riparian nations (Egypt, Ethiopia, and Sudan) were more concerned with flood preparedness, the integration of power networks, and management of the eastern Nile Basin. The planning for the ENSAP and NELSAP projects occurred from 2001-2003 with majority of projects being implemented as of 2005. Thus far, the dual Subsidiary Action Programs have succeeded in planning and implementing an impressive portfolio of regional projects. These multi-lateral projects have not only begun to address the plethora of problems that plague the Nile Basin, they have also aided the ongoing negotiations over a new comprehensive

basin-wide water rights agreement by fostering the cooperative spirit and opening a variety of technical, political, economic, and cultural pathways which have facilitated productive inter-basin dialogue and garnered substantial international financial and technical support. The continuation and expansion of these projects bodes well for the prospect of a peaceful and prosperous Nile Basin.

ENSAP is composed of Egypt, Ethiopia, and Sudan. According to its website (<http://www.nilebasin.org/entro/IDENprojects.htm>), the ENSAP main objectives are to:

1. Ensure efficient water management and optimal use of the resources through equitable utilization and no significant harm
2. Ensure cooperation and joint action between the Eastern Nile countries seeking win-win goals
3. Target poverty eradication and promote economic integration
4. Ensure that the ENSAP results in a move from planning to action.

ENSAP is comprised of the following seven multi-lateral projects and funded primarily by the NBTF and the riparian nations:

Table 5 ENSAP Funding: Planning Stage

ENSAP Project	Nile Basin Trust Fund	Riparian Nations Contributions	Total (in millions)
1. Eastern Nile Planning Model	\$6.60	\$0.00	\$6.60
2. Flood Preparedness and Early Warning Project	\$4.08	\$0.00	\$4.08
3. Baro-Akobo Multi-Purpose Water Resource Development Project	\$7.00	\$0.00	\$7.00
4. Ethiopia-Sudan Transmission Interconnection Project	\$0.00	\$136.00	\$136.00
5. Eastern Nile Power Trade Investment Program	\$12.64	\$0.00	\$12.64
6. Irrigation and Drainage Project	\$12.60	\$0.00	\$12.60
7. Watershed Management Project	\$2.41	\$0.00	\$2.41
Total	\$45.33	\$136.00	\$181.33

Sources: ENSAP homepage. <http://nelsap.nilebasin.org/>

World Bank ENSAP Investment Projects webpage:
<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/EXTREG/INI/EXTAFRNILEBASINI/0,,contentMDK:21089139~menuPK:3426563~pagePK:64168445~piPK:64168309~theSitePK:2959951,00.html>

According to the ENSAP’s website, The Eastern Nile Planning Model is designed to “strengthen the capacity of Egypt, Ethiopia, and Sudan to identify, prepare, and implement cooperative development projects that provide mutual benefits” (<http://www.nilebasin.org/entro/IDENprojects.htm>). The Flood Preparedness and Early Warning Projects are designed to prevent flood damage, provide relief assistance, and capture excess floodwaters for beneficial use in the Blue Nile Basin. The Baro-Akobo

Multipurpose Water Resources Development Project is a joint water management and development venture between Ethiopia and the Sudan. This is a multipurpose project designed to develop the area's agricultural and hydroelectric potential and manage the shared water sources with an emphasis on flood control. This project is of particular significance because it is the first example of a bi-lateral water management project between the previously antagonistic nations. The realization of such a project speaks volumes about the progress of the cooperative process and illustrates the willingness of Egypt to embrace the development of upstream resources. ENSAP has also launched two projects, the Ethiopia-Sudan Electricity Transmission Interconnection Project and the Eastern Nile Power Trade Investment Program, in order to create regional plans for the development of the Eastern Nile's vast hydroelectric potential and the integration of the regional power networks. These consolidation projects are designed to create a regional power pool for the efficient allocation of electricity amongst the eastern Nile nations. With the ultimate goals of stimulating economic development by tapping the eastern Nile Basin's vast hydroelectric potential and furthering the cooperative process by interweaving the hydrologic interests of Egypt, Ethiopia, and Sudan.

The goals of the final two ENSAP projects, the Irrigation and Drainage Projects and the Watershed Management Project, are to increase the food production of the Eastern Nile Basin, promote the efficient use of water in agriculture and to improve the standard of living of the riparian denizens by the collective management of the Eastern Nile Basin. ENSAP has successfully implemented its portfolio of projects with the financial and technical assistance of the international donor community. These projects have greatly reduced the causes of conflict amongst the riparian nations and generated

cooperative momentum by implementing mutually beneficial projects and providing collective solutions to basin-wide problems.

The Equatorial Lakes Nations have little interest in the management of the Blue Nile or the hydropolitics of the Eastern Nile Basin. Their primary concerns are the management of the Equatorial Lakes and the development of the region’s hydroelectric and agricultural potential. In order to address these complex problems, the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) was formed. NELSAP is comprised of the following nine projects:

Table 6 NELSAP Funding: Planning Stage

NELSAP Project	Nile Basin Trust Fund	Riparian Nations Contributions	Total (in millions)
1. Lake Edwards and Albert Fisheries Project	\$2.43	\$0.00	\$2.43
2. Mara Transboundary Project	\$5.20	\$0.00	\$5.20
3. Kagera Transboundary Project	\$7.94	\$0.00	\$7.94
4. Sio-Malaba-Malaski Transboundary Project	\$5.18	\$0.00	\$5.18
5. Regional Agriculture Program	\$0.00	\$0.00	\$0.00
6. Water Hyacinth Abatement Project	\$8.60	\$0.00	\$8.60
7. Rusumo Falls Hydroelectric Power and Development Project	\$5.00	\$0.00	\$5.00
8. Regional Transmission Feasibility Interconnection	\$3.00	\$0.00	\$3.00
9. Strategic Sectoral Social and Environmental Assessment of Power Development Options	\$1.80	\$0.00	\$1.80
Total	\$39.15	\$0.00	\$39.15

Source: NELSAP homepage. <http://nelsap.nilebasin.org/>

The Lake Edwards and Albert Fisheries Project is charged with generating a framework for the collective and sustainable management of the lakes with a detailed investment plan. The project has been funded by the NBTF and is scheduled to begin the implement phase in 2008. The Regional Agriculture Program has yet to secure funding for undisclosed reasons, but it is designed to create investment opportunities and increase food security in the region by the collective development of agriculture (<http://www.nilebasin.org/nelsap/Comp.htm>).

The Mara, Kagera, and Sio-Malaba Transboundary Projects are designed to establish “sustainable frameworks for the joint management and development of each of the three shared river basins...(and) undertake feasibility studies of promising investment projects” (<http://www.nilebasin.org/nelsap/Comp.htm>). These multi-lateral management projects have laid the framework for the collective development of these river basins, but have yet to implement any significant infrastructure projects.

Three of NELSAP’s programs, the Rusumo Falls Hydropower and Multipurpose Development Project, the Regional Transmission Feasibility Interconnection, and the Strategic Sectoral Social and Environmental Assessment of Power Development Options, are collective planning projects for the multi-lateral development of mutually beneficial hydro-infrastructure projects financed by the NBTF and the riparian nations. These projects have generated plans to integrate the power networks of the Equatorial Lakes Nations and broken ground on the Rusumo Falls Multipurpose Project. The plans for this project were developed under the auspices of the Kagera River Basin Organization, which was absorbed by the NBI in 2004. This project represents the realization of a multi-lateral hydroelectric plan first envisioned over 40 years ago.

The final NELSAP project, the Water Hyacinth Abatement Project, has been implemented in conjunction with a separate collective action program, Lake Victoria Environmental Management Project. During the late 1990's the Equatorial Lakes nations of Kenya, Tanzania, and Uganda built on progress made within the Kagera River Basin Organization. They embarked on two water resource management programs designed to collectively and sustainably manage the resources of Lake Victoria. The Lake Victoria Water Resource Project is a collaborative effort of Kenya, Tanzania, and Uganda with financial and technical support from the UN Food and Agriculture Organization, Global Environmental Facility, the International Development Agency, and Japan. The Project progressed in two phases. The first phase began in 1994 and consisted primarily of planning, the collection of technical data, and the development of networks of information systems and mathematical models. The primary output of this effort is a decision support database comprised of precipitation and hydrologic data integrated with remote sensing data. This database has provided valuable hydrologic information to technical experts and policy makers since it became operational in 1999(Karyabwite 2000, 49). The second phase of the project is still in the planning stage.

Kenya, Tanzania, and Uganda, with technical and financial support from the Global Environmental Facility and the World Bank, have also created the Lake Victoria Environmental Management Project. In 1997, the project received GEF grant funding for 50% of external financing and World Bank and IDA assistance with the three nations providing 10% of the final budget. The first phase, focused mainly on planning and preparations, was initiated in mid-1997 and completed in 2002 (EAC 2006). The implementation of projects focused on fisheries management, water quality control, water

hyacinth control, and institution capacity building (Kayombo, 2003). This cooperative effort amongst the Equatorial Lakes nations signals their willingness to integrate their share technical data, embark on collaborative projects, and share benefits.

The invasive water hyacinth is an aquatic plant that reduces the navigability of waterways, increases water evaporation, and contributes to a host of health and environmental problems. The planning for this project was completed during the first phase of the Lake Victoria Environmental Management Project (1997-2005). This joint effort between the NBI and the Lake Victoria Environmental Management Project is funded by the NBTF and embodies the growing trend toward the multi-lateral management of the Equatorial Lakes. This pattern in decision making is also manifest in the 2003 Protocol for the Sustainable Management of the Lake Victoria Basin between Kenya, Tanzania, and Uganda. This agreement resulted in the creation of the Lake Victoria Basin Commission (LVBC) in 2005. The East African Community (EAC) has acted as the donor coordinator for the LVBC and has signed partnership agreements with the World Bank, East African Bank, and the governments of France, Norway, and Sweden. Thus far the LVBC has concentrated on institutional capacity building in order to better consolidate the management of Lake Victoria. This multi-lateral cooperative effort combined with the Lake Victoria Environmental Management Project and NELSAP exemplify the cooperative momentum that has greatly diminished hydro-political tensions between Equatorial Lakes Nations.

The multi-lateral pattern of decision making in the early Post-NBI period has been made possible by the willingness of the riparian nations to seek multi-lateral solutions to their common problems and the generosity of the international donor community. The

NBI and Lake Victoria Management Projects have resulted in a dramatic increase in the sharing of technical information and the identification of a host of mutually beneficial projects, but have yet to establish neither a permanent legal framework for the continued management of the shared Nile Basin resources nor a new water rights agreement to replace the highly contentious 1929 and 1959 Agreements. Negotiations amongst the riparian nations concerning a new water rights agreement are ongoing, but have yet to bear fruit.

The ever-intensifying problems of poverty and food insecurity combined with the inability of the riparian nations to reach a new comprehensive basin-wide water rights agreement have also accelerated the development plans of the riparian nations, particularly Egypt, Ethiopia, Sudan, and Uganda (Waterbury and Whittington 1998). These unilateral projects threaten to unravel the cooperative efforts by setting a volatile unilateral development precedent that threatens to derail the cooperative process and violate the tenuous trust between the riparian nations (Ohlsson 1999, Tafesse 2000). The inability of the NBI to address this problem and discourage unilateral development may prove to be the institution's undoing.

The most ambitious of these new unilateral projects are being pursued by Egypt in an attempt to alleviate some of the nation's most pressing problems, namely crowding in the Nile Valley, increasing reliance on food imports, and the lack of economic development in several provinces. Egypt currently irrigates 3.3 million ha of agricultural land, but plans on expanding to 4.6 million ha over the next few decades via the expansion of the NSADP and the reclamation of lands around a string of western oases (Postel 1999). According to Tafesse, this will leave less water available for upstream

uses and may drive Egyptian water consumption to 65.5 BCM or 10 BCM over its 1959 quota (2002). After an extended drought during the early 1980's, the annual flows of the Nile have regularly been in excess of the 1959 estimate of 84 BCM. These high annual flows and under utilization by Sudan have allowed Egypt to consistently exceed its quota without fear of reprisal. Egypt seized the opportunity to utilize these abundant waters in 1997 when President Mubarak unilaterally embarked on two new desert reclamation projects.

During the construction of the Aswan High Dam the 14 km Toshka Overflow Canal was constructed from Lake Nasser's western shore to the Toshka Depression in anticipation of high floods that could threaten the integrity of the dam. This safety valve was originally designed to divert excess flood, but has been transformed into one of the largest water infrastructure projects in history (Shahin 2002, Collins 2002). Ironically, the completion of this Toshka Overflow Canal in 1978 was accompanied by a decade long drought that dropped the level of Lake Nasser and left the canal dry and desiccated. However, Egyptian engineers saw tremendous potential in the arid wadi and envisioned a fertile flourishing new valley that ran parallel to the Nile River Valley. In 1963 Egypt's Desert and Reclamation Authority launched a decade long soil survey of the western desert and concluded half a million acres were arable for cultivation around the Toshka Depression. However, the 1973 War with Israel and a decade long drought shelved any plans for the New Valley Project (Collins 2002).

The 1990's brought abundant rainfall that renewed interest in reclaiming once fertile lands in the western deserts. During this time period the Egyptian government also became acutely aware of the multitude of problems facing the country including

population growth, the loss of productive farmland to urbanization, increasing reliance of food imports, and the threat posed by floodwaters to integrity of the Aswan High Dam. The construction of the Aswan High Dam also amplified the problems of soil salinization and water-logging, which greatly reduced crop yields by as much as 35 percent in large portions of the Nile Valley (Moustafa et al 2002). The vast exploding population of the Nile Valley became a serious problem as Egypt's population density doubled in the from 1960-1990. With 70 million Egyptians concentrated in only 5.5 percent of the country, an area roughly equivalent to Switzerland, approximately 70, 000 hectares (ha) of agricultural land were being lost annually to urbanization (Hamza and Mason 2004).

These problems drove Egyptian President Hosni Mubarak to initiate the New Valley Project on January 9, 1997; 37 years to the day after Nasser inaugurated the construction of the Aswan High Dam. This coincidence and other evidence led scholars like Waterbury and Collins to assert that Egyptian leaders are afflicted with the “edifice complex”, a desire to create monuments to ensure their legacy. They cite the Pyramids at Giza, Ramses II temple at Abu Simbel, Nasser's Aswan High Dam, and now Mubarak's ambitious New Valley Project as examples. Regardless of Mubarak's Pharaonic ambitions, the New Valley Project (NVP) has transformed the hydro politics of the Nile Basin and the future of Nile water management by significantly increasing Egyptian water consumption and irrigated expansion. No other riparian nations were consulted prior to implementation and technical data concerning the project is tightly controlled by Cairo.

The NVP's primary objectives are to expand irrigated agriculture, alleviate crowding in the Nile Valley, and invigorate the economy of southern Egypt. Wahby

describes the NVP as “a national, integrated, massive development project, aiming mainly at creating a balance re-organized Egyptian map from the demographic, habitation, economic, and security points of view.” The general scheme involves creating a New Nile Valley by building the Sheik Zayed Canal, not to be confused with the Toshka Overflow Canal, from Lake Nasser to the Toshka Depression and then northward using a series of 30 pumping stations to transport the water to the Oases of Kharija, Dahkla, Farafra, Bahriya, and into the Qattara Depression (Collins 2002).

The first phase of the NVP, entitled the Southern Valley Development Project (SVDP), was completed in 2003 and is located in the Toshka Valley. This natural depression has an average diameter of 14 miles and a water storage capacity of 1,665 BCM (Wahby 2004). A system of four canals travels 103 km and carries 900 million cubic feet of water per day or 5.5 BCM per year (15% of the average annual flow) to the depression for the irrigation of 5,340 ha (Hamza & Mason 2004, Wahby 2004). The canals were excavated by wet and dry dredging which removed 3,100 million cubic feet or seven times the amount soil moved for the construction of the Aswan High Dam. The bottoms of the 54 m wide 8 m deep canals are lined by a series of concrete and polyethylene layers that prevent leakage and covered by eight inches of padded concrete to minimize evaporation. The Zayed Canal, named for the President of the United Arab Emirates, Sheikh Zayed Bin Sultan El Nahayan who contributed \$100 million to the construction efforts, is the primary canal and extends 50 km from the Lake Nasser to the Toshka Depression.

The centerpiece of the NVP is the world’s largest pumping station, the \$436 million Mubarak Pumping Station (MPS). Located on the west bank of Lake Nasser and

completed in 2003, the MPS is designed to deliver 12,000 cubic feet per second into the Zayed Canal via 24 vertical pumps each with a discharge capacity of 600 cubic feet per second. The MPS is housed in a concrete facility 30 m high, 140 m long, and 60 meters high in a pit roughly 15 stories deep and approximately ten times the size of a major US football stadium (Sineity 2003).

Figure 3.1 Digital Rendering of the Mubarak Pumping Station



Courtesy of: http://greenweb.hitachi.co.jp/en/introduction/images/csr1_pump.jpg

The construction of the MPS was a multi-national effort. The construction contract was awarded to a European Egyptian Japanese Consortium led by London-based Skanska Cementation International and the Japanese firms Hitachi and SonTek/YSI were awarded the contract to supply all the electric equipment. British based Morris Materials Handling also provided five cranes that were designed and manufactured in the UK and later assembled on-site in Egypt (Wahby 2004).

Official Egyptian estimates put the total expenditures of the SVDP since 1998 at \$2.5 billion and project the costs to rise to \$80 billion by 2020 (Wahby 2004). The Egyptian government has provided 20-25% of the financing for the project with the remainder coming from private and external investments (Hamza & Mason 2004). Saudi Prince Walid bin Talal has been a key private investor thus far. In 1997, he established the Kingdom Agricultural Development Company (KADCO), an Egyptian joint-stock company. KADCO was allocated approximately 1,200 ha for its investment in the NVP that is expected to reach \$500 million by 2013 (Sineity 2003). The first exports from KADCO's holdings left for European markets in the form of organic grapes and cantaloupe, the most profitable cash crops, in 2002. Santa Monica, California based Cadiz Incorporated has also invested in the NVP and currently employs a massive drip-irrigation scheme to raise fruits and vegetables for export (Collins 2002).

After the extension of the canal system to connect the northern oases, Egypt expects to reclaim approximately 168,420 ha at a cost of \$22,000/acre and resettle three million Egyptians in the New Valley (Tafesse 2002, Hamza & Mason 2004). Egypt hopes this project will invigorate its economically depressed southern and western provinces by creating industrial, agricultural, and tourism opportunities.

This massive desert reclamation project was accompanied by the expansion of the North Sinai Agriculture Development, first launched in 1979. In January 1997 President Mubarak announced the commencement of the second phase of the NSADP, which is designed to irrigate 250,000 ha in the Sinai Desert and resettle 2.2 million Egyptians in 37 new urban communities (Tafesse 2002, Westerman 2004). The project is expected to

consume approximately 4-5 BCM composed of 50 percent Nile water and 50 percent reclaimed wastewater at an estimated cost of \$2 billion (Hamza & Mason 2004).

The first phase of the NSADP, built from 1979-1997, begins 20 km south of the Damietta distributor branch in the Nile Delta extends to the west bank of the Suez Canal near Ismalia. Construction of the second phase began in 1998 and continued into 2007. The plan is to extend the canal 242 km eastward to the Northern Sinai town of El-Arish, located 40 km from the Gaza Strip via a series of 4 underground tunnels with the combined capacity to carry 12.5 million cubic meters per day to the Northern Sinai (Tafesse 2002). The project was financed by Egypt the Kuwait Fund for Arab Economic Development and constructed by an Italian Contractor. No other riparian nations were consulted or notified about Egypt's unilateral reclamation projects. All in all Egypt plans on expanding irrigated agriculture in the Northern Sinai to include 1 million additional ha over the next 20 years, with an additional water expenditure of approximately 8 BCM or nearly 1/10th of the Nile's annual flow (Tafesse 2002). Specific plans for this project are difficult to come by as the Egyptian government considers them issues of national security.

Egypt's massive water projects have drawn widespread environmental, economic, and political criticism from the other riparian nations and some of the world's foremost scholars. Tony Allan of King's College in London calls Egypt's water plans "a national fantasy" (Kendie 1999); while Lester Brown, director of the Earth Policy Institute, points out "there is already little water left when the Nile reaches the Sea (Kendie 1999). Others perceive the desert reclamation projects as bargaining chips for Egypt is using at the negotiation table to ensure the nation a larger portion of Nile waters (Ohlsson 1999,

Tafesse 2000). In their 1998 article “Playing Chicken on the Nile”, Waterbury and Whittington argue:

...the New Valley Scheme will be a bargaining chip when and if Egypt is obliged to enter into negotiations with the other Nile riparians over reallocation of waters...such a huge ‘fact’ will effectively preclude accommodation of the growing needs for water of its neighbors, especially those of Ethiopia

(1998:163)

The creation of the NBI has presented numerous opportunities for the riparian nations to engage in discussions over a new Nile water rights agreement. During the last decade, as official interaction between the riparian nations increased, frequent press reports have provided insight into the status of negotiations over a new Nile water rights agreement and a permanent water management institution. Press reports from Egypt, Ethiopia, Sudan, and Uganda identify the official allocation of water resources as the most contentious issue to be resolved.

Egypt’s reclamations projects exacerbate this controversy by illustrating Egypt’s willingness unilaterally reallocate itself more water. The upstream riparian nations have responded with a chorus of dissent. Even Sudan, Egypt’s long-time ally, contends the projects will push the Egypt’s water consumption rate well over the 55.5 BCM allotted by the 1959 Agreement. Egypt denies that its reclamation projects will force its water consumption over its 55.5 BCM allotment. It plans to offset the additional 8 BCM utilized by the NVP and NSADP by increasing its utilization of groundwater, desalinated seawater, and recycled wastewater and by altering its irrigation techniques and cropping patterns (Hamza & Mason 2004, Westerman 2004). According to Hamza and Mason,

Egypt plans on increasing its annual consumption of groundwater and desalinated seawater from 0.5 BCM to 3.3 BCM and 0.03 BCM to 0.5 BCM respectively. Improving irrigation techniques and switching from water intensive crops like rice and sugar cane to less thirsty crops like wheat and sorghum is expected to save approximately 10.4 BCM annually. Recycling municipal and industrial wastewater and increasing the efficiency of water systems are expected to save an additional 7.3 BCM. Overall Egypt estimates it can save 20.9 BCM by employing these water saving techniques and keep its water consumption under its 55.5 BCM quota.

The transfer of Nile waters beyond their natural Basin has drawn harsh criticism from the international community and protest from upstream riparian nations who feel their needs should be met before the Nile Waters are further depleted by extra-basin transfers. These critiques are supported by the tenets of international water law as defined by the 1997 UN Convention of the Law of the Non-navigable Uses of International Watercourses, which states: “regardless of political boundaries, water from one basin should not be diverted outside the area until all water needs of those living within the catchment or basin are satisfied” (Elhance 2000, 112). With famine and lack of access to clean drinking water and sanitation the norm for untold millions of Nile denizens, there can be no doubt that in-basin basic needs are not being met.

Egyptian critics of the reclamation projects stress that the one-third of the labor force directly employed in agriculture, which comprises 15 percent of GDP, is largely impoverished and could greatly benefit from agricultural reform in the Nile Valley. Furthermore, the direst poverty in Egypt is that of the underdeveloped Upper Egyptian countryside, in provinces such as Sohag and Asyut which are highly dependent on

farming. Agricultural reform has the ability to help the poorest improve their own situation, earning higher incomes and in turn generating economic growth in farming-based rural communities. However, the desert reclamation projects divert massive amounts of resource away from these areas and do little to promote economic development in areas where the majority of people lack basin health, education, and housing services.

Some 85 percent of water usage of total annual water usage in Egypt occurs in the agricultural sector, which varies widely in levels of water conservation (Hamza & Mason). While the large commercial farms in the reclaimed lands use the advanced drip irrigation techniques developed by Israel, flood irrigation is still widely used by small farmers in the Nile Valley, who have no incentive to save water because their only cost is in lifting the water one to two meters out of the irrigation canal (Fletcher 1996, 88). Additionally, the soil of the Nile Valley is among the most fertile in the world, while the reclaimed areas are largely comprised of marginally productive lands that require greater amounts of water and fertilizer and are subject to very high evaporation rates that accelerate soil salinization. Egypt risks alienating the other riparian nations by acting outside of the cooperative frameworks that established the NBI and unilaterally implementing large scale water intensive infrastructure projects.

Egypt geographic reality leaves these projects entirely dependent upon water from disgruntled upstream nations. The susceptibility of both projects to environmental fluctuations and upstream developments strain inter-basin relations as upstream nations embark on their own development projects. According to Bleier, climatic shifts resulting from Global Warming, could present Egypt with water shortfalls ranging from 2-6

percent to 22-27 percent, depending upon climatic variation. The record setting precipitation of the 1990's, which made the NVP and NSADP possible, may render Egypt's multi-billion dollar reclamation projects impotent to resist the onslaught of the desert's shifting dunes and searing heat.

The fate of Egypt's reclamation projects is also subject to the volatile hydropolitical landscape of the Nile Basin. Egyptian ability to control the development of Nile water resources has been eroded in the last decade by rapid population growth, political stabilization, and an increase in international influence within the upstream riparian nations, especially Ethiopia (Dinar 2002, Stroh 2003, Swain 2002). The ability of upstream nations to develop their water Nile water resources could significantly diminish the flow of the Nile to Egypt and leave an insufficient supply to implement the reclamation projects without catastrophic environmental degradation in the Nile Valley and Delta. Egypt's unilateral projects also work counter to the cooperative efforts of the NBI and set an alarming precedent that has been accompanied by the development of other unilateral projects throughout the basin. This new trend toward unilateral state-centric decision is having a divisive influence on the ongoing cooperative process.

The Ethiopian Government has been an especially vocal critic of Egypt's unilateral development projects and has responded in kind (Kendie 1999). Despite providing 86 percent of the main Nile's flow, having the largest untapped hydroelectric potential in the Basin, and suffering from devastating drought, Ethiopia utilizes only 1 percent or 0.65 BCM of the Nile waters annually and harnesses 0.2 percent of its hydroelectric potential (Tafesse 2002). Ethiopia's desire to develop its hydrologic resources via a series of dams on the Blue Nile is seen as a direct threat to Egyptian

national security (Stroh 2003, Waterbury 2002, Mohamoda 2003). Ethiopia is quick to point out that Egypt's desert reclamation projects are producing export oriented crops that further increase out-of-basin transfers by transporting virtual water vested in produce to European markets while millions of Ethiopians are dependent upon foreign food aid (Thompson 2005).

In that mindset, Ethiopia revived a 1964 United States Bureau of Reclamation feasibility study and has commissioned five major dams in the Blue Nile Valley. The largest project, the Tekeze Dam, is now under construction by the Chinese Water Resource and Hydropower Engineering Corporation that constructed the Three Gorges Dam. This \$224 million project is jointly financed by China and Ethiopia and is expected to be 3 m taller than the Three Gorges Dam and provide 300 MW or approximately 1/3 of Ethiopia's current supply of electricity upon completion (Pottinger 2004). Ethiopia neglected to consult any of its neighboring countries and decided to unilaterally pursue the Tekeze Dam with Chinese financial and technical assistance. Ethiopia's perpetual suspicion of Egyptian motives within the cooperative process combined with recent Egyptian unilateralism endangers inter-basin confidence in the cooperative process and amplifies hydro-political tensions.

Lori Pottinger of the International Rivers Network also reported in 2006 that China's Gezhouba Water and Power Company is the leading candidate to construct a 100 MW hydropower dam on Ethiopia's Neshi River, a tributary of the Blue Nile. Various press reports also indicate Ethiopia is progressing with planning and implementation of two hydropower dams on the Gibel-Gibe River and one hydropower project near Tana-Beles, the source of the Blue Nile, with support from China and additional funding from

the Italian Government. Although official estimates of Ethiopia's plan to increase its water consumption are not currently available, there can be no doubt that these dams will significantly increase consumption and leave less water for downstream riparian nations. These infrastructure projects are a direct threat to Egypt's program of agricultural expansion and threaten to send the eastern Nile Basin spiraling into open conflict.

Sudan, once an immovable ally of Egypt, has also expressed its discontent with Egypt's unilateral reclamation projects. According to Waterbury, Sudan is in a hydro-political Catch-22 of sorts. Sudan, with Africa's largest agricultural potential, sees the benefits of reservoirs in the Ethiopian Highlands that could feed vast tracts of agricultural land in the expansive Sudanese Plain. However, the contractual obligation of the 1959 Agreement and the fear of completely alienating Egypt by embracing its upstream adversary restrict Sudanese support for development in the Blue Nile.

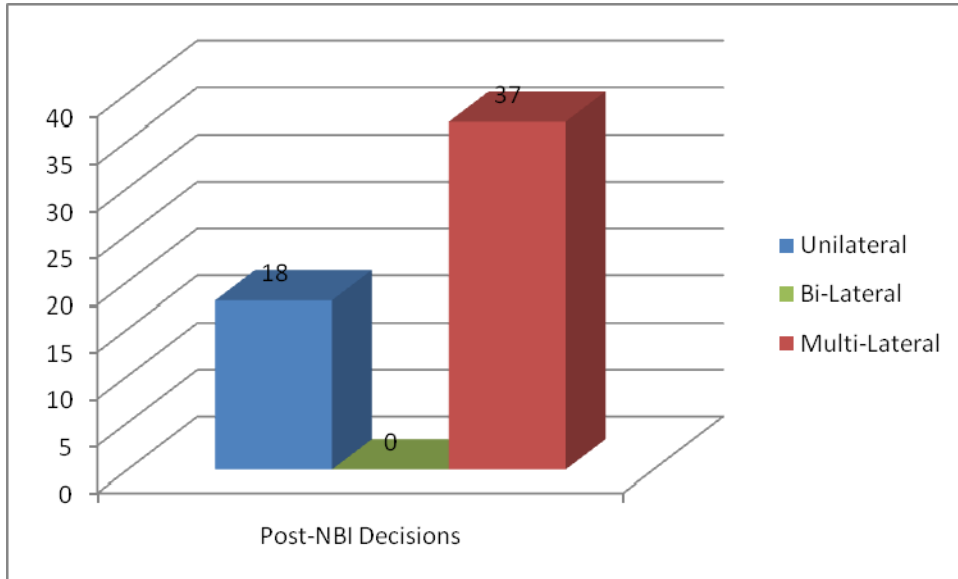
Sudan has repeatedly threatened to withhold Nile waters in its reservoirs in order to reinforce its bargaining position and gain influence in water rights negotiations (Swain, 2002). Harsh rhetoric and outright threats stemming from competing claims about the validity of the 1959 Agreement have fostered an environment of mutual distrust in the face of cooperative progress. In this setting, Sudan has embarked three of its own unilateral infrastructure projects, the Merowe, Kajbar, and Siteit multipurpose dams. Sudan, like Ethiopia, did not consult any other riparian and is relying of Chinese, European, and Arab investment and expertise to construct these dams. The Merowe is expected to provide 1,000 MW of hydropower annually and is expected to be complete by 2009 at a cost of approximately \$1.73 billion with approximately \$480 million coming from China's Export-Import Bank and \$1.2 billion from Arab oil investors (BBC News

2002, Sudan Tribune 2007). Construction for the Kajbar and Siteit Dams has yet to begin, but Chinese firms are once again atop the list of potential contractors. These dams have also raised considerable objections from indigenous peoples who claim egregious human rights violations during protests and resettling.

The Equatorial Lakes Nations have also seized the opportunity to unilaterally develop their hydrologic infrastructure and embraced the recent influx of foreign investment in African hydropower. Since 2000, Uganda completed an extension of the Owens Falls Dam, began construction on two dams (the Bujagali and Nyagak), and prepared plans for three more dams (the Karuma, Ayago, and Kalagala). The World Bank supported the Kiira expansion of the Owens Falls Dam and has expressed its support for the Kalagala Dam, but the Bujagali Dam has raised the ire of the international community due to the threat of serious environmental degradation and the loss of a culturally important site.

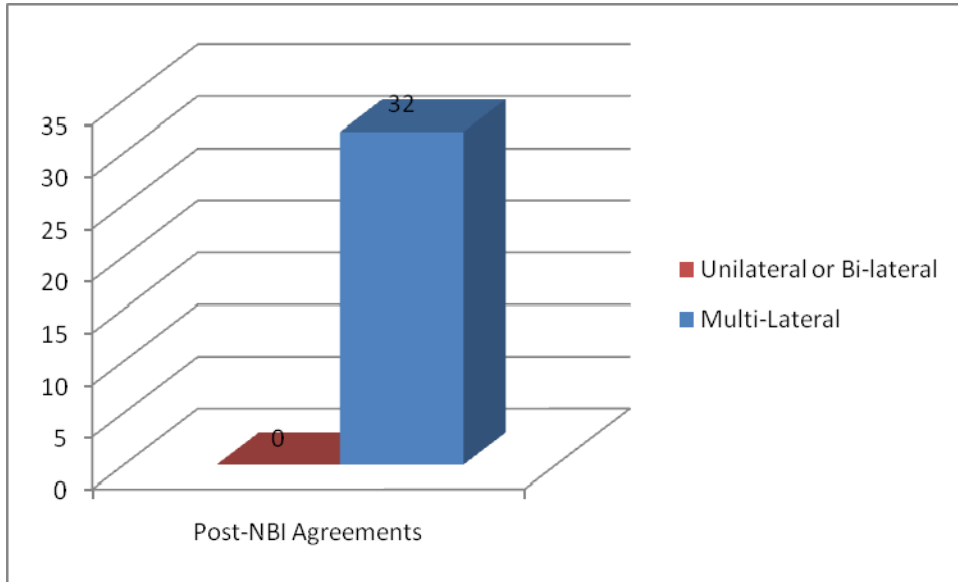
In total, the Post-NBI period generated 37 multi-lateral decisions which include a variety of mutually beneficial transboundary programs that demonstrate the NBI's influence on hydro-decision making.

Figure 3.2 Post-NBI Decisions



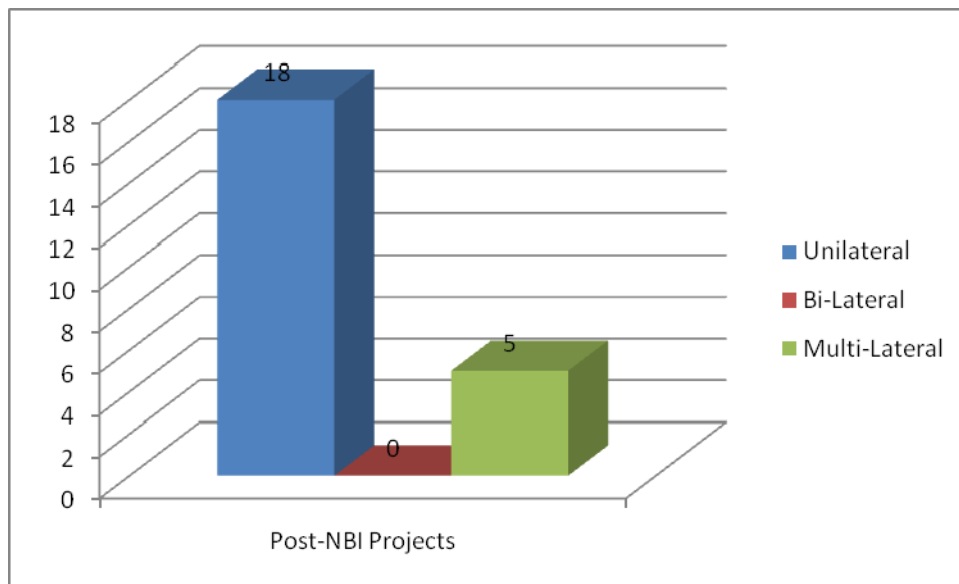
Thus far, all 32 water related agreements made during the Post-NBI period have been multi-lateral. These include a variety of political, economic, and environmental agreements which address many of the sources of conflict in Nile Basin. This spate of multi-lateral agreements making illustrates the collective decision making present in the Post-NBI period.

Figure 3.3



The realization of five multi-lateral projects by the NBI and Lake Victoria Management Organization are the only instances of multi-lateral projects in the history of Nile Water Management. These unprecedented multi-lateral projects stand in stark contrast to the surge of unilateral projects commissioned during the Post-NBI period.

Figure 3.4 Post-NBI Projects



The pattern of multi-lateral decision-making is unprecedented in the history of in the Nile Basin. Previous multi-lateral decisions were rendered impotent due to the exclusion of one or more of the riparian nations. However, the NBI includes all ten riparian nations and has pushed the cooperative process into new frontiers. This recent trend of multi-lateralism represents the culmination of cooperative efforts first begun in the 1960's and a sweeping departure from the bi-lateral regime that dominated water management in the Post-Colonial Period.

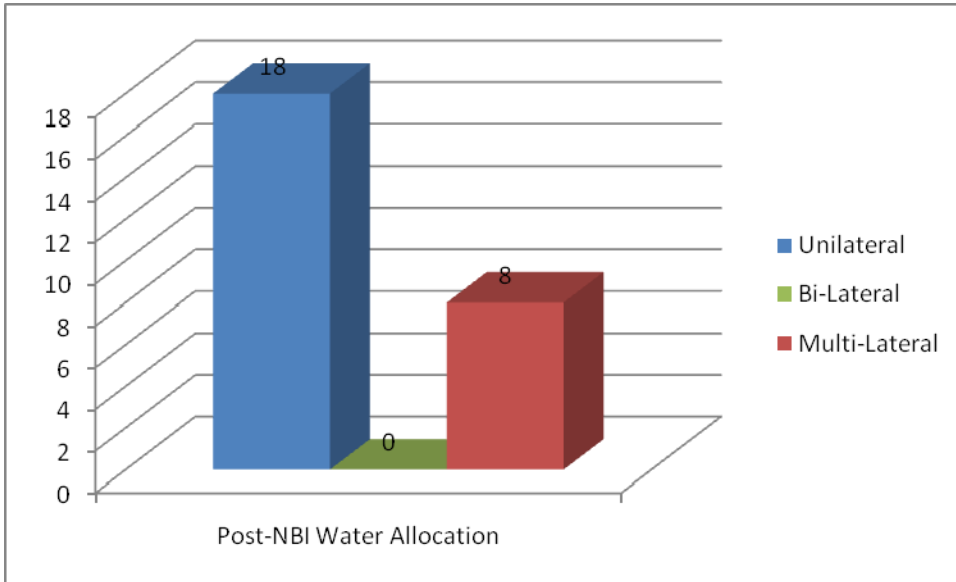
Despite the impact of the NBI, the early Post-NBI wave of multi-lateral decision making pattern was followed by a series of unilateral decisions. 18 unilateral infrastructure projects spread throughout the Basin are evidence of the riparian nations' willingness to independently pursue hydrologic solutions. The fact that this unilateralism occurs simultaneously as the implementation of the NBI's projects indicates discordant patterns of decision making within the post-NBI period.

II. Measures of Conflict in the Post-NBI Period

The early Post-NBI period was defined by multi-lateral decision making within the cooperative framework of the NBI and the Lake Victoria Management institutions. This explosion of cooperative projects and agreements illustrates a significant shift in the decision making pattern. However, the recent resurgence of unilateral decision making threatens to derail the cooperative process and amplify tensions over shared water resources.

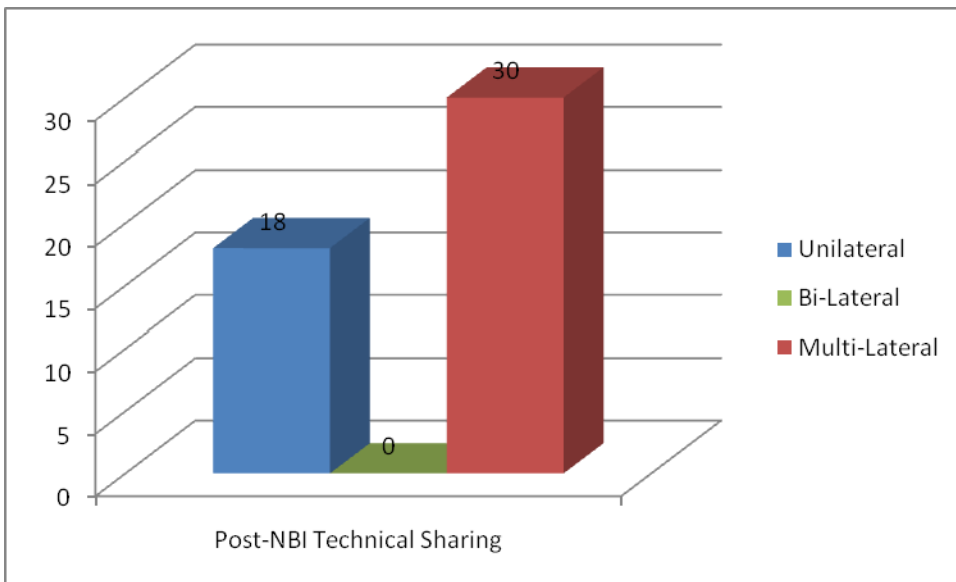
These dissonant patterns are well-illustrated by the trends in the allocation of water resources, the sharing of technical data, and the sources of financing. The allocation of water resources remains the most contentious issue. It threatens to uproot the cooperative process and replace it with uncoordinated unilateral development of the Nile's resources. Water allocation in the Post-NBI period clearly trends towards unilateralism thanks to the independent implementation of infrastructure projects. However, eight multi-lateral decisions, including four international multi-purpose projects, are an unprecedented accomplishment which exemplifies the progression of the cooperative process.

Figure 3.5 Post-NBI Water Allocation



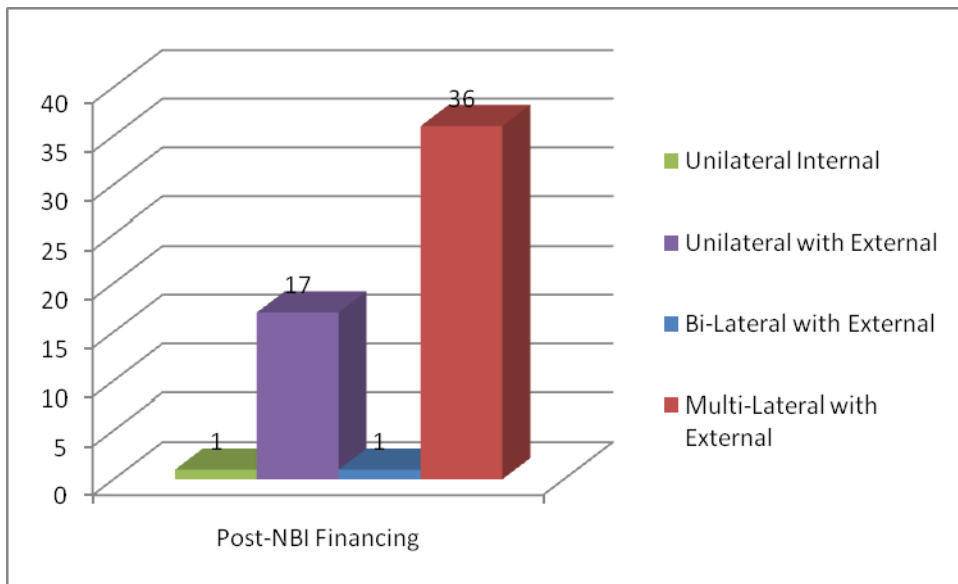
The graph below of Post-NBI technical sharing illustrates divergent unilateral and multi-lateral decision making processes. The multi-lateral sharing of technical data within the NBI and Lake Victoria Management Program runs in stark contrast to the lack of sharing over unilateral infrastructure projects.

Figure 3.6 Post-NBI Technical Sharing



The pattern of financing in the Post-NBI period also illustrates divergent multi-lateral and unilateral trends. A series of four programs were financed multi-laterally beginning in 1994 and extending to the creation of the NBI. This multi-lateral trend was a direct result of the political stabilization of the Nile Basin during the 1990's and the dissolution of the Egyptian-Sudanese hydro-alliance. These events eroded Egyptian hegemony, redistributed hydropolitical power more symmetrically, and catalyzed international investment in the dormant but potent cooperative process. This explosion of multi-lateral financing made the NBI and Lake Victoria programs and possible, but also allowed for the initiation of 17 unilateral projects.

Figure 3.7 Post-NBI Financing



The ability of the NBI to create a multi-lateral funding mechanism and dramatically expand technical sharing has been diminished by a new wave of unilateralism. The evidence presented in this chapter illustrates divergent multi-lateral and unilateral trends in Post-NBI period decision making. The final chapter will utilize

the evidence compiled in chapters two and three to determine if the establishment of the NBI has reduced the prior causes of conflict in the Nile Basin.

Chapter 4 Analysis and Conclusions

A simple count of decisions in the Pre and Post NBI periods reveals a significant change in decision making. The Pre-NBI period was dominated by bi-lateral decisions controlled in large part by Great Britain and Egypt. The Post-NBI period witnessed a surge of multi-lateral decisions accompanied by eighteen unilateral decisions made by countries throughout the basin.

Figure 4.1 Pre-NBI Decisions

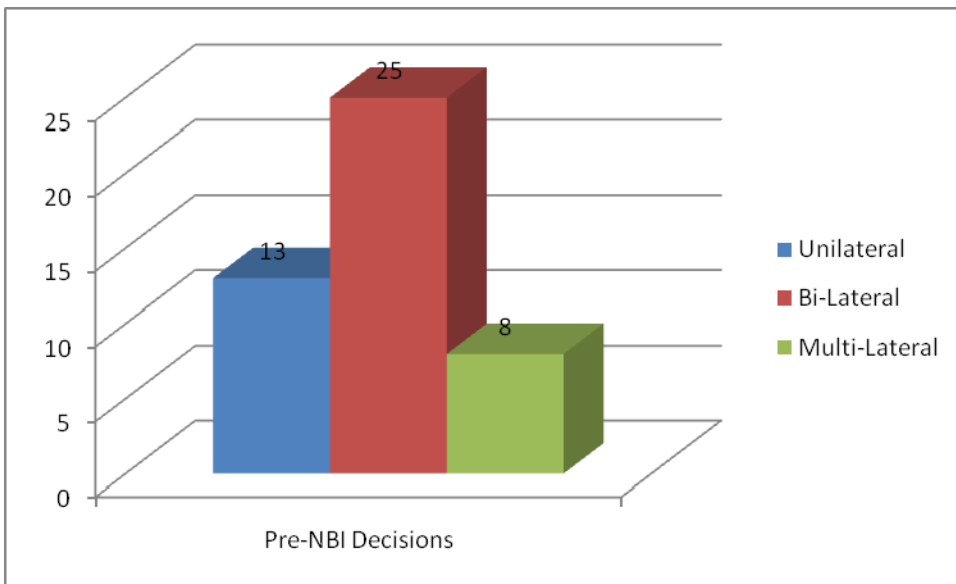
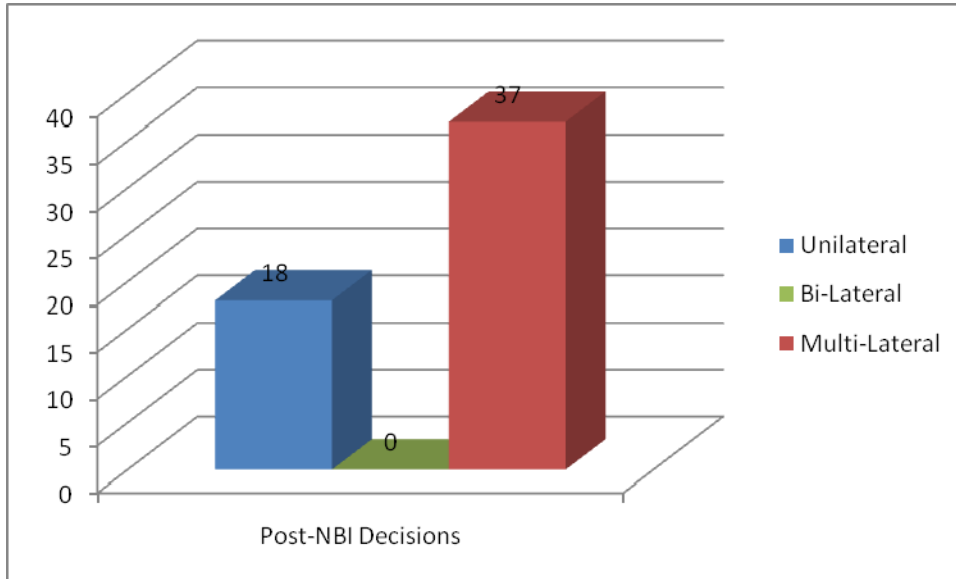


Figure 4.2 Post-NBI Decisions



The Pre-NBI period witnessed the British develop a water management regime that strongly favored its economically productive and strategically important downstream territories, Egypt and Sudan. Despite their inability to control the entire Nile Basin, the British solidified their hold on the Nile's resources through a series of treaties and a vast infrastructure campaign. This power structure remained largely intact after the independence of the riparian nations. Newly independent Egypt and Sudan maintained the favorable status quo as they dominated Nile water management. In 1959 they attempted to legitimize their claims by signing the Treaty for the Full Utilization of the Nile, which concretized their hydro-alliance and divided the entire annual flow of the river between them. Upstream riparian rejected the validity of the 1959 Treaty and complained they were not even consulted. This schism between upstream and downstream nations widened during the Post-Colonial period as tension and mistrust characterized inter-basin relations.

A count of the total number of decisions made during the Pre-NBI period shows a strong trend in bi-lateral decision making. Every bi-lateral decision included one of the two main power brokers, Great Britain and Egypt. There was also a high number of unilateral decisions and multi-lateral decisions. Ethiopia made four of these unilateral decisions, but only completed one of the projects. The remaining 9 unilateral decisions were made by either Great Britain or Egypt. The eight multi-lateral decisions were comprised of early cooperative efforts. Five of these agreements and organizations are considered defunct. The remaining three consist of two Lake Victoria Water Management agreements between the Equatorial Lakes Nations and the annual Nile 2002 Conference Series.

Strong trends toward unilateral and bi-lateral decision making, present in all three measures of the dependent variable, clearly define the dominant water management paradigm of the Pre-NBI period.

Figure 4.3 Pre-NBI Water Allocation

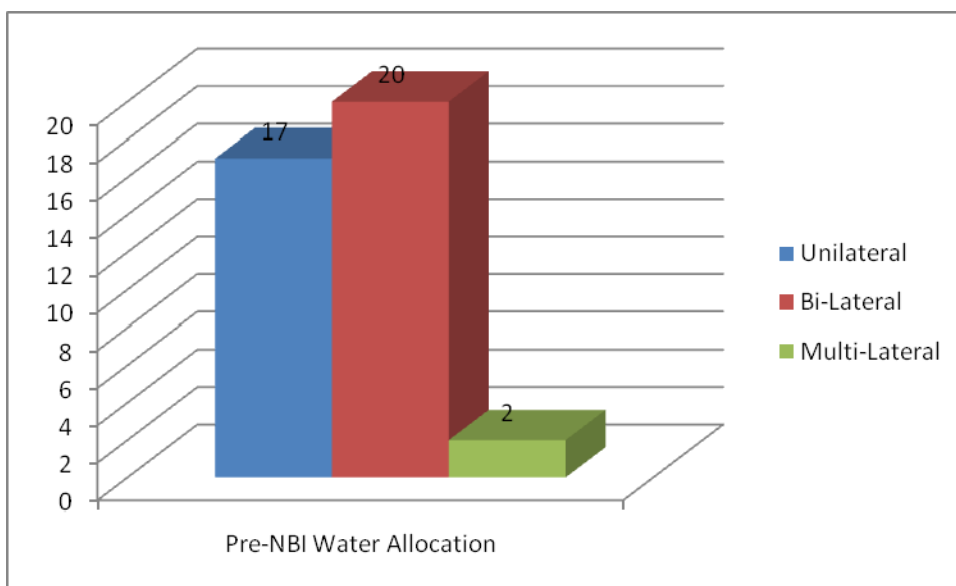


Figure 4.4 Pre-NBI Technical Sharing

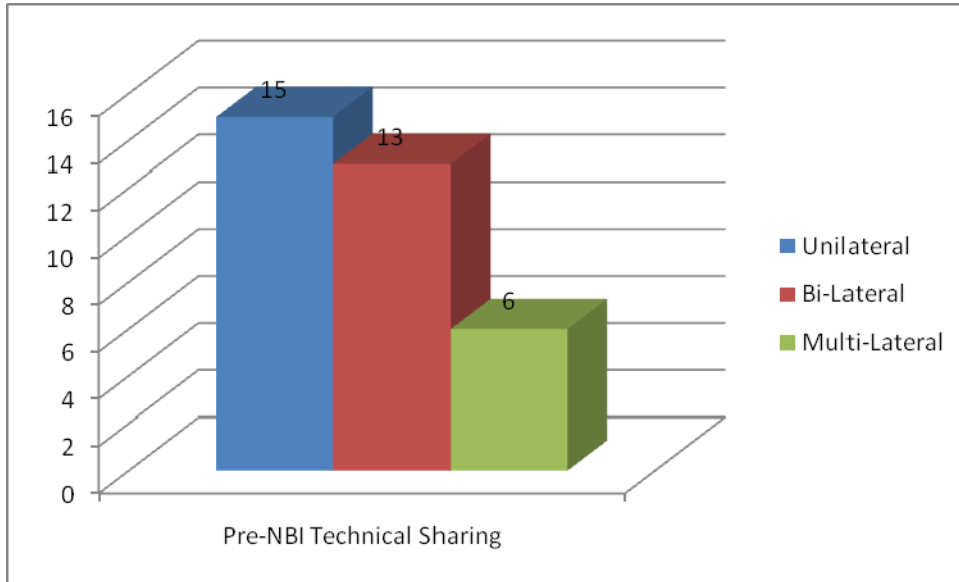
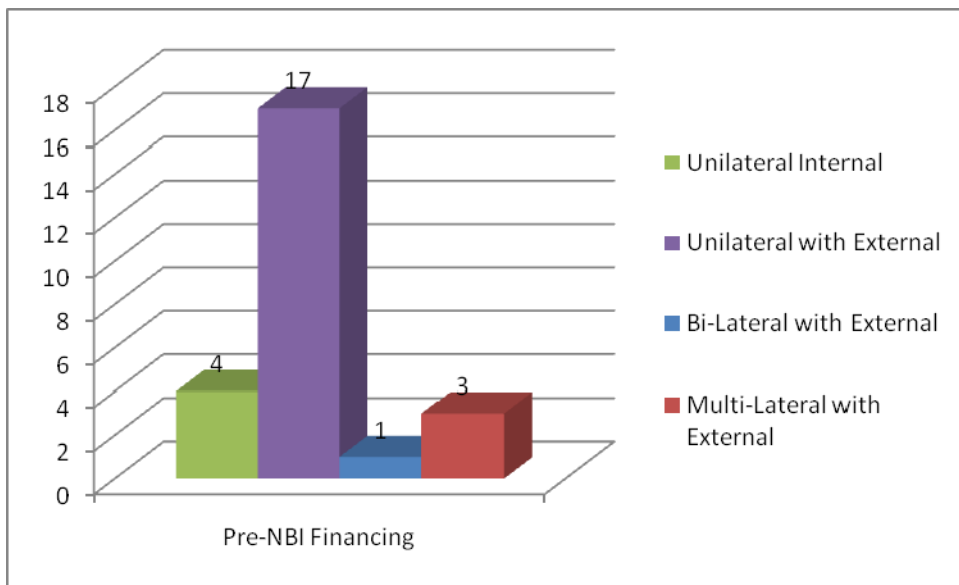


Figure 4.5 Pre-NBI Financing

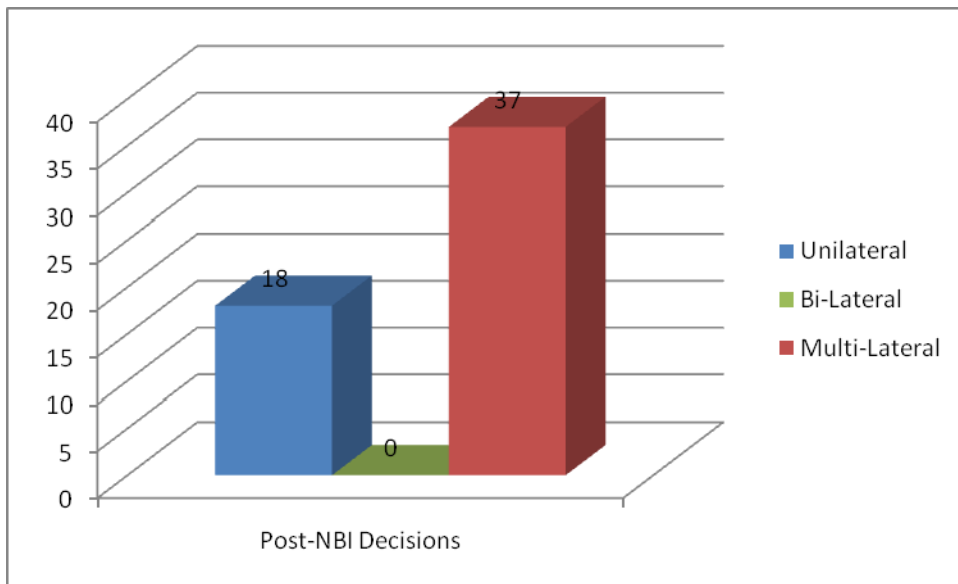


Although open conflict over water resources never materialized, suspicion and animosity characterized inter-basin relations during the Pre-NBI period. The Pre-NBI pattern of unilateral and bi-lateral decision making exacerbated disagreements over

shared Nile water resources and enflamed inter-basin tensions. However, the Post-NBI period witnessed a dramatic shift in decision making.

The dissolution of the Egyptian-Sudanese alliance signalled the end of the bi-lateral decision making and transformed the hydro-political landscape into a more balanced environment. Upstream nations experienced a period of political stability and economic development that helped renew international support for the cooperative process. A more symmetrical power structure emerged which resulted in a wave of multi-lateral decisions and unilateral developments.

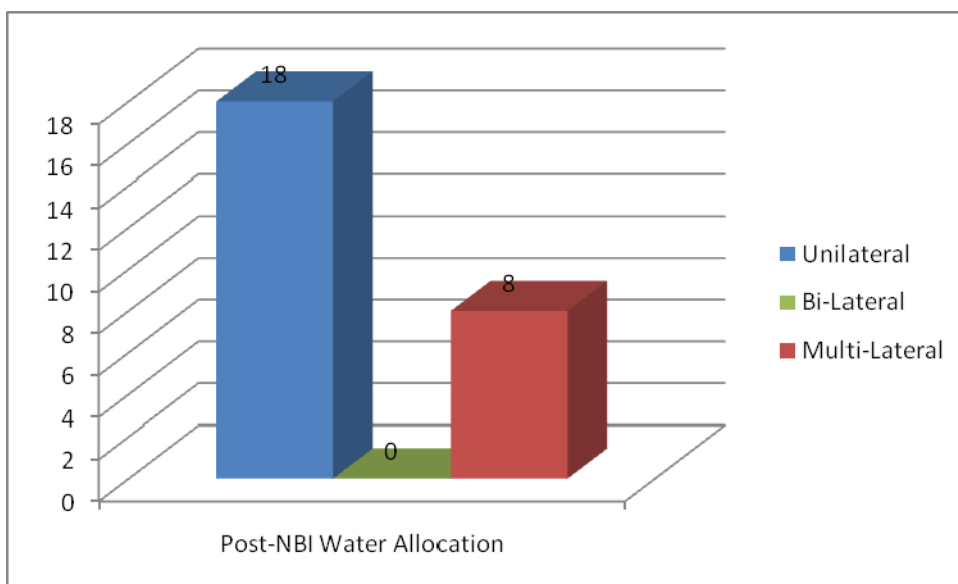
Figure 4.6 Post-NBI Decisions



Cooperative momentum propelled the riparian nations into new frontiers as the first multi-lateral projects and programs were initiated and serious negotiations over a new permanent basin-wide water management agreement commenced. The explosion of multi-lateral decisions in the Post-NBI period and the proliferation of the cooperative

spirit illustrate the ability of the NBI to reduce prior causes of conflict over shared Nile water resources. However, a surge in unilateral state centric decision making has increased tensions amongst the riparian nations and complicated the process of generating a permanent cooperative framework agreement. These competing unilateral and multi-lateral trends are evident in the three measures of the dependent variable.

Figure 4.7 Post-NBI Water Allocation



Water allocation continued to be the most contentious issue during the Post-NBI period. Eight multi-lateral decisions comprised of six agreements and two projects were overshadowed by 18 unilateral decisions. Unilateral water allocation during the Post-NBI period was remarkably different than Pre-NBI unilateralism. Only two nations (Egypt and Ethiopia) unilaterally pursued Pre-NBI infrastructure projects, while five nations (Egypt, Ethiopia, Sudan, Tanzania, and Uganda) unilaterally commissioned Post-NBI infrastructure projects. This illustrates a shift in the basin's power structure away

from the downstream dominated paradigm that dominated the Pre-NBI period and toward a more symmetrical alignment.

A count of decisions that involved technical sharing and financing reveals a strong pattern of multi-lateralism with a lesser trend toward unilateralism.

Figure 4.8 Post-NBI Technical Sharing

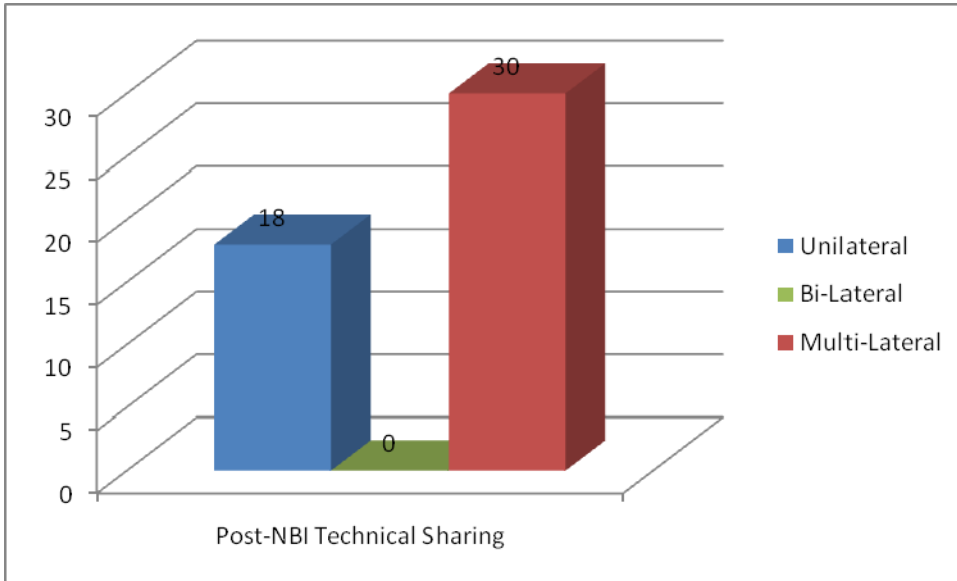
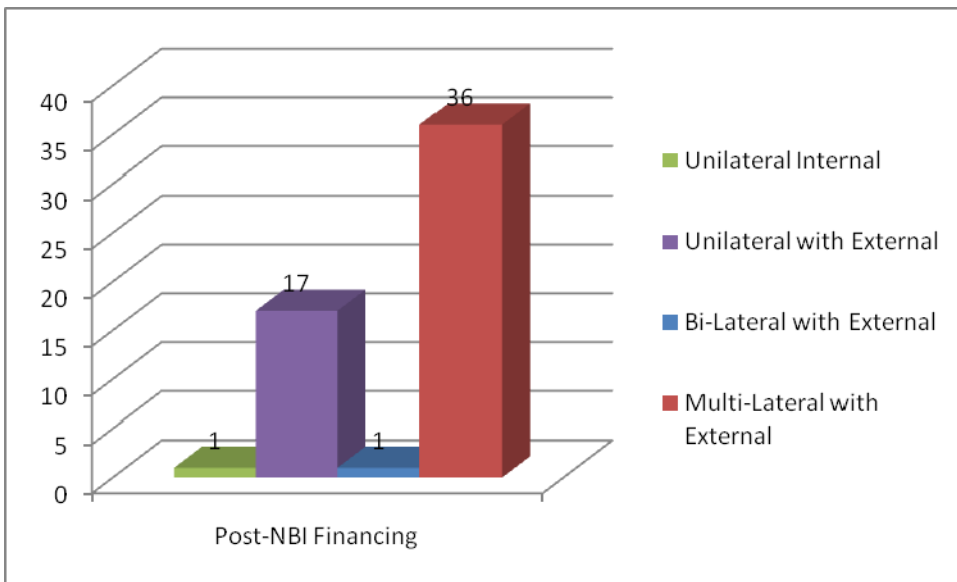


Figure 4.9 Post-NBI Financing



The NBI effectively transformed technical sharing and financing by providing a common forum for the riparian nations to seek collective solutions to their shared problems. The international community embraced this effort by providing funding and expertise which catalyzed a host of multi-lateral agreements and projects. This pattern of multi-lateral technical sharing and financing lies in stark contrast to Pre-NBI pattern of decision-making.

The shift from unilateral and bi-lateral decision making toward multi-lateral decision making are a strong indication that the NBI has transformed Nile water management and reduced prior causes of conflict. The three measures of conflict provide strong evidence that the NBI has dramatically altered the decision making process of the riparian nations and eased tensions over shared Nile water resources. However, the inability of the riparian nations to come to terms over a basin-wide water rights agreement threatens to derail the cooperative process. The ability of the NBI to provide collective solutions to increasingly complex international problems rests upon the propagation of cooperative momentum. However, 9 years of negotiations have yet to resolve disagreements over the allocation of water resources.

The inability of the riparian nations to establish a multi-lateral water allocation in the form of a new Nile water rights agreement is the missing element that must be established in order to legitimate a multi-lateral allocation of water and resolve inter-basin disputes over water management. Ongoing negotiations have encountered difficulty over the status of previous water agreements, with Egypt and Sudan asserting the validity of the 1959 Agreement, much to the dismay of the upstream nations. However, a flurry of press reports beginning in late March 2007 indicate a compromise has been reached.

On March 29, 2007 the Kenyan *Daily Nation* newspaper reported “Egypt has acknowledged the establishment of the Nile Commission, an arrangement recently agreed upon in Nairobi to oversee equal sharing of the world’s longest river.” However, none of the riparian nations have officially announced the creation of a permanent cooperative framework.

By foundering on this barrier, the riparian nations have stalled the cooperative momentum and allowed a new wave of unilateralism to threaten the viability of the cooperative process. The surge of unilateral infrastructure projects was necessitated by the ever-growing problems of drought, food insecurity and poverty. The inability of the NBI to alleviate these problems combined with a flood of foreign investment in African hydropower has allowed the riparian nations to unilaterally pursue large scale infrastructure projects. These unilateral projects run counter to the efforts of the NBI as they increase tensions of shared Nile water resources and complicate ongoing negotiations.

In light of the evidence collected thus far, this author concludes that the process of decision making in the Nile Basin is explainable by Neo-Functionalism. While early Pre-NBI cooperative efforts failed to generate meaningful results, they did prove to be an invaluable guide that helped refine the structure of future cooperative efforts. The establishment of the NBI was the culmination of a long and often tumultuous cooperative process. Early rounds of cooperation followed the norms of Neo-Functionalist theory as they focused mainly on relatively non-controversial technical issues, such as Hydromet and TECCONILE. Each ensuing round of negotiation strengthened the cooperative process and generated momentum that drove negotiations into more sensitive subjects.

This cooperative momentum and the spill-over effect are fundamental aspects of Neo-Functionalism (Schmitter 2002). The creation of the NBI and its subsidiary programs can be interpreted in light of Neo-Functional theory as yet another progressive step in the evolving integration process.

The establishment of the supra-national NBI empowered with the authority to implement multi-lateral projects and programs was made possible by the willingness of the riparian nations to cede some measure of their sovereignty and embrace collective decision-making. The NBI effectively enlisted the assistance of international organizations such as the United Nations and World Bank, and promoted mutually beneficial projects that are directed by technical experts and water management professionals who are focused on completing the project rather than promoting their political interests. These efforts exemplify the process of integration described by Neo-Functionalism.

Neo-functionalism also predicts that the integration process will oftentimes be a complex and challenging process that must continually overcome barriers and spill-over into new more critical arenas. The process of integration in the Nile Basin is currently facing a major challenge as the riparian nations attempt to reach a compromise over a new basin-wide water rights agreement. The recent upswing in unilateral decisions indicates that the cooperative momentum has stalled and that the future of the cooperative process is at stake. The signing of a basin-wide water rights agreement is a vital ingredient in the recipe of Nile Basin integration. A new permanent cooperative legal framework and supranational institution would solidify inter-basin relations and propel the cooperative process into new more important arenas. Although the NBI has

undoubtedly reduced the prior causes of conflict, the legacy of Nile Basin cooperation will be defined by the willingness of the riparian nations to continue building cooperative momentum by signing a new permanent water rights agreement and providing workable collective solutions for the myriad of problems facing the Nile Basin.

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