GEOPOLITICS OF TRANSBOUNDARY RESOURCE MANAGEMENT:

A CASE STUDY OF THE NILE RIVER

Dissertation submitted to Jawaharlal Nehru University
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MASTER OF PHILOSOPHY

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DECLARATION

I declare that the dissertation entitled "***Geopolitics of Transboundary Resource Management: A Case Study of the Nile River***" submitted by me for the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this university or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

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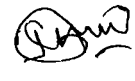

Date: 23rd June, 2010 **INTIKHAB AHMAD**

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ACRONYMS

ASEAN	: -	Association of South-East Asian Nations
ATCC	: -	American Type Culture Collection
BGs	: -	Botanical Gardens
CBD	: -	Convention on Biological Diversity
CGIAR	: -	Consultative Group on International Agricultural Research
CI	: -	Conservation International
CIEL	: -	Centre for International Environmental Law
CSIR	: -	Council of Scientific and Industrial Research
		Development and Environmental Protection of the Nile Basin
EBAs	: -	Endemic Bird Areas
EFTA	: -	European Free Trade Agreement
EPC	: -	European Patent Convention
EPO	: -	European Patent Office
EU	: -	European Union
FAO	:-	Food and Agricultural Organization
FR	: -	Farmer's Rights
GATT	: -	General Agreement on Tariffs and Trade
GBs	: -	Germ Plasm Banks
GEF	:-	Global Environmental Facility
GNI	:-	Gross National Income
GR	: -	Genetic Resources
GRAIN	: -	Genetic Resources Action International
IARC	: -	International Agricultural Research Centres
IMF	: -	International Monetary Fund
IP	: -	Intellectual Property
IPC	: -	International Patent Classification
IPGRI	: -	International Plant Genetic Resources Institute
IPRs	: -	Intellectual Property Rights
IUCN	: -	International Union for Conservation of Nature
JPO	: -	Japanese Patent Office

LMMC	: -	Like-Minded Megadiverse Countries
MNCs	: -	Multi National Corporations
NBI	:-	Nile Basin Initiative
NGOs	: -	Non Governmental Organisations
Nile-COM	:-	Nile Council of Ministers
Nile-SEC	:-	Nile Secretariat
Nile-TEC	:-	Nile Technical Advisory Committee
NRBAP	:-	Nile River Basin Action Programme
OECD	: -	Organization for Economic Cooperation and Development
PBRs	: -	Plant Breeder's Rights
PCT	: -	Patent Cooperation Treaty
PGR	: -	Plant Genetic Resources
PVRs	: -	Plant Varieties Rights
R & D	: -	Research and Development
RAFI	: -	Rural Advancement Foundation International
RBM	:-	River Basin Management
SACSIR	: -	South African Council for Scientific and Industrial Research
SVP	:-	Shared Vision Programme
TECCONILE	:-	Technical Co-operation Committee for the Promotion of the
TK	: -	Traditional Knowledge
TNCs	: -	Transnational Corporations
TRIPS	: -	Trade Related Aspects of Intellectual Property Rights
TWN	: -	Third World Network
UNCED	: -	United Nations Conference on Environment and Development
UNCTAD	: -	United Nations Conference on Trade and Development
UNDP	: -	United Nations Development Programme
UNEP	: -	United Nations Environment Programme
UNESCO	: -	United Nation Educational, Scientific and Cultural Organisation
UPOV	: -	Union for the Protection of New Varieties of Plants
USPTO	: -	United States Patent and Trademark Office
WCMC	: -	World Conservation and Monitoring Centre
WIPO	: -	World Intellectual Property Rights Organisation
WTO	:-	World Trade Organization

CHAPTER 1

INTRODUCTION

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INTRODUCTION

1.1 BACKGROUND

It is essential to first comprehend the economic and political role of the Nile River and its role in the development of the entire region. The White Nile and Blue Nile are two of its main tributaries. From lake Victoria in east Africa, the White Nile flows generally north through Uganda and into Sudan where it meets the Blue Nile at Khartoum, which rises in the Ethiopian highlands. From the confluence of White and Blue Nile, it flows northwards into Egypt and on to the Mediterranean Sea. The Nile River is 5,584 kilometer long if measured from its key source, lake Victoria. However if measured from its farthest source, the Ruvylronza River in Burundi, to the sea, the river is 6,671 kilometers long.

The historical development of the Nile Basin has left a legacy of cultures and societies with a rich archaeological record. This has ensured that the basin remains one of the most distinct and visually identifiable regions of the world. The global importance of the Nile valley's archaeology has generated some of the most important international efforts at protecting archaeological sites.

Beyond the archaeological significance of the river's history, it has also played an important part in early European contact with Africa, drawing explorers and adventurers from Europe as far back as the fifteenth century, many of whose exploits paved the way for future European expansionism and, eventually, colonial control. With the exception of

Ethiopia, a country never colonized, but occupied for five years by Italy, much of this European control was not relinquished until the mid-twentieth century.

Almost half of the Earth's land surface lies within international river basins. The physical, economic and social disparities between riparian[1] nations that share river basins make their management complex. International treaties and agreements serve to provide structure to allow nations to address these disparities within a legal framework. This structure may provide for joint management and monitoring of the resources to support sustainable development of the water resources, including management of water flow, water quality, and infrastructure development.

On the transboundary level, the Nile Basin Initiative (NBI) is the most important acting forum. The Council of Minister of Water Affairs of the Nile Basin or the Nile Council of Ministers (Nile-COM) is the highest authority of the NBI and is supported by a Nile Technical Advisory Committee (Nile-TAC) and a Secretariat (Nile-SEC) located in Entebbe. The NBI is working on implementing the Shared Vision Programme (SVP).

1.2 TRANSBOUNDARY WATER RESOURCES

Transboundary Water Resources share more than 260 international river basins, which cover nearly half of the Earth's surface, provide an estimated 60 percent of global freshwater surface flows and are home to some 40 percent of the world's population. As demand for water grows in all countries, these shared resources will increasingly be drawn upon to meet the competing needs of billions of people for drinking water, food, energy, and industrial production, leaving less water, often of much lesser quality, to sustain ecosystems and to meet people's future demands. Even where historically robust water sharing and river basin management is practiced, the uncertainties of climate change are likely to pose new risks that will challenge riparians, those who share a river basin to enhance cooperation.

[1] The Countries Surrounding The Nile River Will Be Referred As Riparian Countries.

International rivers are not unique in posing the challenge of sharing water resources. Transboundary water resources and tensions among competing users are found at all scales. Sub-national entities such as states, regions, provinces and municipalities need to share and cooperatively manage the waters that flow between them. Even at the smallest scales, within a city or village where no political or physical boundaries are apparent, different users generally find it challenging to share water in a manner that is considered by all to be fair and reasonable. From the international to the local level, similar tensions and opportunities will arise wherever users share a water resource whose quality and quantity affects, and is affected by, all of its users.

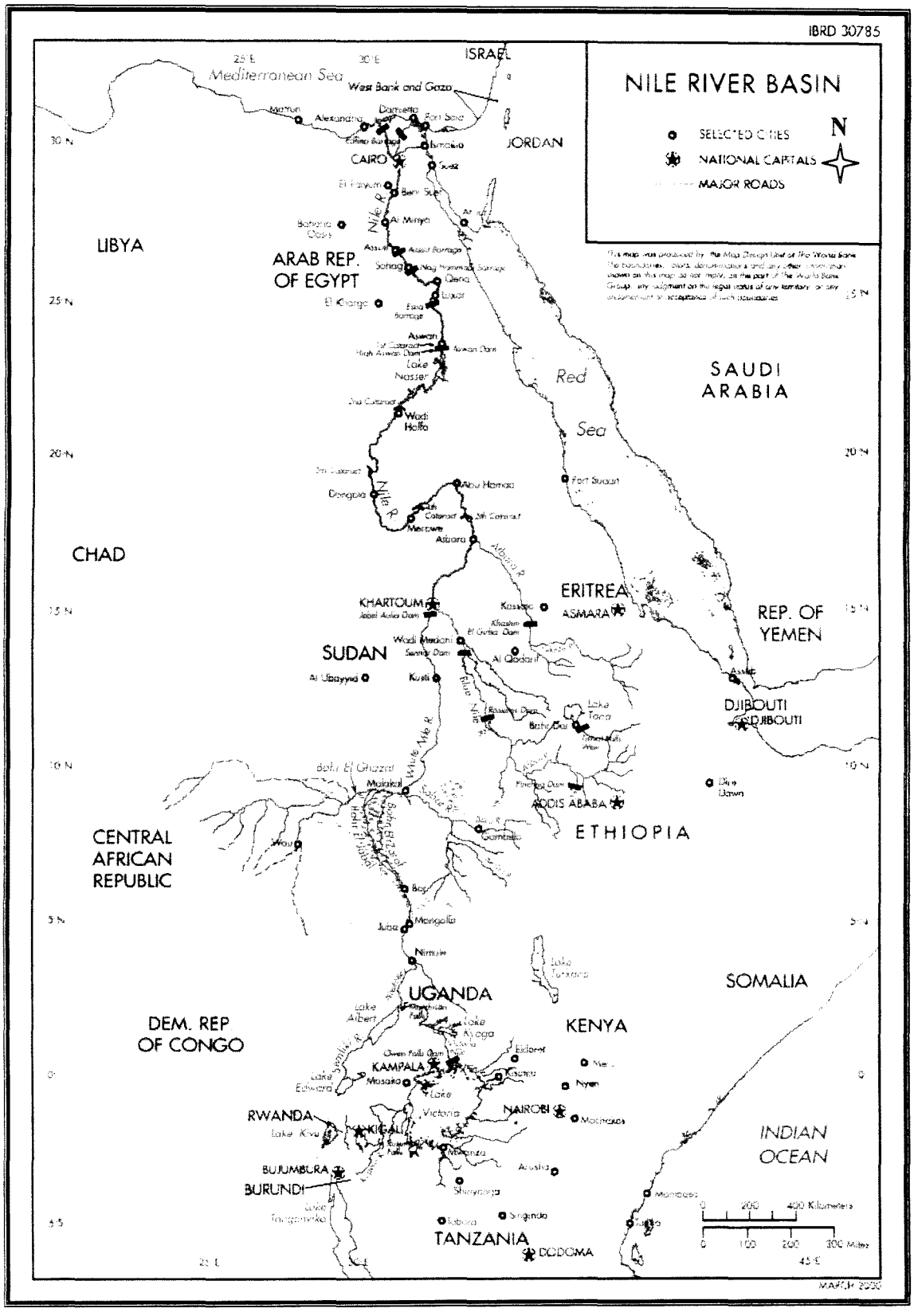
1.3 INTRODUCTION TO THE THEME AND THE AREA

"The study of mathematics, like the Nile, begins in minuteness but ends in magnificence." (Charles Caleb ColtonEnglish sportsman and writer. 1780-1832).
"He who controls the Nile controls Egypt." (Halford, 1936).
"Water flows towards the powerful and the rich." (Fradkin, 1981).

The Nile is a major north-flowing river in Africa, generally regarded as the longest river in the world. The Nile receives its name from the Greek "Neilos", which means a valley or river valley. The river flowed northward and flooded the lands in Egypt, leaving behind black sediment. As a result the ancient Egyptians called the river Ar or Aur (black). The Greeks and Egyptians also gave the land its oldest name Kem or Kemi, which also translates into black. The river's water and the fertile soil along its banks created the perfect setting for the evolution of the civilizations that existed in the ancient world. The ancient peoples that lived along the river's banks cultivated the art of agriculture and were one the first to utilize the plow.

Ten countries share the basin of the Nile, arguably the world's longest river: Burundi, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda, and the Democratic Republic of the Congo (Map: 1.1).

Map: 1.1 Case Study Area (The Nile River Basin)



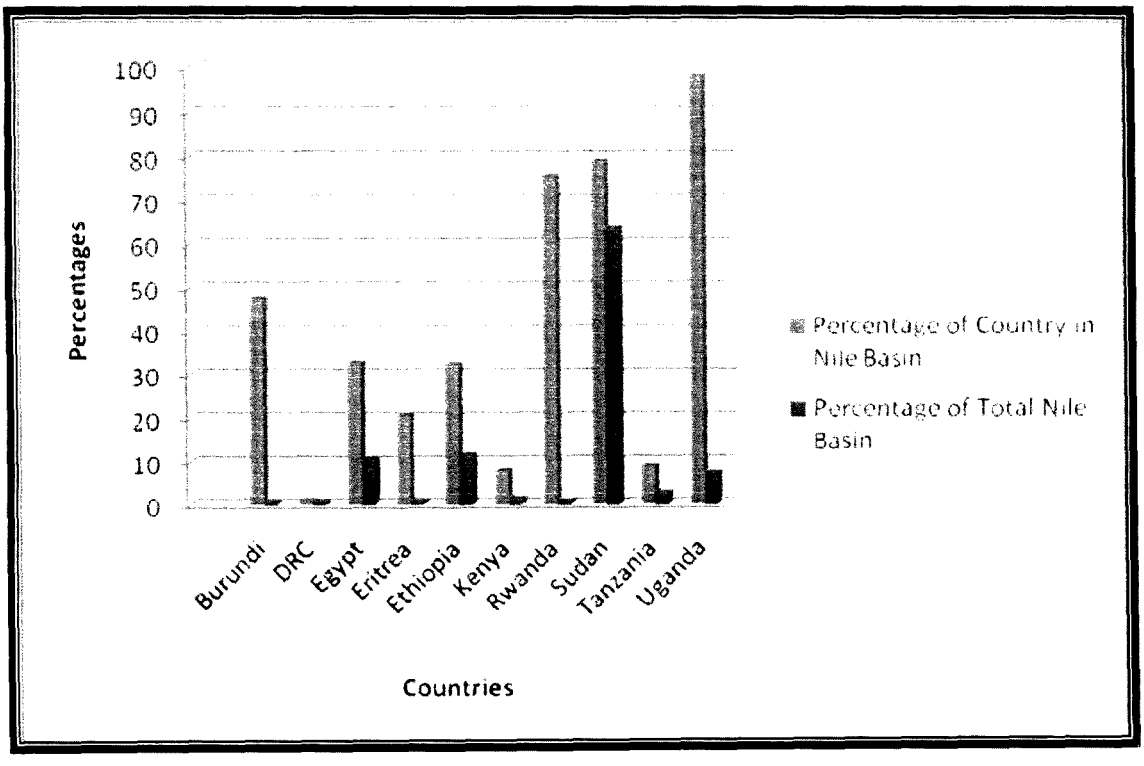
Source: United Nations Environment Programme (UNEP)-2000.

Table: 1.1 The Nile Basin Riparians

Country	Percentage of Country in Nile Basin	Percentage of Total Nile Basin
Burundi	**47.6**	**0.4**
DRC	**0.9**	**0.7**
Egypt	**32.6**	**10.5**
Eritrea	**20.5**	**0.8**
Ethiopia	**32.4**	**11.7**
Kenya	**7.9**	**1.5**
Rwanda	**75.5**	**0.7**
Sudan	**79**	**63.6**
Tanzania	**8.9**	**2.7**
Uganda	**98**	**7.4**

Source: Karyabwite, (2000).

Figure: 1.1 The Nile Basin Riparians



The basin's three million square kilometer cover about 10 percent of the African continent. Approximately 160 million people depend on the Nile River for their livelihoods, and about 300 million people live within the 10 basin countries (Table: 1.1). Within the next 25 years, the region's population is expected to double, adding to the demand for water, which is already exacerbated by the growth of the region's industries and agriculture. The constant threat of droughts increases the urgency of the problem, and pollution from land-use activities affects downstream water quality. Finally, except for Kenya and Egypt, all of the basin countries are among the world's 50 poorest nations, making their populations even more vulnerable to famine and disease.

The Nile has two major tributaries, the White Nile and Blue Nile, the latter being the source of most of the Nile's water and fertile soil, but the former being the longer of the two. The White Nile rises in the Great Lakes region of central Africa, with the most distant source in southern Rwanda 2°16'S 29°19'E / 2°28'S 29°33'E and flows north from there through Tanzania, Lake Victoria, Uganda and southern Sudan, while the Blue Nile starts at Lake Tana in Ethiopia 12°2'N 37°15'E / 12°03'N 37°26'E flowing into Sudan from the southeast. The two rivers meet near the Sudanese capital Khartoum.

The northern section of the river flows almost entirely through desert, from Sudan into Egypt, a country whose civilization has depended on the river since ancient times. Most of the population of Egypt and all of its cities, with the exception of those near the coast, lie along those parts of the Nile valley north of Aswan; and nearly all the cultural and historical sites of Ancient Egypt are found along the banks of the river. The Nile ends in a large delta that empties into the Mediterranean Sea. The drainage basin of the Nile covers 3,254,555 square kilometers (1,256,591 sq mi), about 10% of the area of Africa.

There are two great tributaries of the Nile, joining at Khartoum: the White Nile, starting in equatorial East Africa, and the Blue Nile, beginning in Ethiopia. Both branches are on the western flanks of the East African Rift, the southern part of the Great Rift Valley. Below the Blue and White Nile confluence the only remaining major tributary is the Atbara River, which originates in Ethiopia north of Lake Tana, and is around

800 kilometer (500 mi) long. It flows only while there is rain in Ethiopia and dries very fast. It joins the Nile approximately 300 kilometer (200 mi) north of Khartoum.

The Nile is unusual in that its last tributary (the Atbara) joins it roughly halfway to the sea. From that point north, the Nile diminishes because of evaporation. The course of the Nile in Sudan is distinctive. It flows over 6 groups of cataracts, from the first at Aswan to the sixth at Sabaloka (just north of Khartoum) and then turns to flow southward for a good portion of its course, before again returning to flow north to the sea. This is called the "Great Bend of the Nile".

East Africa, showing the course of the Nile River, with the "Blue" and "White" Niles marked in those colours North of Cairo, the Nile splits into two branches (or distributaries) that feed the Mediterranean: the Rosetta Branch to the west and the Damietta to the east, forming the Nile Delta. The Blue Nile Falls fed by Lake Tana near the city of Bahar Dar, Ethiopia forms the upstream of the Blue Nile. It is also known as Tis Issat Falls after the name of the nearby village.

The Blue Nile (Black Abay) to Ethiopians; Bahr al Azraq to Sudanese) springs from Lake Tana in the Ethiopian Highlands. The Blue Nile flows about 1,400 kilometer (870 mi) to Khartoum, where the Blue Nile and White Nile join to form the "Nile proper". 90 percent of the water and 96 percent of the transported sediment carried by the Nile originates in Ethiopia, with 59 percent of the water from the Blue Nile alone (the rest being from the Tekeze, Atbarah, Sobat, and small tributaries). The erosion and transportation of silt only occurs during the Ethiopian rainy season in the summer, however, when rainfall is especially high on the Ethiopian Plateau; the rest of the year, the great rivers draining Ethiopia into the Nile (Sobat, Blue Nile, Tekeze, and Atbarah) flow weakly.

The Yellow Nile is a former tributary that connected the Ouaddai Highlands of eastern Chad to the Nile River Valley. Its remains are known as the Wadi Howar. The

wadi passes through Gharb Darfur near the northern border with Chad and meets up with the Nile and near the southern point of the Great Bend.

1.4 GEOPOLITICS AND HYDROPOLITICS OF THE NILE

Geopolitics examines the political, economic and strategic significance of geography, and how strategy is induced by geographical factors, whereas hydropolitics refers to the study of conflict and cooperation among nations over shared water resources. Although contemporary Western geopolitics favor's the Horn of Africa for its geographic and strategic importance in the fight against terrorism and transportation of commodities, especially oil, for more than half a century, Egypt situated in one of the most unstable regions of the world has been viewed as a critical ally of the West. As a consequence, the leading industrialised nations were unwilling to support anything upstream on the Nile that might disrupt the vital flow of water to Egypt and trigger instability there. Meanwhile, Ethiopia and the upper riparian states lacked funds to develop the badly needed broad irrigation and hydroelectric network.

To date, Egypt claims that it has natural, acquired and historical rights on the Nile, and will be governed by the hydro-political doctrines of 'prior use', 'primary need' and 'acquired rights'. These principles have all been regarded by the Egyptians as the crux of any talks or negotiations with upstream states. Moreover, these water rights are often referred to as an Egyptian foreign policy benchmark which calls for the safeguarding of the uninterrupted flow of the Nile water.

Ethiopia has even more logically plausible and legally defensible claims to reserve the possibility of a massive unilateral water development Programme for the Blue Nile Basin and other water resources. The development of irrigation schemes in Ethiopia has been minimal. The combination of land degradation and lack of adequate rainfall has often caused crop failures. To stabilize and boost agricultural production, it has become necessary to expand irrigated agriculture. The lowlands, with their extensive flat and

fertile land, hold great potential for the development of large-scale irrigation based agricultural production. The potential gross irrigable area is estimated to be 3.5 million hectares. Till date, only 5 percent of the total potential is utilised.

Egypt is almost completely dependent on the Nile's water and claims that prior usage entitles it to a disproportionate share of the water resource; over ninety-five percent of agricultural production comes from Nile irrigated land. Egypt needs to expand its agricultural land and reduce saltwater intrusion from the Mediterranean Sea to the Nile delta.

Egypt is very concerned about its relationship with Ethiopia since roughly 85 percent of the Nile River's flow in Egypt originates with the Blue Nile. Egypt has frequently warned Ethiopia not to take any steps that would affect the Blue Nile's discharge. Ethiopia has responded on numerous occasions that it reserves sovereign right to use the Blue Nile for the benefit of its own population. Ethiopia has broad plans to develop fifty irrigation and hydroelectric generation projects. As Ethiopia claims a larger share of the Nile headwaters, Egypt will likely experience a slight reduction in Nile water Egypt is also apprehensive about Sudan. Incapable of expanding its water use at the present, this situation could change in the future. With increased use of Nile waters for agricultural irrigation, Sudan could become the breadbasket of the Middle East. The Nile Waters Agreement of 1929 is one of the most important agreements between the two countries allocating the Nile's water. The Sudano-Egyptian Agreement of 1959 adjusted the 1929 allocation, reducing Egypt's share. Regional economic improvements will require cooperative management of the Nile River and its tributaries. Egypt has protection of its Nile water resources as one of its key strategic objectives.

Egypt and Sudan hold absolute rights to use 100 percent of the river's water under agreements reached in 1929 between Egypt and Britain (which was then the colonial power in Kenya, Sudan, Tanzania, and Uganda) and in 1959 between Egypt and Sudan. Since Egypt must consent to other nation's use of the Nile's water, most of the other basin countries have not developed projects that use it extensively. Not surprisingly, over

the years other basin countries have contested the validity of these treaties and demanded their revocation to make way for a more equitable system of management.

Growing water demands stemming from population and economic growth in all riparian countries have increased the pressure on water resources. This bears the potential for conflicts over how to share water resources in the future. However, the need to share the Nile's waters also offers the potential for cooperation. In fact, in recent years the riparian countries moved closer towards cooperation and joint development of the river basin. In the late 1990s the Nile Basin Initiative (NBI) was launched bringing together the riparian countries at one table. The challenge ahead is to jointly develop the Nile River Basin and to allocate water to its optimum uses while sharing the benefits.

The Nile River supplies 55.5 million cubic meters of water. This accounts of 86 percent of the water used in Egypt annually. The Nile River's importance to Egypt is not in its water alone, but also the flow of the river's water. Twenty-eight percent of the country's power is produced from hydroelectric plants on the river. Flood irrigation from the Nile River supplies water for almost all of Egypt's food production. Already Egypt imports fifty percent of its food requirements. Despite these factors, Egypt's water needs will continue to increase. Egypt's population will shortly exceed seventy million, increasing by more than one million per year. Egypt and Sudan are likely to face water deficits within the next ten years. Both currently require about five billion cubic meters per year.

As stated above, the Nile is Egypt's primary source of water for meeting consumption demand Egypt's reliance on the river's water is absolute. Coupled with the striking seasonal variation in river flow, Egypt suffers from insufficient water during the long, dry summer months. The storage capacity of the Aswan High Dam is essential for coping with periods of low flow levels. Settlement in the Nile basin is intimately associated with the river. In Egypt, most of its population is crowded in a habitable, thirty thousand square kilometer, narrow corridor of arable land along the Nile River and in the Nile Delta. Moreover; Egypt is the furthest downstream state in the Nile River Basin.

1.5 RATIONALE

Transboundary water resources are increasing in importance as sources of freshwater worldwide. As much as 80 percent of water resources in the Mediterranean region are shared between two or more countries, in North Africa and the Middle East, transboundary groundwaters are the most important source of freshwater. The Nile River is the life-giving source for its riparian nations. Although it is one of the longest river in the world, its annual average flow is relatively low (Nile: 2,622 m^3s^{-1}, Amazon: 180,000 m^3s^{-1}, Rhine: 2,200 m^3s^{-1}). Moreover, ten African countries share the Nile River waters.

The 2003 UN Development Report (UN WWDR, 2003) entitled "Water for Life Water for People", listed 263 transboundary basins. These basins:

- Cover 45% of the land surface of the Earth;
- Affect 40% of the world's population;
- Account for approximately 80% of global river flow;
- Cross the political boundaries of 145 nations.

All available predictions agree that there is a growing water scarcity and it is estimated that within 25 years, two-thirds of the world's inhabitants will live in countries with serious water problems. Growing demand, inadequate water governance, excessive abstraction and climate change coupled with the fact that the quality of water is deteriorating in many parts of the world due to pollution, has put both surface and groundwater resources under severe stress in many parts of the world.

Transboundary water resources additionally face political, cultural and ethical challenges. Scarcity leads to increasing competition among users. Cooperative arrangements, based on a multi-disciplinary approach integrating scientific, social, economic and institutional components, are crucial in order to jointly develop, manage and protect transboundary waters, to avoid conflict, to optimise the sustainable utilisation of these resources and to ensure water security.

1.6 STATEMENT OF THE PROBLEM

The principal causes for concern in the Nile River Basin are environmental and economic. Lack of written agreements between users of Nile water is largely a result of Egypt's insistence on its overriding needs. Rapid population growth in the states of the Nile River Basin means that demand for water will increase. Existing water resources will have to be used and allocated more efficiently to meet demand. Otherwise, the consumption and development requirements of some states will not be met. The combination of high population growth and a scare resource is not be sustainable and may prove to be highly unstable. Consequently, 25 years from now, when the population has doubled and there is a lack of water resource cooperation, there could be conflict over control of the waters of the Nile River Basin.

As the Nile riparian's gained independence from Colonial powers, riparian disputes became international and consequently more contentious, particularly between Egypt and Sudan. The core question of historic versus sovereign water rights is complicated by the technical question of where the river ought to be best controlled-upstream or down.

Thus there arise many questions, which need to be answered such as:

(i) What is the geopolitics involved in the issue surrounding transboundary water resource management?

(ii) Is rapid population growth creates a higher demand on an already scare resources, "rapid economic expansion, development and urbanization place additional pressure on scare fresh water resources?

(iii) Unequal distribution of water due to the transboundary nature of most water supplies is a source of regional tension. If water scarcity has an inherently high conflict potential, water can (or should) be done to mitigate that conflict.

(iv) How can one understand the political dynamics of securitization, desecuritization, regime creation and institutional development, in the context of the international river basins like Nile River Basin?

1.7 RESEARCH HYPOTHESES

(i) Transboundary resource management theme is very pertinent particularly at this hour when the scarcity of resources in terms of drinking water, famine and drought is being observed in different parts of the world in general and Nile River Basin countries in particular.

(ii) Transboundary resource management is in fact the imperative prerequisite for the political and social and economic stability of any nation.

1.8 RESEARCH METHODOLOGY

The proposed study will be based on historical, descriptive, comparative and analytical review of the data collected both from primary and secondary sources. Apart from the available source materials like books, periodicals, journals, newspapers etc, primary sources like official documents, reports and statistical analysis will be take care of. Proposed study will make use of various cartographic and statistical and based techniques to provide a visual analysis and scientific base to the study. This will give a more accurate view of the subject. The cartographic and statistical techniques like bar diagram, pie diagram and line graph, etc. would be used as per the requirement. Maps would be used to show the Nile River Basin as the area of study. Data provided by various international organizations like Nile Basin Initiative, World Bank, Food and Agricultural Organization etc will also be used.

1.9 FRAMEWORK OF THE STUDY

The present work is presented in six chapters. The first chapter provides a general introduction of the Nile River Basin countries. This chapter highlights the background, transboundary water resources, geographical setting of the Nile Basin Countries. It provides a general view of the debates surrounding the geopolitical situation in the Nile River Basin Countries also give emphasis on the rationale behind the study of the geopolitics of the resources of the Nile River basin. This chapter talks about the scope of the study, statement of the problem, research hypotheses and research methodology.

The second chapter "Physiography of the Nile River" highlights the general history of the Nile River basin, the basic Nile's geography, climate of the basin, the impact of the climate, demography and society, sources of the Nile, confluence of the white and black Nile, cataracts of the Nile and their importance. This chapter consists of eight subsections besides the first subsection as introduction and final subsection as conclusion. The prominent sub-section of this chapter is the relief of the Nile River.

The third chapter "Resources of the Nile River" analyses the basic resources of the Nile and their importance. The first subsection looks into the characteristics of water as a resource. The second subsection looks into the role of Nile in the founding of Egyptian civilization. The next subsection looks into the, hydrology of the Nile River. The next subsection analyse the socio- economic aspects of the Nile as a resource. The next subsection looks the basic resources of the Nile. Further the next subsection analyse the economic importance of the Nile as a resource. Likewise, the last subsection analyses water resources management in the Nile river basin and the conclusion.

The fourth chapter "Geopolitics of Resources of the Nile" provides a comprehensive review of the water as a source of conflict and the geopolitics involved in its utilisation. The first subsection provides critical insight into the water as a source of conflict and cooperation. The next subsection analyse the conflicting perspective of the politics of water in the Nile basin countries. It provides an introduction to the issues

involved with "resource geopolitics." The next subsection looks into the Nile water agreements. The final part looks into the water and environmental security.

The fifth chapter "Issues and Conflicts over Resources and Conflict Management Resolution" analyses issues concerning the Nile water resources and their resolution. The first subsection provides historical background of the issues of the geopolitics of the Nile. The second subsection highlights the broad overview of the Nile agreements. The next subsection analyses broad conflict and cooperation in the Nile river basin. The next subsection highlights the main transboundary issues and description regime as formal and informal actors. The next subsection analyses the conflict and cooperation and various institution for Nile water sharing. The final subsection analyses the effects of various treaties and agreements for the utilization of Nile water.

Finally, the conclusion provides a summary and synthesis of the overall presentation of the work. The bibliography of the consulted source material is provided at the end of the dissertation.

CHAPTER 2

PHYSIOGRAPHY OF THE NILE RIVER

CHAPTER 2

PHYSIOGRAPHY OF THE NILE RIVER

2.1 INTRODUCTION

The Physiography of the Nile Basin is both distinct and varied. From the most remote source at the head of the River Luvironzo near Lake Tanganyika, to its mouth on the Mediterranean Sea, at 6695 kilometer the Nile is the longest river in the world. Some 2.9 million km sq in extent, overall the basin drains about 10 percent of the continent. It is a confluence of the Blue Nile stemming from Lake Tana in Ethiopia and the White Nile[2], stemming from Lake Victoria in Uganda. The Nile and its tributaries flow though ten countries, the White Nile flows though Uganda, Sudan, and Egypt, the Blue Nile flows through Ethiopia, while Kenya, Tanzania, Democratic Republic of Congo (DRC), Rwanda, and Burundi all have tributaries, which flow into the Nile or into lake Victoria Nyanes. The Nile River's average discharge is about 300 million cubic meters per day at its mouth.

The Nile gets its name from the Greek word "Nelios", meaning River Valley. The Blue Nile rises at a spring site upstream of Lake Tana in Ethiopia, 2,150 m above sea level. The river flows west then north until it eventually meets the White Nile at Khartoum. A length of 800 km is navigable during high water times. The Ruvyironza River, regarded as the ultimate source of the Nile, is one of the upper branches of the Kagera River. The Kagera River follows the boundary of Rwanda northward, turns where the borders of Rwanda, Uganda and Tanzania meet, and drains into Lake Victoria. On leaving Lake Victoria at the site of the now-submerged Owen Falls, the Nile rushes for 483 km over rapids and cataracts, at first northwest and then west, until it enters Lake

[2] The term "White Nile" is used in both a general sense, referring to the entire river above Khartoum, and in a limited sense, describing the section between Lake No and Khartoum.

Albert. The section between the two lakes is called the Victoria Nile. The river leaves the northern end of Lake Albert as the Albert Nile, flows through northern Uganda, and at the Sudan border becomes the Bahr al Jabal. At its junction with the Bahr al Ghazal, the river becomes the Bahr al Abyad, or the White Nile. Various tributaries flow through the Bahr al Ghazal district. A major tributary of the White Nile is the River Sobat coming from Ethiopia. At Khartoum the Blue Nile or Bahr al Azraq joins the White Nile. These are so named because of the colour of the water. From Khartoum the Nile flows northeast. 322 km below Khartoum it is joined by the 'Atbarah River. The black sediment brought down by the 'Atbarah and Blue Nile Rivers used to settle in the Nile delta making it very fertile. This process historically occurred during the annual flooding of the Nile in the summer months.

However, the opening of the Aswan High Dam in the early 1970s allowed for control of the flooding and reduced sediment deposits in the river as these now settle in Lake Nasser. During its course from the confluence of the 'Atbarah through the Nubian Desert, the river makes two deep bends. From Khartoum to Aswan there are six cataracts. The Nile is navigable to the second cataract, a distance of 1,545 km. The water level behind the Aswan Dam fell from 170 m in 1979 to 150 m in 1988, threatening Egypt's hydroelectric power generation. 86% of the Nile water in Egypt originates from Ethiopia. The delta of the Nile is 190 km wide (Nicol and Shahin 2003).

2.2 HISTORY OF THE DEVELOPMENT CONTEXT IN THE NILE RIVER BASIN

The recent historical development of the Nile Basin includes three major phases over the last 150 years. The first phase from the late nineteenth century to after the Second World War was an era of almost total social and economic domination by European powers. From after the Second World War to the late 1980s there was a period of colonial "unbundling" of control and exploitation, giving way to ideologies and political systems influenced by the state ideologies developing within the cold war

bipolar world. Frequently, the legacy left behind was one of competing nationalisms between newly independent states, and within the more centrally controlled states, challenges to state legitimacy by rebel groups.

The third major shift has taken place from the end of the 1980s onwards. As the cold war gave way to a new system of global political control dominated by one superpower, realignments, regime change, and new policy directions emerged during the 1990s. In particular the economic situation of many basin states shifted to more open, free-market economic systems causing major social and economic wrenches. It is within this era of substantial social, economic, and political change that the emergence of the Nile Basin Initiative has taken place and the major ideas and concepts of the Nile Basin Initiative have been framed.

2.3 THE SOURCE OF THE NILE RIVER

Despite the attempts of the Greeks and Romans (who were unable to penetrate the Sudd), the upper reaches of the Nile remained largely unknown. Various expeditions had failed to determine the river's source, thus yielding classical Hellenistic and Roman representations of the river as a male god with his face and head obscured in drapery. Agatharcides records that in the time of Ptolemy II Philadelphus, a military expedition had penetrated far enough along the course of the Blue Nile to determine that the summer floods were caused by heavy seasonal rainstorms in the Ethiopian highlands, but no European in antiquity is known to have reached Lake Tana.

Historic map of the River Nile by Piri Reis have been the first European to have visited the headwaters. Europeans learned little new information about the origins of the Nile until the 15th and 16th centuries, when travellers to Ethiopia visited not only Lake Tana, but the source of the Blue Nile in the mountains south of the lake. Paez' account of the source of the Nile (History of Ethiopia c. 1622) was not published in full until the early 20th century. The work is a long and vivid account of Ethiopia. The account is however featured in several contemporary works, including Balthazar Telles (Historia

geral da Ethiopia a Alta, 1660), Athanasius Kircher (Mundus Subterraneus, 1664) and by Johann Michael Vansleb (The Present State of Egypt, 1678). Europeans had been resident in the country since the late 15th century, and it is entirely possible one of them had visited the headwaters even earlier but was unable to send a report of his discoveries out of Ethiopia. Jeronimo Lobo also describes the source of the Blue Nile, visiting shortly after Pedro Paez. His account is likewise utilized by Balthazar Telles.

The White Nile was even less understood, and the ancients mistakenly believed that the Niger River represented the upper reaches of the White Nile; for example, Pliny the Elder wrote that the Nile had its origins "in a mountain of lower Mauretania", flowed above ground for "many days" distance, then went underground, reappeared as a large lake in the territories of the Masaesyli, then sank again below the desert to flow underground "for a distance of 20 days' journey till it reaches the nearest Ethiopians. A merchant named Diogenes reported the Nile's water attracted game such as water buffalo; and after the Persians introduced them in the 7^{th} century BC, camels.

Lake Victoria was first sighted by Europeans in 1858 when the British explorer John Hanning Speke reached its southern shore whilst on his journey with Richard Francis Burton to explore central Africa and locate the great Lakes. Believing he had found the source of the Nile on seeing this "vast expanse of open water" for the first time. Speke named the lake after the then Queen of the United Kingdom. Burton, who had been recovering from illness at the time and resting further south on the shores of Lake Tanganyika, was outraged that Speke claimed to have proved his discovery to be the true source of the Nile when Burton regarded this as still unsettled. A very public quarrel ensued, which not only sparked a great deal of intense debate within the scientific community of the day, but much interest by other explorers keen to either confirm or refute Speke's discovery. The well known British explorer and missionary David Livingstone failed in his attempt to verify Speke's discovery, instead pushing too far west and entering the Congo River system instead. It was ultimately the Welsh-American explorer Henry Morton Stanley who confirmed the truth of Speke's discovery,

circumnavigating Lake Victoria and reporting the great outflow at Ripon Falls on the Lake's northern shore.

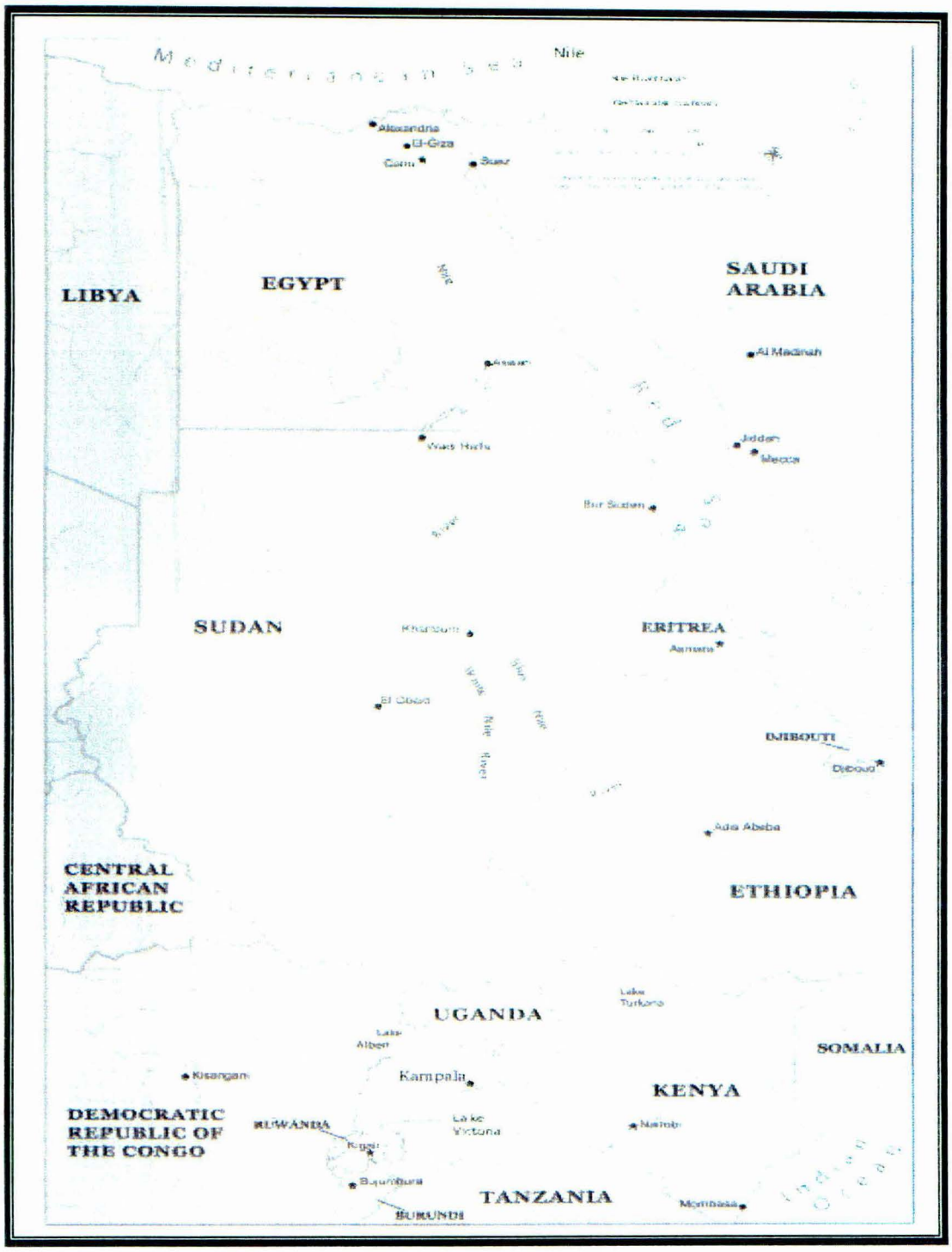
European involvement in Egypt goes back to the time of Napoleon. Laird shipyard of Liverpool sent an iron steamer to the Nile in the 1830s. With the completion of the Suez Canal, and the British takeover of Egypt in the1870s, more British river steamers were sure to follow. The Nile is the natural navigation channel in the area. Access to Khartoum and Sudan was via steamer. The Siege of Khartoum was ameliorated with steamers. Purpose built sternwheelers were shipped from England and steamed up the river to re-take the city. After this regular steam navigation came. With British Forces in Egypt in the First World War and the inter war years, river steamers provided both security and sight seeing to the pyramids and Luxor. Agatha Christie stories indicate the penetration of Nile steamer into the public consciousness. Steam navigation remained integral to the two countries as late as 1962, Sudan steamer traffic was the lifeline as few railways or roads were built. Most paddle steamers have been retired to shorefront service, but modern diesel tourist boats remain on the river.

2.4 THE GEOGRAPHY OF THE NILE RIVER BASIN

The Nile River is about 6,800 km in length, and its basin covers 3.1 million km^2, approximately 10% of the land mass of Africa, running from south to north over 35 degrees of latitude (Nicol, 2003). In total, 10 co-riparians share the Nile, with a combined population of 300 million (40% of the total African population; some 160 million of these live within the Nile basin). Four of the co-riparians to the Nile River are amongst the ten poorest countries in the world (Burundi, Eritrea, Ethiopia and Tanzania), and two of these are co-riparians in the Kagera River basin. The Kagera River basin comprises just less than 2% of the total area of the Nile River basin (Map 2.1), but is very significant for three specific reasons. Firstly, historical institutional development and inter-State agreements exist for the Kagera basin that could form a part of the foundation of future benefit-sharing scenarios in the Nile Basin as a whole. Secondly, the Kagera River basin is characterized largely by the use of endogenous water resources, introducing the important issue of endogenous versus exogenous water, and more specifically the rights, duties and obligations associated with these two conditions into the Nile Basin as a

whole. Thirdly, the issue of out-of basin transfers is of relevance for the co-riparians to the Kagera basin, and this is an important element of the hydro-political dynamics of the Nile Basin as a whole.

Map: 2.1 The Nile River Basin Area



Source: The Nile River Basin (TFDD, 2007).

The Nile River has two main upper branches: the White Nile originating in the equatorial lakes region (which includes the Kagera River basin), and the Blue Nile, which rises in the highlands of Ethiopia. The areas of the various co-riparians within the basin are shown in Table 2.1, with data for average rainfall also being provided. This shows the very marked decrease in precipitation with distance northwards, the main transition occurring in northern Sudan and Eritrea, and continuing into Egypt. As a reflection of this, all of the waters in Rwanda and Burundi are produced internally (i.e. are endogenous water resources), while most of the surface waters in Sudan (77%) and Egypt (97%) are derived from external sources in the upstream reaches of the Nile (i.e. are exogenous water resources). The Nile Basin is also characterized by one unique feature the downstream country (Egypt) is the most reliant on exogenous water resources of any country in the world (Gleick, 1993). It is impossible to fully understand the potential for benefit-sharing without grasping this fundamental reality and unique driver of hydro-politics in the Nile River Basin as a whole, the dynamics unleashed by endogenous *versus* exogenous flows in specific sub-basins.

One of the most important areas within the Nile River basin in relation to hydrology is the Sudd in southern Sudan. The Albert Nile becomes the Bahr el Jebel as it enters the Sudd, and the Bahr el Gazal River originating in south-western Sudan joins the main river at this point. The Sudd constitutes one of Africa's most important wetlands, and consists of a vast maze of swamps, channels and lakes. The area of the Sudd is also highly sensitive to variations in the upstream rainfall, expanding over five-fold after years of high rain in the equatorial lakes region. In addition, less than half of the flows entering the Sudd remain at the exit there from, to feed the White Nile. In an attempt to circumvent such losses due to evaporation, the Jonglei Canal was designed to partially by-pass the Sudd and deliver flows more efficiently downstream to the White Nile (running from Borr to Malakal, and estimated to enhance downstream flows by about 8,000 MCM/ year, or some 5-7 percent).

Table: 2.1 The Nile Basin Areas and Rainfall by Country

Country	Total area of the country (km^2)	Area of the country within the basin (km^2)	As % of total area of country	Average annual rainfall in the basin area (mean)
Burundi	**27 834**	**13260**	**47.6**	**1 110**
Rwanda	**26 340**	**19 876**	**75.5**	**1 105**
Tanzania	**945 090**	**84 200**	**8.9**	**1 015**
Kenya	**580 370**	**46 229**	**8**	**1 260**
Zaire	**2 344 860**	**22 143**	**0.9**	**1 245**
Uganda	**235 880**	**231 366**	**98.1**	**1 140**
Ethiopia	**1 100 010**	**365 117**	**33.2**	**1 125**
Eritrea	**121 890**	**24 921**	**20.4**	**520**
Sudan	**2 505 810**	**1 978 506**	**79**	**500**
Egypt	**1 001 450**	**326 751**	**32.6**	**15**
For Nile Basin		**3 112 369**		**615**

Source: FAO (2005).

Construction of the 360 km Canal commenced in 1978, but ceased in 1983 after the completion of about 240 km, due to the civil war (Howell *et al.*, 1989; Collins, 1990). The project remains incomplete to date, but the recent cessation of hostilities in the Sudan could offer an opportunity for its completion. However, any decision would need to balance a demand for the retention of the Sudd wetlands, with the needs downstream. The status of the Jonglei Canal remains hotly contested, and the rationale for draining a wetland of major international significance such as the Sudd will undoubtedly draw very considerable attention amongst the global environmental community. Lessons in this regard have been provided by the highly contested nature of a similar project, designed to 'enhance the yield' of the Okavango wetland system, by dredging a similar canal (Scudder *et al.*, 1993). It can therefore be presumed that any planned attempts to complete the construction of the Jonglei Canal would meet with a similar response to that

in the Okavango case. The viability of this option needs to be evaluated in the context of global reflexivity that characterized the end of the 20th Century. Close to Malakal, the Sobat River joins the White Nile, providing flows from the southern Ethiopian foothills. The White Nile and the Blue Nile merge at Khartoum, and the Atbara River (which forms the border between Ethiopia and Eritrea) then joins the main stem of the Nile as the last major tributary before the Mediterranean Sea, far to the north. The Blue Nile and the Atbara River are the predominant contributors of water to the downstream sections of the Nile River, accounting for the majority of the flow leaving Sudan and entering Egypt. However, this varies considerably over time.

2.4.1 CONFLUENCE OF THE NILE RIVER

The drainage basin of the Nile covers 3,254,555 square kilometer (1,256,591 sq mi), about 10 percent of the area of Africa. There are two great tributaries of the Nile, joining at Khartoum: the White Nile, starting in equatorial East Africa, and the Blue Nile, beginning in Ethiopia. Both branches are on the western flanks of the East African Rift, the southern part of the Great Rift Valley. Below the Blue and White Nile confluence the only remaining major tributary is the Atbara River, which originates in Ethiopia north of Lake Tana, and is around 800 kilometer (500 mi) long. During the dry period of January to June, there is typically no flow from the Atbara River. It flows only while there is rain in Ethiopia and dries very rapidly. It joins the Nile approximately 300 kilometer (200 mi) north of Khartoum.

North of Cairo, the Nile splits into two branches (or distributaries) that feed the Mediterranean: the Rosetta Branch to the west and the Damietta to the east, forming the Nile Delta. The Nile basin is complex, and because of this, the discharge at any given point along the mainstem depends on many factors including weather, diversions, evaporation and evapotranspiration, and groundwater flow.

2.4.1.1 White Nile

The source of the Nile is sometimes considered to be Lake Victoria, but the lake itself has feeder rivers of considerable size. The most distant stream and thus the ultimate source of the Nile, emerges from Nyungwe Forest in Rwanda, via the Rukarara, Mwogo, Nyabarongo and Kagera rivers, before flowing into Lake Victoria in Tanzania near the town of Bukoba.

The Nile leaves Lake Victoria at Ripon Falls near Jinja, Uganda, as the Victoria Nile. It flows for approximately 500 kilometres (300 mi) farther, through Lake Kyoga, until it reaches Lake Albert. After leaving Lake Albert, the river is known as the Albert Nile. It then flows into Sudan, where it is known as the Bahr al Jabal ("River of the Mountain"). The Bahr al Ghazal, itself 716 kilometer (445 mi) long, joins the Bahr al Jabal at a small lagoon called Lake No, after which the Nile becomes known as the Bahr al Abyad, or the White Nile, from the whitish clay suspended in its waters. When the Nile flooded it left a rich silty deposit, which fertilized the soil. The Nile no longer floods annually since the completion of the Aswan Dam in 1970. From Lake No, the river flows to Khartoum. An anabranch river, the Bahr el Zeraf, flows out of the Nile's Bahr al Jabal section and rejoins the White Nile.

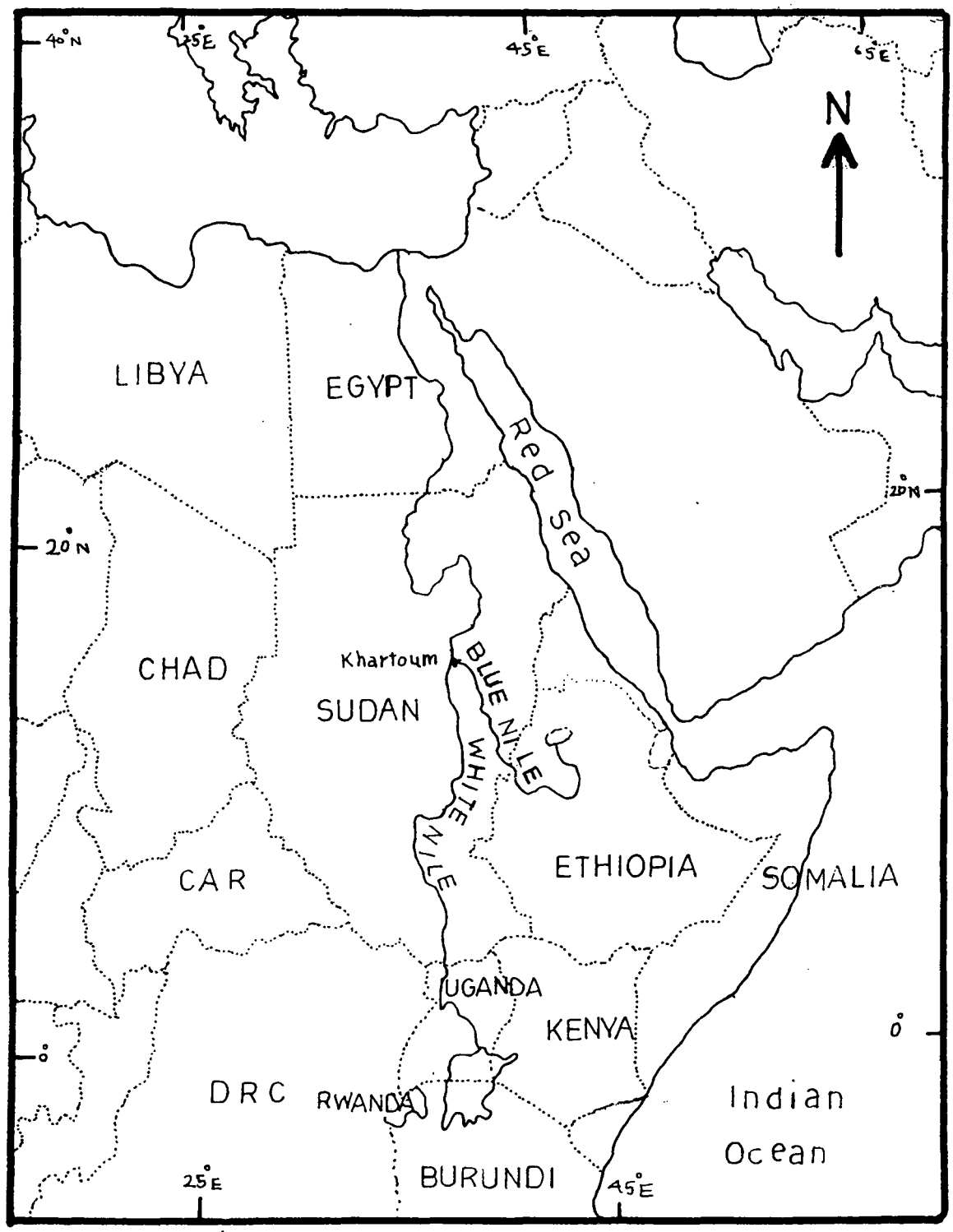
The flow rate of the Albert Nile at Mongalla is almost constant throughout the year and averages 1048 m^3/s (37,000 cu ft/s). After Mongalla, the Nile is known as the Bahr El Jebel, which enters the enormous swamps of the Sudd region of Sudan. More than half of the Nile's water is lost in this swamp to evaporation and transpiration. The average flow rate in the Bahr El Jebel at the tails of the swamps is about 510 m^3/s (18,000 cu ft/s). From here it soon meets with the Sobat River and forms the White Nile.

The Bahr al Ghazal and the Sobat River are the two most important tributaries of the White Nile in terms of drainage area and discharge. The Bahr al Ghazal's drainage basin is the largest of any of the Nile's sub-basins, measuring 520,000 square kilometres (200,000 sq mi) in size, but it contributes a relatively small amount of water, about 2 m^3/s (71 cu ft/s) annually, due to tremendous volumes of water being lost in the Sudd

wetlands. The Sobat River, which joins the Nile a short distance below Lake No, drains about half as much land, 225,000 km^2 (86,900 sq mi), but contributes 412 cubic metres per second (14,500 cu ft/s) annually to the Nile. When in flood the Sobat carries a large amount of sediment, adding greatly to the White Nile's colour.

The average flow of the White Nile at Malakal, just below the Sobat River, is 924 m^3/s (32,600 cu ft/s); the peak flow is approximately 1,218 m^3/s (43,000 cu ft/s) in early March and minimum flow is about 609 m^3/s (21,500 cu ft/s) in late August. This fluctuation is due the substantial variation in the flow of the Sobat, which has a minimum flow of about 99 m^3/s (3,500 cu ft/s) in August and a peak flow of over 680 m^3/s (24,000 cu ft/s) in early March. During the dry season (January to June) the White Nile contributes between 70 percent and 90 percent of the total discharge from the Nile.

Map:2.2 Confluence of White & Blue Nile



Source : Swain, Ashok. (1997).

2.4.1.2 Blue Nile

The Blue Nile springs from Lake Tana in the Ethiopian Highlands. The Blue Nile flows about 1,400 kilometres (870 mi) to Khartoum, where the Blue Nile and White Nile join to form the Nile. 90% of the water and 96% of the transported sediment carried by the Nile originates in Ethiopia, with 59% of the water from the Blue Nile (the rest being from the Tekeze, Atbarah, Sobat, and small tributaries). The erosion and transportation of silt only occurs during the Ethiopian rainy season in the summer, however, when rainfall is especially high on the Ethiopian Plateau; the rest of the year, the great rivers draining Ethiopia into the Nile (Sobat, Blue Nile, Tekeze, and Atbarah) have a weaker flow.

The Blue Nile contributes approximately 80-90% of the Nile River discharge. The flow of the Blue Nile varies considerably over its yearly cycle and is the main contribution to the large natural variation of the Nile flow. During the wet season the peak flow of the Blue Nile will often exceed 5,663 m^3/s (200,000 cu ft/s) in late August (a difference of a factor of 50). During the dry season the natural discharge of the Blue Nile can be as low as 113 m^3/s (4,000 cu ft/s), although upstream dams regulate the flow of the river.

Before the placement of dams on the river the yearly discharge varied by a factor of 15 at Aswan. Peak flows of over 8,212 m^3/s (290,000 cu ft/s) would occur during late August and early September and minimum flows of about 552 m^3/s (19,500 cu ft/s) would occur during late April and early May.

2.4.1.3 Yellow Nile

The Yellow Nile is a former tributary that connected the Ouaddai Highlands of eastern Chad to the Nile River Valley ca. 8000 to ca. 1000 BCE. Its remains are known as the Wadi Howar. The wadi passes through Gharb Darfur near the northern border with Chad and meets up with the Nile near the southern point of the Great Bend.

2.4.2 CLIMATE OF THE NILE BASIN

The north-south orientation of the River Nile on the African continent ensures extreme variability in climate between the extremes of the basin. The Nile Basin receives annually an average rainfall of about 650 mm, or a total of about 1,900 bcm per year. Long-term mean annual flow at Aswan is about 85 bcm per year, making the annual runoff coefficient of the basin around 4.5 percent. This figure is small and, for example, is just 10 percent of that of the Rhine. The reason for this is found largely in those parts of the basin belonging to the arid and hyper-arid zones that are large in surface area, and contribute only negligibly to basin runoff. With losses from major swamp areas as well, up to 30 percent of the rainfall the Nile Basin receives in an average year is lost before being used for any purpose.

The Nile Basin's climate range varies between extreme aridity in the north (Egypt and Sudan in particular) to tropical rainforest in Central and East Africa and parts of Ethiopia. On the Ethiopian massif, the key contributor of Nile flows, the kiremt rains produces the main June to November spate. This spectacular phenomenon is the combination of three mechanisms: the move of the Inter Tropical Convergence Zone (ITCZ) (summer monsoon) over the highlands, before retreating again, the tropical "upper easterlies," and local convergence in the Red Sea coastal region. The resulting rainfall is often intense, and causes rapid runoff leading to major soil loss.

Changes to the pattern and movement of the ITCZ cause major shifts in rainfall across Ethiopia and neighboring countries, particularly in association with the varied topography in the region. In some years the northeastern highlands of Ethiopia are particularly badly affected by low and unpredictable rainfall patterns, contributing to severe crop failure, and at times major famine.

One of the key factors affecting this rainfall variability is the El Nino-Southern Oscillation (ENSO), the occurrence of positive anomalies in sea surface temperatures over the Central and Eastern Pacific Ocean, which can have dramatic global impacts on regional weather systems. In the case of the Nile, studies have shown significant correlation between the ENSO index in May and Ethiopia's Kiremt rainfall. Whetton and Rutherford (1994, cited by Conway *et al.,* 1997) showed that Nile floods were

significantly lower than average in all El Nino years, but that the strong relationship develops only after 1830 and continues up to the 1980s.

These variable rainfall patterns in recent years have prompted major efforts at better forecasting in the basin. In particular, the successive years of low rainfall during the mid-1980s, with floods in some years barely half a "normal" year, led to a decline in the level of Lake Nasser/Nubia to such an extent that by the time a major rainfall event occurred in August 1988 the turbines were just short of being turned off.

This experience had the dual impact of illustrating how vulnerable Egypt could be to successive low flows in the absence of the High Dam, but also the importance of a more integrated basin-wide management regime for Egypt's water security. Successive low-flow years would require more than one massive structure to help achieve greater water security in the future; upstream augmentation of flows would also be important.

2.4.3 Climatic Change Impacts

Climate change is likely to occur. However, there is no agreement on the trend of this change, especially in terms of precipitation and evaporation (Singh, 1995; John *et. al.,* 1990; Rowntree, 1990). Hulme (1994) provides a good overview of the various factors that have an impact on future variability of temperature and precipitation. He points out that the White and the Blue Nile behave quite differently to climatic change scenarios. In recent decades a noticeable decrease of rainfall has been recorded at Ethiopia highlands, which almost provides about 80% of the Nile waters (Howell *et. al.,* 1996). Temperature, on the other hand is likely to increase and as a consequence overall evaporation is likely to increase as well. IPCC (2001) estimate's that the net change of runoff in the Nile Basin will be zero. Strzepek (2001) on the other hand, presents 9 different scenarios. Eight of them predict a lower Nile flow (at Aswan) until 2100; two even predict a reduction of over 75 percent.

2.5 ROLE OF THE NILE RIVER ON DEMOGRAPHY AND SOCIETY

Given the large number of countries, the reach of the Nile basin across Africa, as well as the range of agro-ecological zones, the human geography of the Nile Basin is extremely diverse. The ten states that comprise the basin cover some 300 million people, of which about 150 million live within the Nile Basin itself. The basin also boasts some of Africa's major cities, from Dar-es-Salaam, Kampala, and Nairobi to Addis Ababa, Khartoum, and Cairo. The latter alone accounts for probably in the region of 10 percent of the basin's total population.

The rich human geography is characterized by great ethnic, religious, and cultural diversity, cutting across national as well as basin boundaries with neighboring watersheds. This increases the complexity of the Nile's interrelationships with wider African social, political, and economic systems. For decision makers and managers this adds layer upon layer of complexity to the ways in which the Nile Basin Initiative will develop and implement projects based on the equitable sharing of benefits between states and the ethnic groups which they comprise and, in many cases, share. Even a single state can have great diversity: Ethiopia alone, for instance, has over fifty languages and is roughly split between Muslims and Christian populations, with significant animist minorities.

Equally as important as ethnicity is the range of livelihoods associated with the demographic characteristics of the basin. For many populations within the basin, subsistence production is the mainstay of their survival, whether through pastoral livestock production in the lowlands of Ethiopia or the Sudd region of southern Sudan, or highland agriculture in countries including Rwanda, Burundi, Eritrea, and Kenya. In many cases these livelihoods are linked to particular ethnic and/or religious identities, and changes wrought externally in policy decisions over resource management can therefore have important socioeconomic as well as political consequences. In the case of Ethiopia, balancing the needs of particular ethnic regions and wider national development goals has led to the creation of a federal system based on ethnic regions.

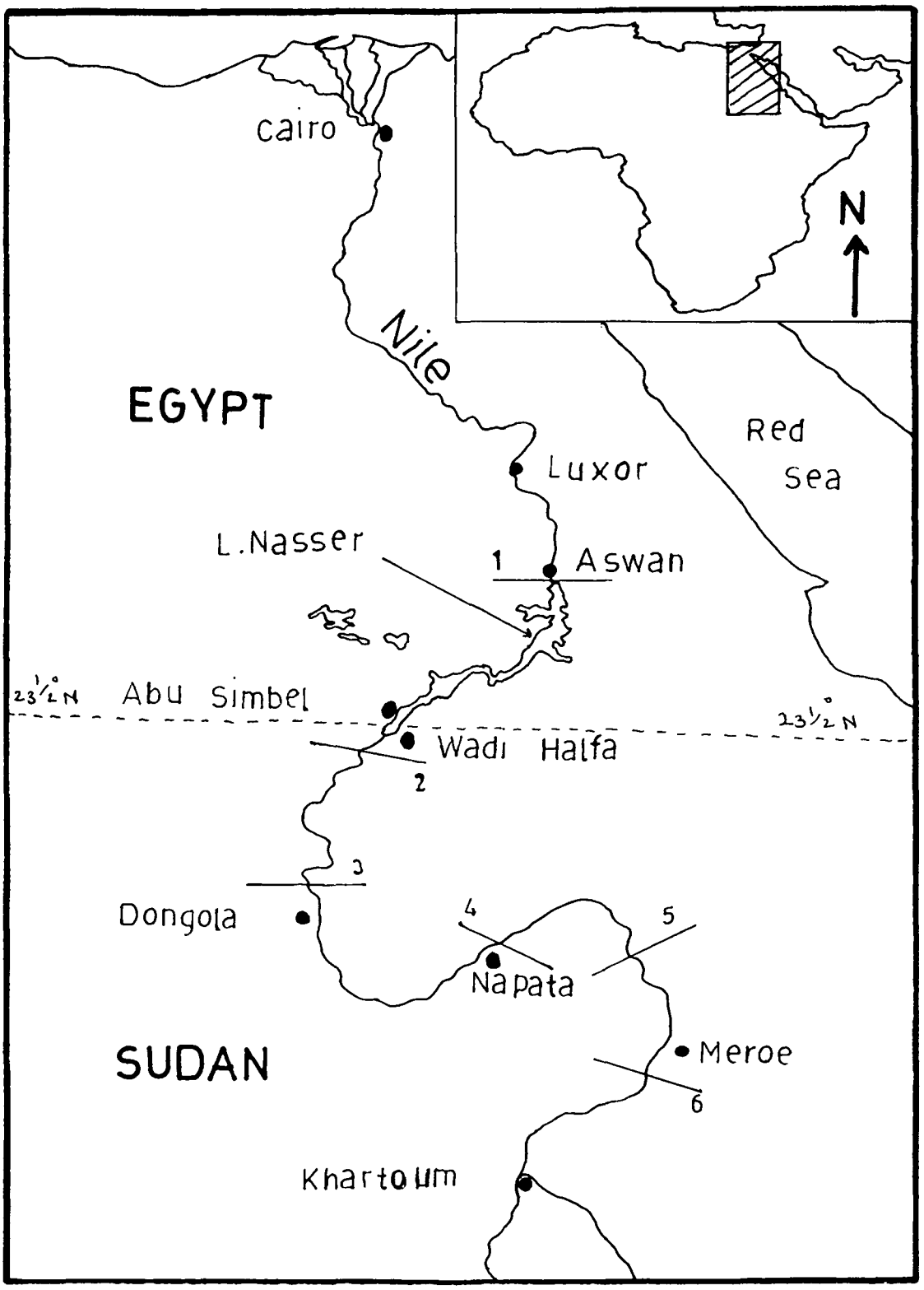
Given the human heterogeneity of the basin, the achievement of a socially stable, politically benign environment for river basin development will always be challenging. However, there are important ways in which the development of benefits from the river's waters can form a positive feedback loop, assisting national development processes in adding advantage to deprived regions, increasing successful national integration and economic development, and eventually broadening the elimination of poverty within the basin.

2.6 CATARACTS OF THE NILE RIVER

The cataracts of the Nile are shallow stretches of the river between Aswan and Khartoum where the water's surface is broken by numerous small boulders and stones protruding from the riverbed, as well as many small rocky islets. Aswan is also the marking point of Upper and Lower Egypt. In some places, these stretches are punctuated by whitewater and are perhaps well characterized as rapids, while at others the water flow is smoother, but still shallow. Counted upstream (from north to south) [Map: 2.3 (i) & (ii)], the First Cataract is in modern Egypt; the rest are in Sudan.

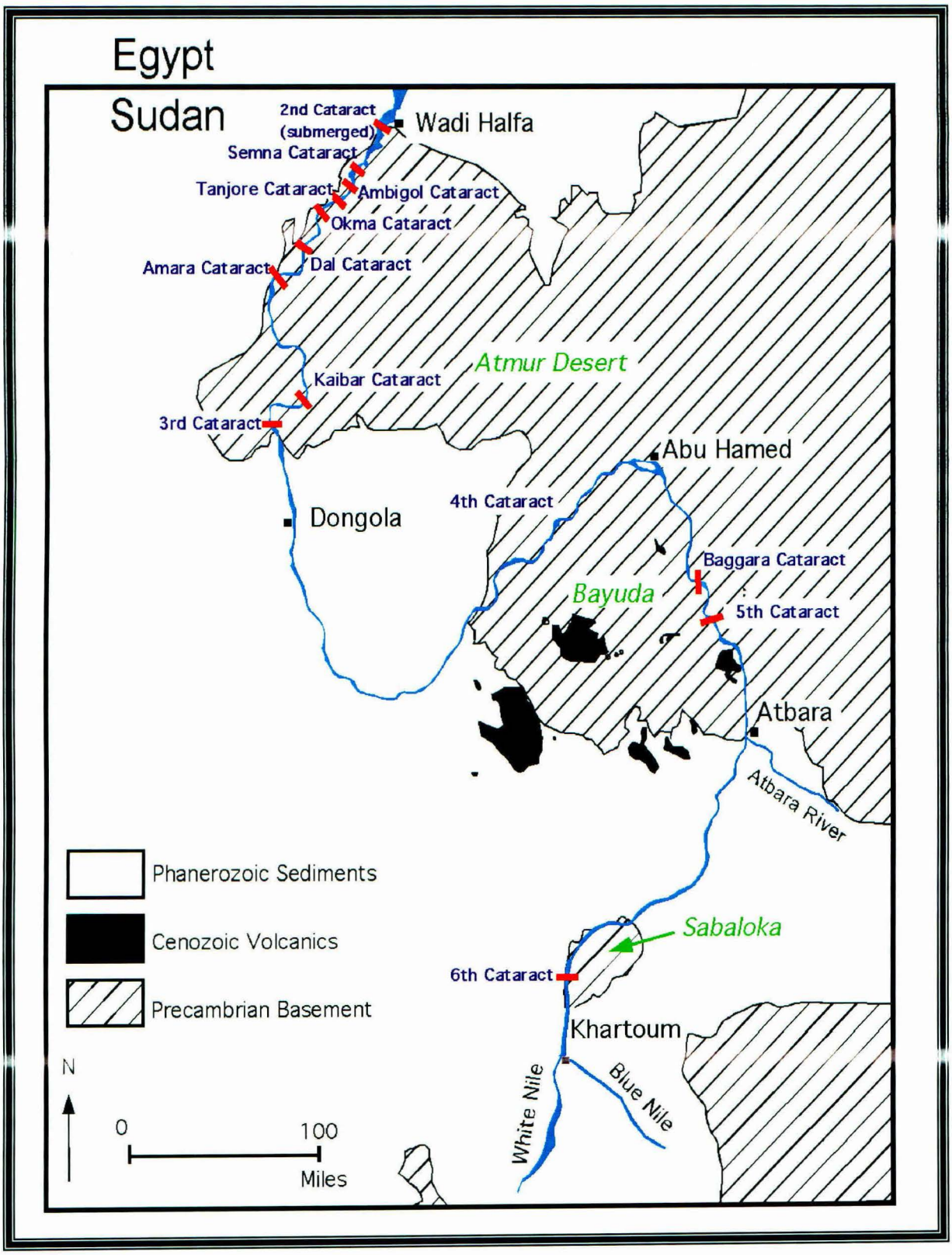
1. The First Cataract is in Aswan (24.07°N / 32.87°E).
2. The Second Cataract (or Great Cataract) was in Nubia and is now submerged in Lake Nasser (21.48°N / 30.97°E).
3. The Third Cataract is around Tombos/Hannek (19.76°N / 30.97°E).
4. The Fourth Cataract is in the Manasir Desert and is flooded by the Merowe Dam beginning in the third quarter of 2008 (18.91°N / 32.36°E).
5. The Fifth Cataract is near the confluence with the Atbara River (17.67°N / 33.97°E).
6. The Sixth Cataract is where the Nile cuts through the Sabaluka pluton near Bagrawiyah (16.88°N / 33.66°E).

Map :2-3(ii) Cataracts of the Nile



Source: http://www.utdallas.edu/geosciences/remsens/Nile/cataracts.html

Map: 2.3 (ii) The Cataracts of the Nile



Source: Jarret, H.R. Mcdonald and Evans. (1974).

The word cataract is, literally "down-rushing", meaning "waterfall" or "floodgate". It is a Greek word that means "waterfall"; however, none of the Nile's six primary cataracts would be accurately described as waterfalls, and given the broader definition, many minor cataracts should perhaps also be included in the count. Geologists indicate that the region of the northern Sudan is tectonically active and this activity has caused the river to take on "youthful" characteristics, Thurmond, A.K., *et al.* (2004). The Nubian Swell has diverted the river's course to the west, while keeping its depth shallow and causing the formation of the cataracts. Even as the riverbed is worn down by erosion, the land mass is lifted keeping parts of the riverbed exposed. These distinctive features of the river between Aswan and Khartoum have led to the stretch being often referred to as the Cataract Nile, while the downstream portion is occasionally referred to as the "Egyptian" Nile. The geological distinction between these two portions of the river is considerable. North of Aswan, the river bed is not rocky, but is instead composed of sediment, and far from being a shallow river, it is believed that the bedrock was previously eroded to be several thousand feet deep. This created a vast canyon that is now filled by the sediment, some of which originated from the Mediterranean.

2.6.1 Importance of the Cataracts and the Great Bend of the Nile River

Two things define the Nile for almost 2000 km from Khartoum to Aswan: the cataracts and the great bend. The cataracts are sections where the river tumbles over rocks and have long kept boats from going up and down the river from Equatorial Africa to Egypt.

There are six classical cataracts, but there are really many more. The cataracts are also significant because these define river segments where granites and other hard rocks come down to the edge of the Nile. The floodplain is narrow to non-existent here, and opportunities for agricultural development are correspondingly limited. These two reasons, navigation obstacles and restricted floodplain are the most important reasons

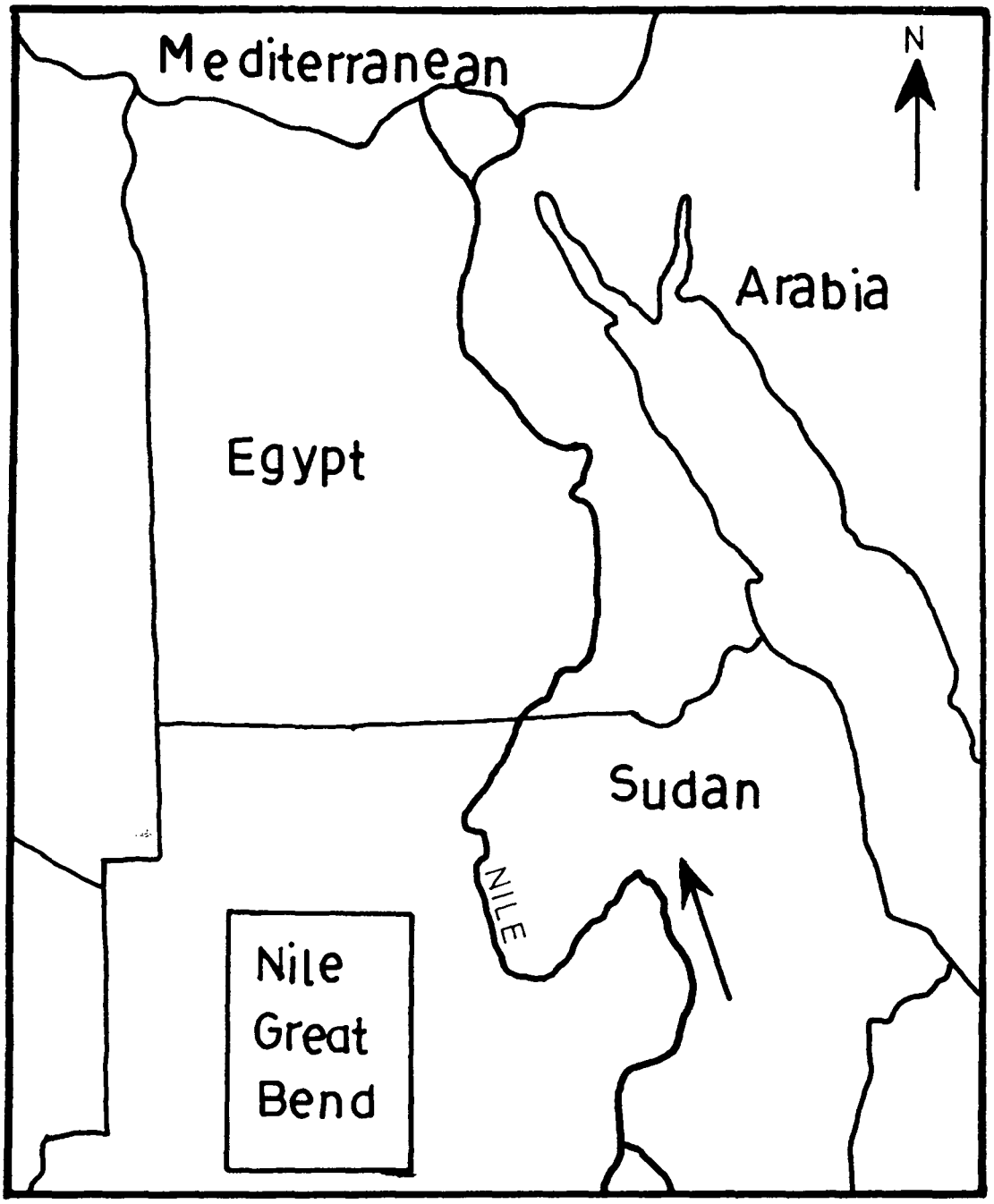
why this part of the Nile is thinly populated and why the historic border between Egypt in the north and Nubia or Sudan in the south.

The great bend is one of the most unexpected features of the Nile. For most of its course, the Nile flows inexorably north, but here in the heart of the Sahara; it turns southwest and flows away from the sea for 300 km before resuming its northward journey. This deflection of the river's course is due to tectonic uplift of the Nubian Swell over the past 100,000's of years. This uplift is also responsible for the cataracts, if not for recent uplift, these rocky rivers stretches would have been quickly reduced by the abrasive action of the sediment-laden Nile.

The cataracts hinder navigation of the Nile, and have done so for thousands of years. The ancients used the strong north winds to sail up the Nile in Egypt, but this could not carry them over the cataracts. Instead, the boat would have to be dragged up the cataract by teams of men, often with great difficulty.

The best description of cataracts comes from 'The River War', written in 1899 by Winston Churchill, then 25 years old. The book details the exploits of the British in 1896 through 1898 to return to the Sudan after they were chased out by the Sudanese people in 1885. The British tried to reconquer the Sudan by steaming in gunboats up the Nile, so they were very interested in how the water flowed through the cataracts. They knew that the only time that ships could move upstream through the cataracts was during the summer flood, and then only with great difficulty. Churchill describes the Second Cataract (now submerged beneath Lake Nasser) as being about 9 miles long and having a total descent of sixty feet. The river flowed over successive ledges of black granite. During the summer floods, the Nile flowed swiftly but with an unbroken surface, but the granite ledges were exposed when the annual flood abated. During this time, Churchill reported that the river tumbled violently from ledge to ledge, its entire surface for miles churned to white foam. There are several other small cataracts between the Second and the Third Cataracts (Churchill shows cataracts near Semna, Ambigol, Tanjore, Okma, and Dal) but none of these posed any problems to the British moving upstream.

Map:2.4 The Great Bend of the Nile



Source: http://www.utdallas.edu/geosciences/remsens/Nile/Great-Bend-Big-Bend.GIF

According to Churchill, the Third Cataract is "a formidable barrier." There is smooth water for 200 miles upstream from this in all seasons.

The Fourth Cataract lies in the Monassir Desert, and Churchill reported the following about this portion of the Nile: "Throughout the whole length of the course of the Nile there is no more miserable wilderness than the Monassir Desert. The stream of the river is broken and its channel obstructed by a great confusion of boulders, between and among which the water rushes in dangerous cataracts. The sandy waste approaches the very brim, and only a few palm-trees, or here and there a squalid mud hamlet, reveal the existence of life." The British gunboats El Teb and Tamai in 1897 attempted to go up the river at the Fourth Cataract, but in spite of being helped by 200 Egyptians and 300 tribesmen, the Tamai was swept downstream and almost capsized in the great rush of water. Four hundred more tribesmen were assembled to help the El Teb, which was capsized and carried off downstream.

The Fifth and Sixth Cataracts are regions of swift and rough water, but can be navigated all year round.

2.7 CONCLUSION

The Nile River is a very important in its physiography. Even though we have now many resources. Natural and artificial, we should still use these resources sparingly and carefully because without them, we do not have much as to depend on.

As the world's longest river, the Nile has long helped sustain the countries through which it traverses, and is considered to be the lifeline of Egypt. The Nile has a relatively low annual runoff, and is shared by ten diverse countries. Furthering the strain is the almost entire dependence upon the resource by the Eastern Nile riparian countries. The myriad of complex issues facing the basin countries requires innovative and comprehensive solutions, and these solutions must come soon.

CHAPTER 3

RESOURCES OF THE NILE RIVER

CHAPTER 3

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3.1 INTRODUCTION

Resources of the Nile has the capacity to unite the people and states that share a source of water, and to incite conflict among them as they compete for it. The conflict, reaching the point of "water wars", has become increasingly common in the media, but the contents of the Atlas show that treaties, not wars, are the custom. Since the dawn of hydropower and large-scale irrigation development in the twentieth century, however, the focus of negotiation and of treaty-making has shifted away from navigation and from boundary demarcation towards the use, development, protection and conservation of water resources. The issues requiring negotiation and agreement among states have grown more complex and intricate, but the practice of seeking a negotiated, agreed solution has remained. The "water law" which developed in response to past transboundary disputes, emerged from decisions of domestic and international courts or tribunals and from international agreements. At the international level, the principle of "reasonable and equitable utilisation" crystallized as a rule of customary international law derived, in part, from national and international judicial practice, and supported by treaty law.

3.2 CHARACTERISTICS OF WATER AS A RESORUCE

Water has unique characteristics and is crucial to every form of life and practically every human activity. It is important for agriculture, facilitates transport, disperses waste products, lubricates the wheels of industry, and often forms district or international borders (Powers, K. 2004). For this reason, it 'eludes institutional

classification "and requires extensive inter-sectoral coordination for proper holistic management (Wolf *et al;* 2003). This makes disputes or inefficiencies more likely.

Its key characteristic, from the point of view of management, is that it is a 'fugitive resource'. It is easily 'lost' due to evaporation or seepage into porous substances, and has to be contained. It flows as surface water, often crossing administrative including international boundaries, and it crosses such borders underground, in the form of large aquifers. Therefore any alteration of water sources, in terms of quality or quantity, will have ripple effects outside the immediate location of the changes. In the case of a river, "what happens at its source will reverberate all through its course until it reaches the ocean. Problems at the mouth may be unsolvable if you cannot control what happens at the source". In the case of underground reservoirs, pollution at one point can make the source unusable by anyone for decades, or longer. If a river or lake is shared by a number of riparian communities, one can easily abstract more than its allotted share from its own territory: it may even be able to do so undetected, if the downstream user lacks an effective monitoring capacity. Underground reservoirs may cross international borders, meaning that over-pumping can effect neighboring countries. Uneven geographical distribution of water means that many areas of the African continent with a high water demand due to agricultural and industrial development are water-scarce. South Africa, for example, accounts for 80% of Southern Africa's total water use, but only 10% of the water resources in the southern African region are found in that country. North Africa is another case-in-point. Libya, for example, by draining underground aquifers at unsustainable rates, withdraws uses four times more than its annual renewable water supply (World Bank, 1994).

It is also important to note that control of water opens doors to many potential land-uses. The location of water sources can influence pastoralists' choices of grazing areas, opening up new pasture areas and thus improving the animals' nutritional status. Because of the need for water resources in dry areas, water access rights are the key to control and utilization of arid and semi-arid areas, and can make African countries more food secure through irrigation technology. The systems of access to such water sources

may therefore be the most complex of all natural resource tenure systems in such an area. Interventions should be carefully located geographically and in terms of socio-cultural 'ownership'. Development of water sources can lead to many second-order conflicts not directly around the water itself, but related to the effects of water development. For example, in dryland areas of Tanzania, the population of villages provided with a new borehole can increase by a factor of three within a few years. This has obvious implications for land use.

Finally, it is clear that a key characteristic of water resources in Nile basin countries is their increasing 'scarcity' due to a variety of factors. In many ways, the Integrated Water Resources Management (IWRM) paradigm, which is dominant across the globe, is predicated upon the idea of scarcity, which has put emphasis on demand-management, and efficiency in both allocation and distribution.

However, even in areas of relative 'natural' water abundance, many people lack access to water. Indeed, the African countries where populations have the least access to water are not those with the least natural water availability, but generally those in the equatorial belt with higher levels of rainfall. It is clear therefore that amongst the primary causes of lack of water access, economic, institutional, political and social factors are just as significant as 'hard' technological factors, (McGranahan and Satterthwaite, 2004).

In addition, because of the importance of shared water resources and other regional links, water scarcity cannot be seen in a local or even national context, but rather as a regional issue. States, corporations, and other institutions have the power to manage water and transfer water from one basin to another. "Scarcity therefore is relative and mediated by power relationships, amongst other factors, within and between states", (Thompson, L. 2000).

3.3 ROLE OF THE NILE RIVER IN THE FOUNDING OF EGYPTIAN CIVILIZATION AS A RESOURCE

"Egypt is a gift of the Nile." (Greek historian Herodotus, circa. 486–425 BC).

Egyptian civilization has sustained itself utilizing water management and agriculture for some 5,000 years in the Nile River valley. The Egyptians practiced basin irrigation, a form of water management adapted to the natural rise and fall of the Nile River. Since around 3000 B.C., the Egyptians constructed earthen banks to form flood basins of various sizes that were regulated by sluices to redirect floodwater into the basin where it would sit until the soil was saturated, the water was then drained, and crops planted. This method of agriculture did not deplete the soil of nutrients or cause salinization problems experienced by modern agricultural methods. In 1869, the Suez Canal was opened linking the Mediterranean and the Red Sea, creating an international transportation route and linking the resources of Egypt to international trade.

The Nile, an unending source of sustenance, provided a crucial role in the development of Egyptian civilization. The Nile made the land surrounding it extremely fertile when it flooded or was inundated annually. The Egyptians were able to cultivate wheat and crops around the Nile, providing food for the general population. Also, the Nile's water attracted game such as water buffalo; and after the Persians introduced them in the 7^{th} century BC, camels. These animals could be killed for meat, or could be captured, tamed and used for ploughing or in the camels' case, traveling. Water was vital to both people and livestock. The Nile was also a convenient and efficient way of transportation for people and goods.

The structure of Egypt's society made it one of the most stable in history. In fact, it might easily have surpassed many modern societies. This stability was an immediate result of the Nile's fertility. The Nile also provided flax for trade. Wheat was also traded, a crucial crop in the Middle East where famine was very common. This trading system secured the diplomatic relationship Egypt had with other countries, and often contributed

to Egypt's economic stability. Also, the Nile provided the resources such as food or money, to quickly and efficiently raises an army for offensive or defensive roles.

The Greek historian, Herodotus, wrote that 'Egypt was the gift of the Nile', and in a sense that is correct. Without the waters of the Nile River for irrigation, Egyptian civilization would probably have been short-lived. The Nile provided the elements that make a vigorous civilization, and contributed much to its lasting three thousand years.

3.4 THE HYDROLOGIC RESOURCES OF THE NILE RIVER

Along the 6500 km of its course from source to mouth the Nile overcomes an elevation difference of around 2700 m. After entering the Sudd wetlands region in southern Sudan, at 2000 km, the remaining height difference is a mere 400 m. For the second main river within the watershed, the Blue Nile, a similarly sharp profile exists for the first 1000 km before it enters the Sudan plains. The main rivers within the Nile watershed are the Victoria Nile which later enters to the White Nile, the Blue Nile, originating in Ethiopia (Shown In Map: 2.2 Chapter -2), the major contributor to the main Nile flows and the Main Nile which is called as such after the confluence of the White Nile with the Blue Nile, in Khartoum.

Table: 3.1 Flow of the Nile River at Various Locations

Catchments	Outlet location	Annual flow ($10^9 m^3 a^{-1}$)
Nile	**Aswan**	**84.1**
Atbara	**Atbara**	**11.1**
Blue Nile	**Khartoum**	**48.3**
White Nile	**Khartoum**	**26.0**

Source: Mohamed, (2005).

The Nile's hydrology has preoccupied basin residents for thousands of years, and with good reason. A large portion of the basin flows is highly seasonal, and the overall flow range is susceptible to major inter-annual and decadal fluctuations. Since the end of

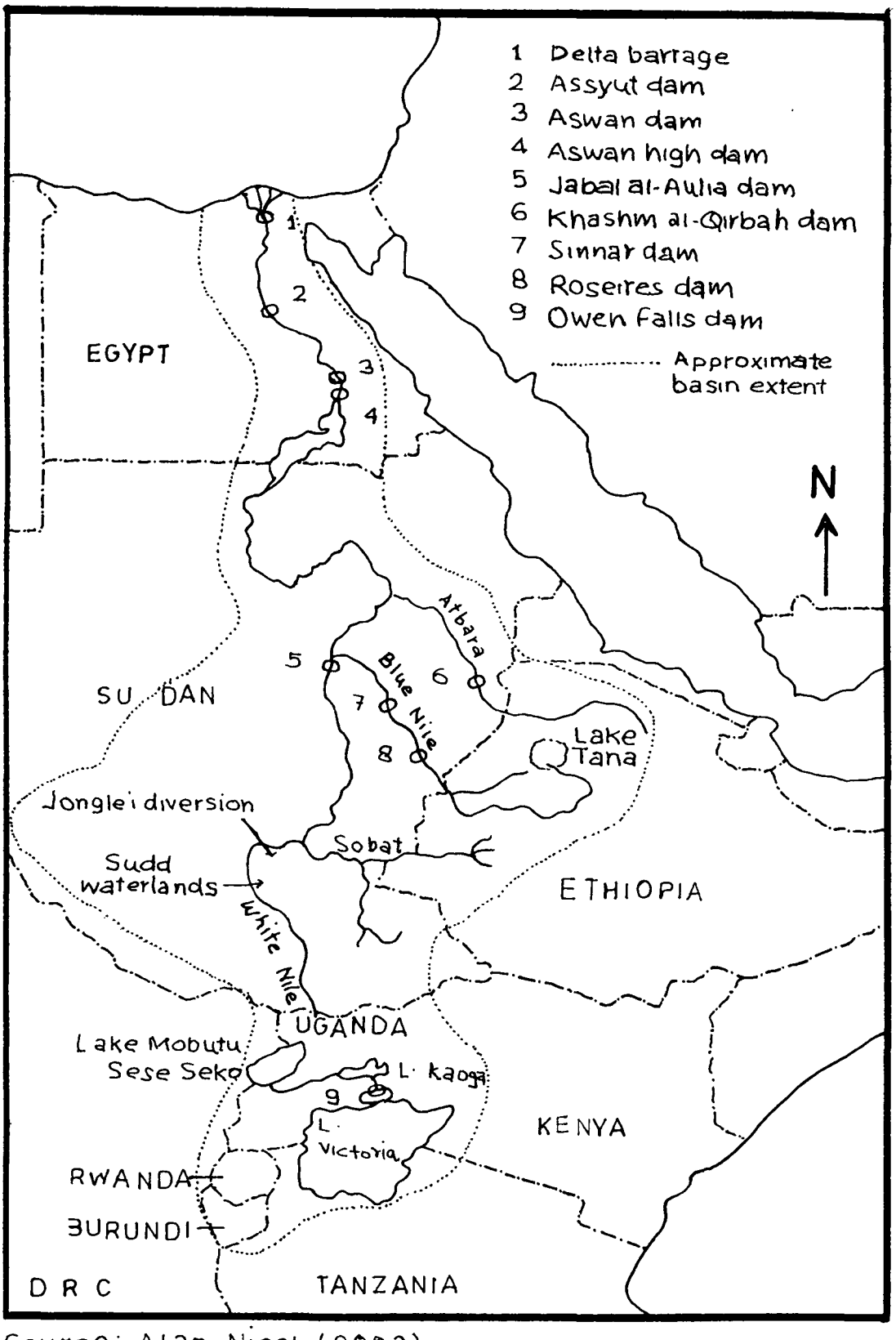
the nineteenth century and in particular following British control of a key part of the Nile Basin major hydrological investigations were undertaken to try to devise methods of controlling the river system in order to facilitate its exploitation. The flows of the Nile have been measured for thousands of years, and the origins and reasons for variations preoccupied many of the Nilotic societies. The Nilometers at Roda Island in Cairo and elsewhere along the river are testament to the huge task of trying to grapple with the fickle flows of the Nile.

That the flow could vary from year to year as well as seasonally has been recorded for many thousands of years and the awareness of Egypt's cycles of lean years followed by years of plenty was part of the way of life of people residing in the lower Nile valley before the filling of Lake Nasser/Nubia in the 1960s. (Sutcliffe and Lazenby, 1994).

The key hydrological characteristics of the river are its two major origins: in the highlands of Ethiopia and Eritrea, and in the Nile equatorial lakes region. The former provides the major flow of the Nile north of Khartoum, the Blue Nile and the latter the far lower and slower flows of the White Nile. While the catchment of the Blue Nile is small relative to that of the White Nile, high rainfall from June to September means that it is by far the greatest contributor to main Nile flows, some 60 percent of the total. The White Nile, by contrast, is derived from rainfall in the equatorial lakes region around Lake Victoria, at 69,500 km^2 the world's second largest lake, but provides a mere 30 percent of flows as measured at Aswan.

The second major feature of the hydrological system is the huge seasonality of the Blue Nile's flows, concentrated from July to October in a spectacular flood. From the point of view of basin development the main interest in the hydrology of the Blue Nile within Ethiopia is for flood forecasting for reservoir operation and to give warning of possible inundation in Khartoum and in the agricultural areas downstream, (Sutcliffe and Lazenby, 1994). This massive spate is roughly equivalent to seventy times its low season discharge, and brings with it huge quantities of silt. These have literally provided the building blocks of downstream Nilotic societies for millennia.

Map:3.1 Major Supply Structures and Approximate Extent of the Nile River Basin



Source: Alan Nicol, (2003).

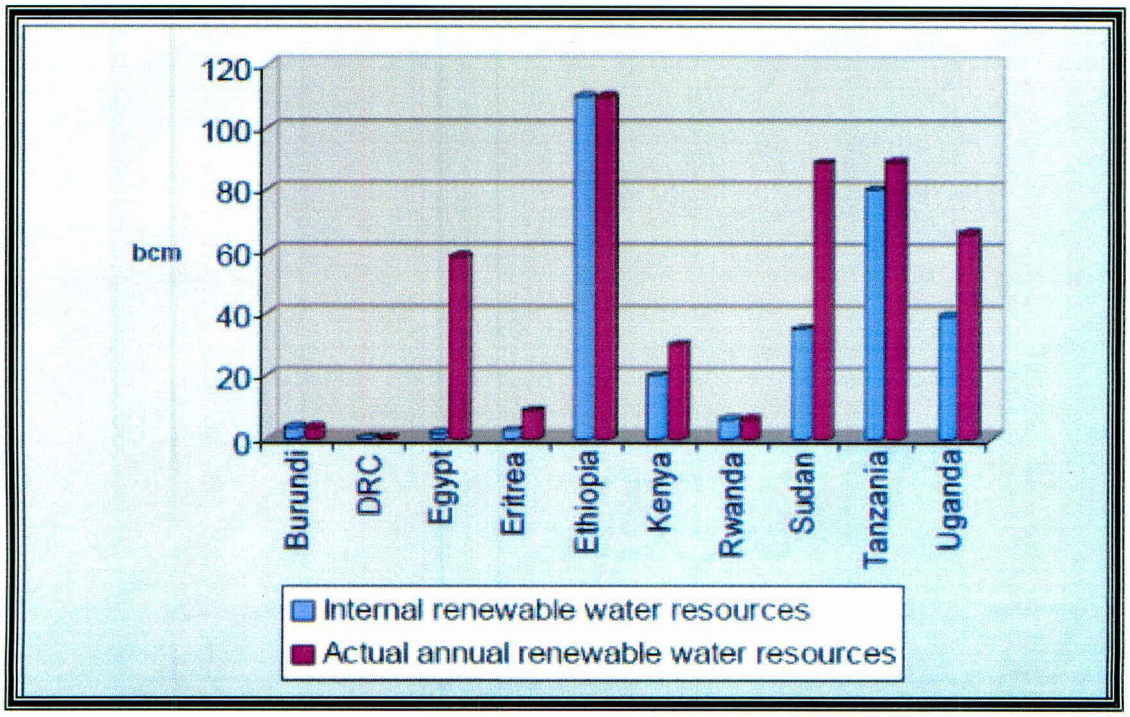
The difference in the two major river regimes is marked: while the White Nile's average monthly maximum (October) and minimum (February) discharges vary only slightly from 1.4 billion cubic meter (bcm) to 1.2 bcm, the Blue Nile and associated rivers Atbara and the Sobat river vary greatly from a high of 15.6 bcm in August to just 0.3 bcm in April.

Over the years, fluctuations in the flow of the Blue Nile have contributed changes in mean annual discharge of plus or minus 20 percent, with very severe consequences for water management in Egypt and Sudan (Conway and Hulme, 1996). The mitigation of major inter-annual variation was the task of the "Century Storage" scheme developed as a concept during the first half of the twentieth century. The idea was to capture a whole annual flood in order to fully control and regulate the river's flow. This would enable states to maximize resource use efficiency. In part the idea was realized in Aswan High Dam, constructed in the late 1950s and early 1960s, but with some major human and environmental costs.

Another major feature of the river system is caused by virtue of the river's situation in hot, arid areas where evaporation losses are high. By far the most significant losses are in the Sudd in southern Sudan. Between entry and exit the river loses up to 50 percent of its original flow. This loss to the system for Egypt and Sudan has meant significant shortfalls in summer months, when flows from the Blue Nile reach their lowest point. Therefore, enabling greater White Nile flows during this period has important economic consequences, even though it is only a relatively small proportion of annual flows. Reducing this loss was at the heart of attempts to speed up the flow through the Sudd via the Jonglei Canal Scheme.

The figure 3.1, illustrates the variance between "export" and "import" of water. The major production of water by Ethiopia, but low capture of the resources, is contrasted with Egypt's low internal renewable resources.

Figure: 3.1 Renewable Water Resources of the Nile Riparians



Source: Alan Nicol, (2003).

This marks the nature of dependence on water from upstream catchment to downstream states in the Nile Basin. It goes a long way towards illustrating the reason the Egyptian claim on historic or acquired rights to the waters became its main stated position on the Nile waters for so long.

Table: 3.2 Selected Hydrological Features of Some of the World's Rivers

River	Length (km)	Length Drainage Area (10^3 km^2)	Annual Discharge (10^9 m^3)	Runoff (per km^2 10^3m^3 a^{-1})
Amazon	6700	7050	5518	78.3
Congo	4700	3820	1248	32.7
Mekong	4200	795	470	59.1
Niger	4100	2274	177	7.8
Nile	6850	3000	82.7	2.8
Mississippi	3778	3202	562	17.6

Source: UNEP (2000), data on Mississippi: IUCN *et.al,* (2003).

Despite its size the average annual runoff is comparably low, at Dongola (northern Sudan) it is only 2622 m^3s^{-1} (FAO 1997). The river Rhine, for instance, has a similar discharge but its watershed is only 6.2% of the Nile's, the Mississippi's watershed covers a similar area but has a discharge of 17,820 m^3s^{-1}.

3.4.1 Precipitation

While the central and northern parts of the basin receive no significant precipitation, there are two main areas, which contribute almost 100 percent of the water in the Nile flowing through Aswan: the Ethiopian Plateau and the Equatorial Lake Plateau. In the Ethiopian plain annual rainfall ranges from 1400-1750 mm, in the Equatorial lakes Plateau average annual rainfall ranges from 1200-1400 mm, while from the river mouth in Egypt to the middle of Sudan it ranges from 0 to 300 mm. The Table 3.3 show's the average precipitation in the Nile basin countries.

Table: 3.3 Average precipitations within the Nile River Basin per country

Country	mm/annum
Burundi	**1 110**
Rwanda	**1 105**
Tanzania	**1 015**
Kenya	**1 260**
Zaire	**1 245**
Uganda	**1 140**
Ethiopia	**1 125**
Eritrea	**520**
Sudan	**500**
Egypt	**15**
Nile Basin (average)	**615**

Source: FAO (1997).

The average rainfall over the basin is 615 $mm.a^{-1}$, adding up to around 1845 km^3 a^{-1}. The Runoff at Dongola, the last discharge station before the Nile enters Lake Nasser is around 83 km^3 a^{-1}. This means that the total runoff coefficient for the basin is 0.045. This is quite low compared to other basins (Rhine: 0.41) or to the global average of 0.35 (Dai and Tenberth, 2002).

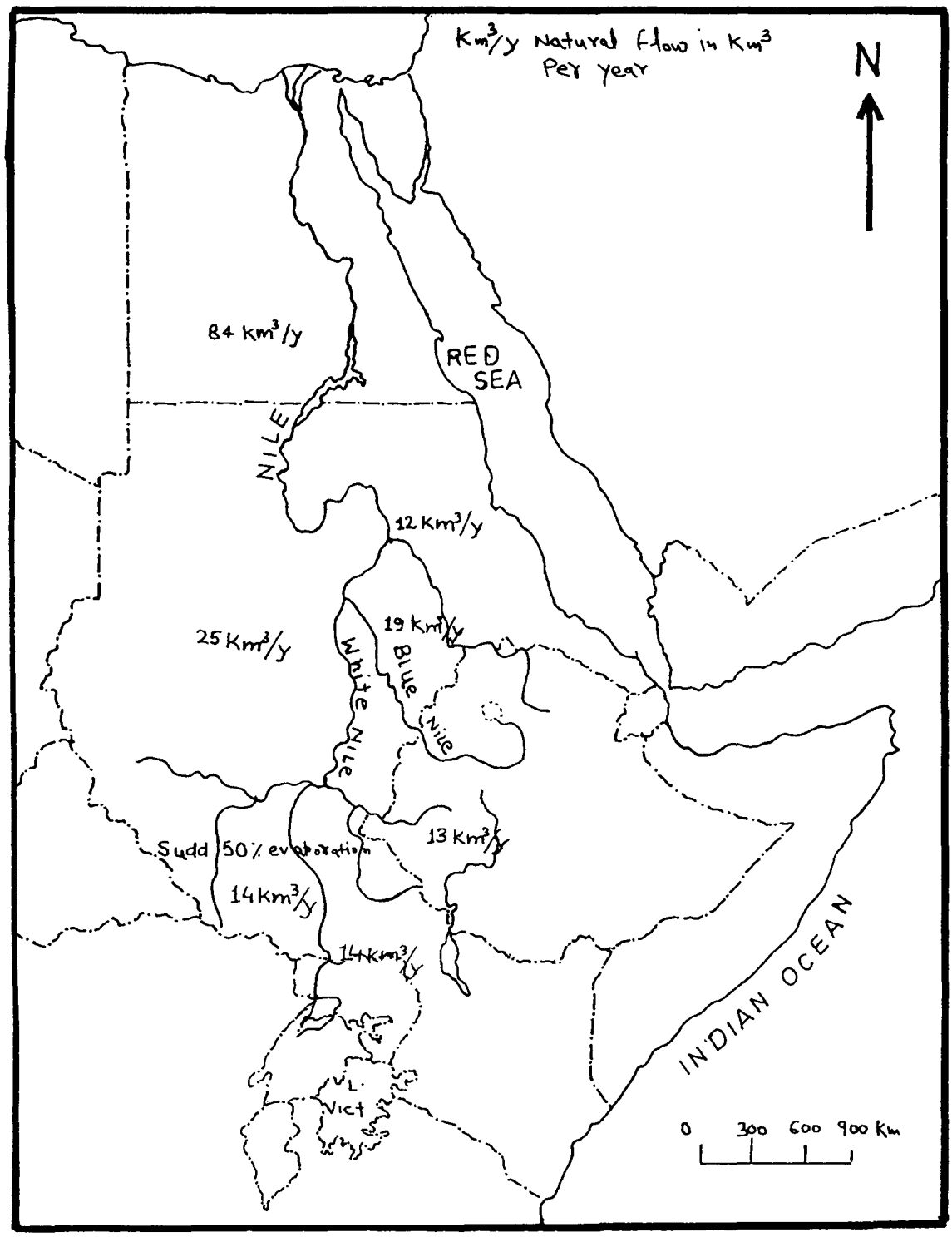
The precipitation amount varies greatly during the year and inter-annually. The records between 1830 and 1980 show that precipitation in the upper Nile basin was significantly lower during El Nino years and higher in La Nina years, (Whetton and Rutherford, 1994).

The Nile makes its way through the Sahara. The flow rate of the Albert Nile at Mongalla is almost constant throughout the year and averages 1,048 m^3/s (37,000 cu ft/s). More than half of the Nile's water is lost in this swamp to evaporation and transpiration. The average flow rate in the Bahr El Jebel at the tails of the swamps is about 510 m^3/s (18,000 cu ft/s). From here it soon meets with the Sobat.

The Bahr al Ghazal and the Sobat River are the two most important tributaries of the White Nile in terms of drainage area and discharge. The Bahr al Ghazal's drainage basin is the largest of any of the Nile's sub-basins, measuring 520,000 square kilometres (200,000 sq mi) in size, but it contributes a relatively small amount of water, about 2 m^3/s (71 cu ft/s) annually, due to tremendous volumes of water being lost in the Sudd wetlands. The Sobat River, which joins the Nile a short distance below Lake No, drains about half as much land, 225,000 km^2 (86,900 sq mi), but contributes 412 cubic meter per second (14,500 cu ft/s) annually to the Nile. When in flood the Sobat River carries a large amount of sediment, adding greatly to the White Nile's colour.

The average flow of the White Nile at Malakal, just below the Sobat River, is 924 m^3/s (32,600 cu ft/s), the peak flow is approximately 1,218 m^3/s (43,000 cu ft/s) in

Map:3.2 Water Flow in the Nile Basin



Source: Mason, (2005).

early March and minimum flow is about 609 m^3/s (21,500 cu ft/s) in late August. The fluctuation there is due the substantial variation in the flow of the Sobat which has a minimum flow of about 99 m^3/s (3,500 cu ft/s) in August and a peak flow of over 680 m^3/s (24,000 cu ft/s) in early March.

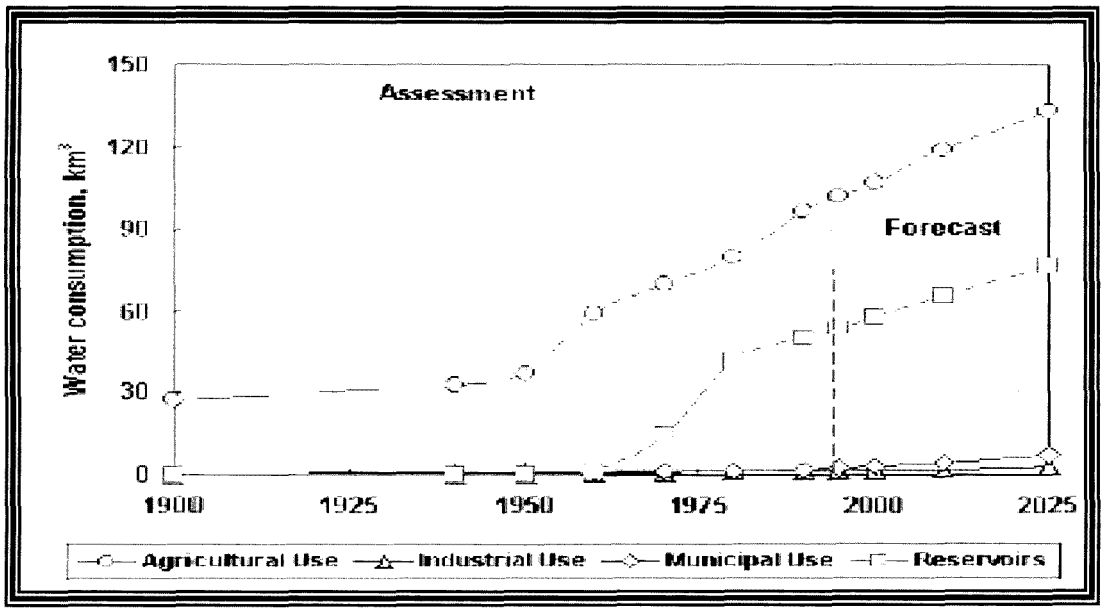
From here the White Nile flows to Khartoum where it merges with the Blue Nile to form the Nile River. Further downstream the Atbara River, the last significant Nile tributary, merges with the Nile. During the dry season (January to June) the White Nile contributes between 70% and 90% of the total discharge from the Nile. During this period of time the natural discharge of the Blue Nile can be as low as 113 m^3/s (4,000 cu ft/s), although upstream dams regulate the flow of the river. During the dry period, there will typically be no flow from the Atbara River.

The Blue Nile contributes approximately 80-90 percent of the Nile River discharge. The flow of the Blue Nile varies considerably over its yearly cycle and is the main contribution to the large natural variation of the Nile flow. During the wet season the peak flow of the Blue Nile will often exceed 5,663 m^3/s (200,000 cu ft/s) in latter August (variation by a factor of 50). Before the placement of dams on the river the yearly discharge varied by a factor of 15 at Aswan. Peak flows of over 8,212 m^3/s (290,000 cu ft/s) would occur during the later portions of August and early September and minimum flows of about 552 m^3/s (19,500 cu ft/s) would occur during later April and early May. The Nile basin is complex, and because of this, the discharge at any given point along the mainstem depends on many factors including weather, diversions, evaporation/evapotranspiration, and groundwater flow.

3.4.2 Water Demands

While water demands will increase on all continents, this is particularly the case for Africa (fig: 3.2). Population will probably increase extraordinarily in the Nile Basin countries within the next decades leading with no doubt to higher demands in all water related sectors. The predicted population growth in Egypt, Sudan and Ethiopia; illustrates that the three countries together will probably reach over 400 million by the year 2050. This may question how the limited water resources within the basin would be allocated to the maximum benefit for all riparian people.

Figure: 3.2 Predicted Water Demands for Africa



Source: SHI/UNESCO (2000)

Irrigation potential is still not fully utilized and the actual limiting factor in feeding the inhabitants of the Nile Basin seems to be water, not arable land. In this regard an interesting question will be how the vast irrigation potential (Tab: 3.4) will be used to its optimum within the next decades. On the other hand, as mentioned before, a large part of the precipitation falling on the Nile watershed is evaporated before reaching surface waters. This implies that there is a high potential for optimizing rainfall use through, for example, the various water harvesting techniques. Water demands for municipal and

Table: 3.4 Irrigation potential versus current irrigated areas in the Nile River Basin

Country	Irrigation Potential (Ha)	Area Already Under Irrigation (Ha)
Burundi	**80.000**	**0**
Rwanda	**150.000**	**2.000**
Tanzania	**30.000**	**10.000**
Kenya	**180.000**	**6.000**
Congo	**10.000**	**0**
Uganda	**202.000**	**9.120**
Ethiopia	**2,220.000**	**23.160**
Eritrea	**150.000**	**15.124**
Sudan	**2,750.000**	**1,935.200**
Egypt	**4,420.000**	**3,078.000**
Sum of countries	**10,192.000**	**5,078.604**

Source: FAO (1997).

Table: 3.5 Hydropower potential and current production in the Nile River Basin.

Country	Hydropower Production (Mw)	Hydropower Potential (Mw)
Burundi	**41**	**161**
Rwanda	**34**	**155**
DR Congo	**23**	**2,600**
Tanzania	**337**	**4,837**
Uganda	**180**	**5,000**
Kenya	**2**	**357**
Sudan	**238**	**1,618**
Ethiopia	**410**	**30,000**
Eritrea	**-**	**-**
Egypt	**2,845**	**2,983**
Sum	**4110**	**47,711**

Source: Mason (2001).

industrial purposes will play a minor role, compared with irrigations demands; nevertheless, they will also compete with irrigation demands. In general, the potential to increase efficiency in agricultural water use is still high and water savings in irrigation could easily compensate the growing demand for municipal and industrial water uses. Hydropower production is another important, though non-consumptive, water use. Especially Ethiopia has a large potential, which is not used so far (Tab: 3.5).

Hydropower production has an excellent potential for cooperation with mutual benefits for the riparian countries. The utilization of Hydropower could be combined with the demand to further store Nile floods and to control siltation processes.

3.4.3 SHARING OF THE NILE WATER

As described above, the Nile offers a limited amount of water for a total of around 280 million people living within the basin today; and estimated at 591 million by the year 2025 (CP Nile, 2006). In combination with the high spatial and temporal variability of water availability and the multiple water demands including domestic water supply, industry, irrigation, hydropower and nature, the demand for cooperation and coordination within the riparian countries is a prominent task. Under the 1959 agreement between Sudan and Egypt the long term average flow of 84 km^3a^{-1} was assumed and of that 55.5 $km^3\ a^{-1}$ were guaranteed to Egypt and 18.5 $km^3\ a^{-1}$ to Sudan (10 km^3a^{-1} were reserved for evaporation losses in the then planned Lake Nasser). With this treaty and the construction of the High Aswan dam, Egypt secured its share of the Nile and made itself independent from options to store the Nile flood outside of its territory as was proposed in earlier plans (namely the "Century Storage Scheme-CSS" at the beginning of the 20th century; (Waterbury, 2002). The post Cold-war era led to a new environment favouring international cooperation in the Nile basin.

In the 1990s a number of activities started to foster cooperation in the Nile Basin. In 1992 the Technical Co-operation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE) was established by

Egypt, Sudan, Uganda, Rwanda, Zaire, and Tanzania with the other four riparian countries having observer status. In addition a series of international conferences was organized with the participation of the representatives of the relevant ministries of each country. The first took place in 1993 in Aswan. These activities later resulted in the formation of the Nile Basin Initiative (NBI). The NBI is a transitional arrangement until a permanent framework will be in place (World Bank 2006). At the moment the NBI consist of the Council of Ministers (Nile-COM), the technical advisory committees (Nile-TAC) and a secretariat (Nile-SEC). The role of the Nile-SEC is to support and coordinate the Shared Vision Program, supporting basin-wide projects and activities and the NBI's two investment programs: the Eastern Nile Subsidiary Action Program, which is based in Addis Ababa, Ethiopia, and the Nile Equatorial Lakes Subsidiary Action Program, which is based in Kigali, Rwanda, (NBI 2006).

It remains to be seen if the Nile Basin Initiative can address the challenges related to an equitable sharing of the Nile water including allocation among its riparian states and sharing the benefits of water related economic activities especially of irrigation and hydropower production.

3.5 THE NILE RIVER BASIN AND SOCIO-ECONOMIC DEVELOPMENT

The hydrological and geographical variability of the Nile Basin are matched by socioeconomic differences between countries. The range of income levels and the structural differences between national economies spans Egypt a middle-income, industrializing nation at one end of the scale, to many upstream states that in an economic sense are a fraction of the size of Egypt and are weighed down by debt, static or declining economies, and huge externalities caused, amongst other things, by internal conflict and the impact of diseases.

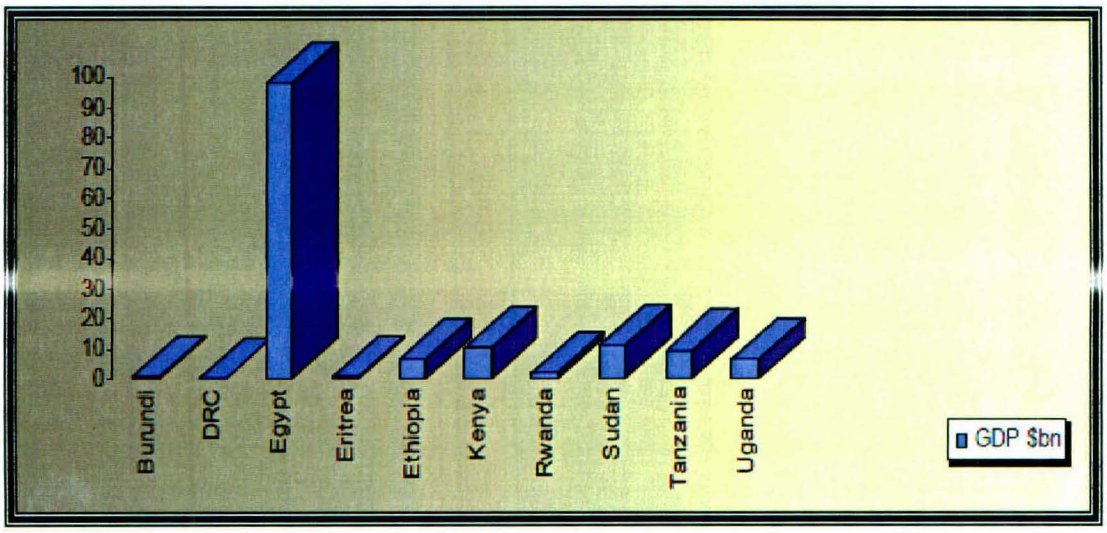
The significance of agriculture in the different economies also varies widely as a proportion of GDP, which is of key significance in terms of water usage. Workers engaged in agriculture constitute 80 to 90 percent of the total workforce in the Equatorial Plateau and East African countries. This drops to between 70 and 75 percent in Congo and the Sudan and to 42 percent in Egypt. Similarly, the proportion of hydropower produced by the various states is related in many cases to the seasonality of flows, the capacity to capture the resource, and the relationship of water storage to irrigation potential. Internal food production as opposed to import dependency varies in both type (staple foods) and quantity (proportion purchased externally and/or provided in the form of food aid).

The key issue arising out of this diversity of contexts, which is of relevance to turning cooperative frameworks into long-term development processes, is that the solutions to benefit sharing have to begin with the actual needs of people. At the most basic level the ten states vary hugely in population terms, from over 60 million in each of Ethiopia and Egypt, to under 10 million in Rwanda, Burundi, and Eritrea. Half of the states have populations of over 20 million, ensuring that the development needs vary hugely in qualitative and quantitative terms.

There are also great variations in livestock populations and in area and population density, from just 26,300 km^2 in Burundi to Sudan, which at 2,505,800 km^2, is the largest state (by area) in Africa. There are implications for the integration of remoter areas of the basin within new development processes.

At a macro level, Egypt's economy dwarfs all the other economies (Figure 3.3). GNI per head ranges widely, from only US$100 in Ethiopia to more than fourteen times that amount, US$1,490 in Egypt. In addition, the proportion of the amount that accrues to agriculture in Ethiopia is substantially more than in Egypt.

Figure: 3.3 Gross National Income in the Nile River Basin Countries (in percentage)



Source: Alan, Nicol. (2003).

The concept of "benefit sharing" mentioned earlier neatly encapsulates one key issue in any basin-wide cooperative process. That is the creation of more equitable development within the basin, and the flattening of charts such as the Figure above. Clearly linked to this issue is the need to turn the Nile's development into economic growth and stability in the nine other major basin states. Yet, within this hugely diverse social and economic environment, inhabited by economies with few major linkages between one another and with massive divergence in financial strength, economic structure, and growth trajectories, building an equitable basis for benefit sharing will be difficult. One starting point may well be a clearer focus on addressing poverty, defined in human development terms.

These disparities in poverty reduction capability in the basin, and the difference in scope and extent of poverty, ensure that benefit sharing needs to have a basic poverty focus, even to the extent that cross-subsidization of poverty reduction approaches might take place between states as part of the benefit-sharing process.

3.5.1 Water and Food Security

Water scarcity has attracted the attention not only of the Nile riparian states, but also of the international community, and is considered one of the major environmental issues of the twenty-first century.

Sixty per cent of the African continent is covered by transboundary river basins, and about 300 million people, a third of the continent's population, live with water scarcity. Six of the world's ten least developed countries are situated in the Nile Basin and it is projected that 50 per cent of African countries will suffer from water stress by 2025.

Unless basin-wide water development planning is considered a viable solution to conflict resolution and poverty reduction, such increasing water scarcity is likely to generate more regional conflicts in the Nile Basin. In addition, it is imperative to shift from reliance on emergency food aid to long-term environmentally and socially sustainable development, including irrigation and watershed management.

The upper riparian states have not built major dams or water projects on the Nile, but population growth and the demands of modern economies are forcing Ethiopia and other states to consider developing the river. Although their hopes for economic and agricultural development can be seen as a threat by downstream states

3.6 ECONOMIC ACTIVITIES IN THE NILE RIVER BASIN

Irrigation along much of the river supports the growth of agricultural products such as cotton, wheat, sorghum, dates, citrus fruits, sugarcane, and various legumes. Local communities fish its waters. Ferries and barges navigate between Aswan and Qina in Egypt, between the third and fourth cataracts in northern Sudan, from Juba to Kusti in southern Sudan, and on Lakes Nasser and Victoria. Principal river ports are Luxor and Aswan in Egypt and Wadi Halfa', Dunqulah, Kuraymah, Kusti, Malakal and Juba in

Sudan. Tourism is important around ancient Egyptian sites near the river, such as Al Karnak and the pyramids at Giza.

To raise water levels for irrigation in the late 19th century, several dams were built across the Egyptian Nile, the most important being at Qina, Asyut, and north of Cairo. The first dam on the Nile, the Aswan Dam, was built in 1902 and heightened in 1936. The Sennar Dam was built across the Blue Nile south of Khartoum following World War I (1914-1918) to provide irrigation water for Sudanese cotton plantations. Hydroelectric dams were constructed at Jabal al Awliya' on the White Nile (1937), Owen Falls in Uganda (1954), and Roseires on the Blue Nile (1962). The Aswan High Dam, completed in 1970, impounds one of the world's largest reservoirs, Lake Nasser. Annual summer flooding of the Nile once deposited rich sediment along its banks, creating fertile farmland. However, the dams now control the flooding, drastically reducing sedimentation and fertility. The dams' environmental impact has been profound, as stretches of the river above the dams have become clogged with silt, and decreased flooding has led to increased erosion and greater salt content in the soil and water of the delta. Local communities and ancient sites in Egypt and Sudan were either submerged or relocated because of the dams.

3.6.1 Navigation and Transportation on the Nile River

"He who rides the sea of the Nile must have sails woven of patience." (William G. Golding. English Novelist and Poet. Nobel Prize in Literature in 1983. 1911-1993).

Navigation and transportation on the Nile River is very important activity. Steamers on the Nile River serve as the only means of transportation for goods and people during the flood season in parts of The Sudan. Between May and November road transportation is not possible in this region. Many of the towns are located on or near the riverbanks throughout Egypt and the Sudan. In The Sudan alone, 2,400 miles are served by steamer service along the Nile and its tributaries. Portions of the Blue Nile are navigable only when the river's water level is high. Other sections of the Nile are served by the steamers on a seasonal basis.

In The Sudan the river is only navigable in three portions due to the cataracts that occur north of Khartoum. The first navigable area is from Egypt's border to the southern end of Lake Nasser. The second portion is between the third and fourth cataract and the third goes from Khartoum south to Juba. The third navigable section is the most important. As the Nile continues through Egypt, its waters are utilized by shallow-draft steamers and sailing vessels as far as Aswan. Smaller boats are found throughout the remainder of the Nile and the delta waterways as they lead to the Mediterranean Sea.

3.6.2 Fishing in the Nile River

Fishing accelerated over the 20th century; by the 1950s and 1960s, there was alarming evidence that most large species were overexploited (Graham 1929, Ogutu-Ohwayo 1990). In 1957, Oreochromis esculentus dominated the fish catch at the Lake Victoria Fisheries Service recording stations in Kenya (46.7% of the catch by number) and in Uganda (52.5% of the catch; it is a highly palatable suspension and suspension-deposit feeder that masses in open waters just offshore. Oreochromis variabilis, a more littoral species that is also endemic to the region, was abundant at the stations in Kenya (14.9%) and Uganda (20.2%) as well. In Tanzania, the anadromous carp-like fish Labeo victorianus, the large catfish Bagrus docmak, and O. esculentus dominated the catch.

However, by the 1970s, catches by mass of several species, including O. esculentus, O. variabilis, Labeo victorianus, B. docmak, and Mormyrus kannume (a large elephant-nose fish that feeds on insect larvae on muddy bottoms), had fallen dramatically (Kudhongania and Cordone 1974, Goudswaard *et al.* 2002a). Catches of the African lungfish Protopterus aethiopicus also showed local declines; (Kudhongania and Cordone 1974, Goudswaard *et al.* 2002b). By the late 1960s, haplochromines constituted an important component of the Tanzanian fishery; however, even there, intensive trawl fishing reduced local stocks (Witte *et al.* 1992b). In Kenya, haplochromines were also an important component of the fishery in the mid- to late 1970s, while in Uganda B. docmak was the most heavily harvested species during this period. In addition to fisheries within

the main lake, fisheries in the rivers for high-value species, such as Labeo victorianus, resulted in the fishes' near-disappearance in the 1960s (Cadwalladr 1965).

The changes in the Lake Victoria fish stocks between 1950 and 1980 conform to the "fishing-down" model. In Kenya and Tanzania, the fishery was characterized by a drift to what were then the smallest species: the haplochromine cichlids and Rastrineobola argentea. In Uganda, the fishing-down process was also evident; the sequence of change for key taxa. The decline in the landings of tilapiines (representing primarily native O. esculentus and O. variabilis stock) in the late 1960s coincided with increased fishing pressure and catch of newly preferred taxa, including the two large catfishes B. docmak and Clarias gariepinus, the African lungfish P. aethiopicus, and haplochromine cichlids. This was followed by a major fishing-down sequence in late 1960s (Tanzania) and 1970s (Uganda) that was characterized by a dramatic decline in tilapia, sharply followed by a decline in the large catfishes (Bagrus, Clarias) and lungfish and an increase in smaller taxa, including haplochromines, characids, and synodontid catfishes.

The fishing-down sequence in Tanzanian and Ugandan waters was initially not based on size; rather, it represented a shift to other preferred large species (e.g., the large catfishes and lungfish). Nonetheless, it demonstrates a general shift in fishing pressure to sequentially less-preferred stocks. The fishing-down sequence also correlates in a general way with characteristics of the species' life history. For example, the larger catfishes, Bagrus and Clarias, have a lower reproductive load, a lower growth coefficient (0.22), and a higher age at maturity (3.6 and 6.5 years, respectively) than the synodontid catfishes (reproductive load 0.58) and haplochromine cichlids (reproductive load about 0.62, growth coefficient about 1, age at maturity 0.5 to 1 year; (Froese and Pauly 2000, Wanink and Witte 2000a). The close resemblance of the sequence of events resulting from fishing down in Tanzania and in Uganda, despite a 10-year difference between them, is remarkable.

3.6.3 Agriculture and Industry

The agricultural sector is by far the biggest user of Nile waters for all of the riparian countries, which for the time being are predominately agriculturally based economies. Rainwater contributes considerably to agriculture in the upper riparian countries of the Great Lakes region, but Sudan and Egypt rely almost entirely on irrigated agriculture. Of the estimated 10.2 million hectares of irrigated land along the Nile Basin, only about 5 million hectares are currently irrigated, with 98.7% of this irrigated land located in Sudan and Egypt (Swain, 2008). Overall Sudan and Egypt extract 75% of Nile waters every year (Swain, 2008). Annually, agriculture uses represent 78% of the total Nile water intake in Egypt, 93% in Ethiopia and 97% in Sudan (FAO, 2000).

Urban water supply on the other hand, which is used in industrial or service sectors of the economy, is estimated on average to generate 250 times more revenue than the same amount being used for agricultural purposes (Beaumont, 2000). As urbanization increases, irrigated agriculture may no longer be an 'optimal' use for Nile waters. As aforementioned, 78% of Egypt's annual water supply goes toward agricultural purposes, but agriculture accounts for only 14% of GDP. Compared to the 14% of their water going toward urban industry which accounts for 34% of GDP; agricultural uses are therefore inversely much less profitable. From a purely "macroeconomic perspective, the rationale of justifying the allocation of water to agriculture over industrial and other sectors is weak" (Raphaeli, 2004).

Neither Sudan nor Ethiopia has strong industrial sectors to make up for the lack of efficient productivity in agriculture. The reality of these countries achieving food security for their populations may require a large expansion of irrigated land in the absence of other avenues of feeding their people. Although agriculture as a percent of GDP has slightly declined over time, it still accounts for 28.3% of GDP in Sudan and 46.3% in Ethiopia. Ethiopia and Sudan plan to continue to expand their agricultural output by implementing large new irrigation schemes; however these may not be the best or most efficient use of the waters as a means to develop economically. While not optimal, other solutions would require an entire upheaval of the structure of the economy, which may

not be feasible in the near future. According to the Food and Agricultural Organization of the United Nations (FAO), Ethiopia currently has 290,000 hectares of irrigated land, which is only 11% of the country's irrigation potential (Swain, 2008).

The Ethiopian water minister publicly announced the country's plans to develop nearly 200,000 more hectares of land through irrigation projects (Raphaeli, 2004). Sudan is also currently well below its irrigation potential, with the FAO estimating that they have cultivated 16.7 million hectares out of a possible 105 million hectares (Swain, 2008). Due to the higher levels of returns associated with industrial uses, both of these countries continue to explore different avenues to develop their industrial sectors through expanded access to already scarce Nile waters.

3.7 CONCLUSION

Water is a critical resource at the international and regional levels particularly Nile Basin Countries. International rivers that covering almost one half of the total land surface of the globe, are linked to a variety of environmental and socio-economic factors, and have become prominent in literature on environment and international conflict.

Water, a powerful necessity, has become an object of intense competition on the global market. This coincides with a period of history when ideological wars of the Cold War era are being replaced by resource wars. As water is becoming scarcer, the potential for water-based conflicts is increasing, particularly around internationally shared rivers.

Africa, because of its many internationally shared rivers and its states endowed with many international rivers particularly Nile River, is a perfect candidate for water resources management. Water is a clear and immediate basis for an Africa Union. Cooperation in hydroelectricity is moving much faster than the NEPADization of the continent. For such cooperation to take roots and expand states have to revisit their conception of national sovereignty.

CHAPTER 4

GEOPOLITICS OF RESOURCES OF THE NILE

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4.1 INTRODUCTION

The economic, social, and environmental importance of water resources cannot be overstated. Water is a vital resource, critical for healthy living conditions and sound ecosystems. Drinking water, food production, energy supply, and industrial development are dependent on water availability. Yet, the rising demands associated with rapid population growth and economic development place increasing pressure on this fragile and finite resource. This is already evidenced at the sectoral level by insufficient and inadequate supplies, at the national level, by competing demands between sectors, and at the international level, by conflicts or the threat thereof between nations sharing transboundary water resources. The situation is expected to worsen, with a quarter of the world's population predicted to face severe water scarcity in the next 25 years, even during years of average rainfall, (Schiff and Winters, 2002). The water management challenge is, thus, enormous. The manner in which it is confronted will determine future patterns of development, macroeconomic growth potentials, and the extent of poverty burdens.

More than 260 river basins covering almost 50% of the earth's land area are shared by at least two countries, making many countries dependent on the use of common water resources for national development (Wolf, *et al,* 1999). Unilateral action by any one country concerning international basins is often ineffective (fish ladders in an upstream country only), inefficient (hydropower development in a flat downstream country), or impossible (many developments on boundary stretches) (Mostert, 2005). However, cooperation in managing transboundary water resources can be difficult, not least because property rights are often unclear and contested.

'Benefit sharing' has been proposed as one approach to bypass the contentious issue of property rights. The idea is that if the focus is switched from physical volumes of water to the various values derived from water use in multiple spheres, including economic, social, political, and environmental, riparians will correctly view the problem as one of positive-sum outcomes associated with optimising benefits rather than the zero-sum outcomes associated with dividing water.

The case for sharing benefits is a compelling one. A river basin is a Common Pool Resource[3]. Meaning that use of it by one riparian (or indeed individual) will necessarily diminish the benefits available to others. In other words, water use in one part of the basin creates external effects in other parts. If these externalities are not 'internalised', the overall benefits are reduced and the outcome is suboptimal. Thus, both hydrology and economics concur that a river basin should be treated as a single unit to maintain the physical integrity of the system and to internalise externalities.

The question, then, is not whether the concept of benefit sharing has appeal, but rather how it can be operationalised. In other words, how is it that riparians to a transboundary river arrive at 'seeing' the benefits from optimal water management, such that their interests coincide with cooperation, (Halla Qaddumi, 2008).

4.2 WATER AS A SOURCE OF CONFLICT

Ancient Egypt has a natural historical right on the Nile River, and principles of its acquired rights have been a focal point of negotiations with other upstream states. The fact that this right exist means that any perceived reduction of the Nile water supply to

[3] A common pool resource has the same attributes as a pure public good, but its benefits are subtractable or rival (the use of the resource by one individual diminishes the benefits available to others). A public good is defined as a good that is nonrival and that cannot be managed in such a way as to preclude its use by any individual (non-excludability).

Egypt is tampering with its national security and thus could trigger potential conflict. There have been occasions when Egypt has threatened to go to war over Nile water. This has been because of a threat to Egypt's water supply by neighboring states. Sudan also has hydraulic potential and has created four dams in the last century. This has resulted in the development so far of 18,000 km^2 of irrigated land, making Sudan the second most extensive user of the Nile, after Egypt.

While Egypt is highly dependent on the Nile, there are factors that prevent the necessity of conflict over the distribution of the Nile's water supply. For example, Egypt no longer has such an agriculturally-dependent economy. Further, Egypt is already dependent on 'virtual water'[4] imports, and we can see that pursuing this as an alternative may prove an efficient way of avoiding water conflict. On the other hand, consider the riparian state of Ethiopia, whose tributaries supply about 86 percent of the waters of the Nile, conflict could arise from the fact that Ethiopia has limited hydraulic power and only uses about one percent of the Nile. With this in mind, some academics argue that it is the fact that other riparian states simply do not have the resources to enter into conflict that conflict has not yet occurred. However, this is not the only reason that conflict has not occurred. Governments, over the years, have put agreements and treaties into place so that conflict can be controlled.

4.3 GEOPOLITICS OF RESOURCES- THE NILE RIVER

The Nahr An-Nil, Arabic for the Nile River, is the longest river system in the world, stretching for over 5,000 miles from its major source at Lake Victoria in east central Africa. The White Nile flows generally north through Uganda and into Sudan where it meets the Blue Nile at Khartoum. From Khartoum, the river continues northwards into Egypt and on to the Mediterranean Sea.

[4] Virtual water (also known as embedded water, embodied water, or hidden water) refers, in the context of trade, to the water used in the production of a good or service.

Since time immemorial, the Nile has been the lifeblood of Egypt. In the spring, the waters of the river flooded, bringing black soil from the south and depositing it on the banks and creating the fertile Nile delta. Without the waters of the Nile to irrigate the dry deserts, Egypt would cease to exist. Despite the construction of the Aswan Dam in the late 1950's and early 1960s, the Nile remains the single most important facet of Egyptian geopolitics.

Although there had been dams constructed near Aswan as early as the late 19th Century, the first effective effort to control the flow of the Nile was the Aswan High Dam. The project itself underscores the politics involved in the river. To finance the massive project, Egyptian President Gamal 'Abd Al-Nasir (Gamal Adbul Nasser) nationalized the Suez Canal in 1956. Construction on the dam began in 1960 with Russian (Soviet) technical and financial assistance. The lake created by the dam flooded numerous ancient archaeological sites and modern villages, many of which were relocated at great expense.

In conjunction with the building of the dam, Egypt and Sudan entered into the Agreement for the Full Utilization of the Nile Waters, signed in Cairo on November 8, 1959. This agreement replaced a limited agreement signed in 1929 between the two countries. The new agreement established the minimum flow of the Nile, and provided monetary payments to the Sudan for damages to be caused by the construction of the High Dam.

First and foremost among Egypt's vital national interests is the unimpeded flow of the Nile River. The phrase "Egyptian interests" has become synonymous with the flow of the river. Egypt has stated that it will protect the flow of the Nile even if that requires military action outside its borders. It has demonstrated that on numerous occasions. As early as the 1970s, Egyptian Air Force bombers and reconnaissance aircraft routinely patrolled Sudanese skies.

The usage of the Nile River has been vastly associated with East and horn of African politics for many decades. Various countries, including Uganda, Sudan, Ethiopia

and Kenya have complained about the Egyptian domination of the Nile water resources. The Nile Basin Initiative was one of the most important programs to promote equal usage and peaceful cooperation between the "Nile Basin States." Yet many fears, the Egyptian domination of the waters still causes massive economic obstacles in the area.

The Nile still supports much of the population living along its banks, with the Egyptians living in otherwise inhospitable regions of the Sahara. The river flooded every summer, depositing fertile silt on the plains. The flow of the river is disturbed at several points by cataracts, which are sections of faster-flowing water with many small islands, shallow water, and rocks, forming an obstacle to navigation by boats. The Sudd wetland in Sudan also forms a formidable obstacle for navigation and flow of water, to the extent that Sudan had once attempted to dig a canal (the Jonglei Canal) to bypass this stagnant mass of water.

The Nile was, and still is, used to transport goods to different places along its long path; especially since winter winds in this area blow up river, the ships could travel up with no work by using the sail, and down using the flow of the river. While most Egyptians still live in the Nile valley, the construction of the Aswan High Dam (finished in 1970) to provide hydroelectricity ended the summer floods and their renewal of the fertile soil.

Cities on the Nile include Khartoum, Aswan, Luxor (Thebes), and the Giza-Cairo conurbation. The first cataract, the closest to the mouth of the river, is at Aswan to the north of the Aswan Dams. The Nile north of Aswan is a regular tourist route, with cruise ships and traditional wooden sailing boats known as feluccas. In addition, many "floating hotel" cruise boats ply the route between Luxor and Aswan, stopping in at Edfu and Kom Ombo along the way. It used to be possible to sail on these boats all the way from Cairo to Aswan, but security concerns have shut down the northernmost portion for many years.

More recently, drought during the 1980s led to widespread starvation in Ethiopia and Sudan but Egypt was protected from drought by water impounded in Lake Nasser.

Beginning in the 1980s techniques of analysis using hydrology transport models have been used in the Nile to analyze water quality.

4.4 Geopolitics in the Nile River Basin, among its Main Countries

Ten countries share the waters of the Nile River Basin, but the main disputes over the water resource has so far involved only three countries, Egypt, Ethiopia, and Sudan. Egypt faces the most obvious water crisis, and the situation becomes more severe each year. Its population of 68.5 million is growing by an annual rate of 1.78 percent. Table: 4.1 shows population and growth rates for Egypt, Ethiopia, and Sudan. Egypt is almost completely dependent on the Nile's water and claims that prior usage entitles it to a disproportionate share of the water resource; over ninety-five percent of agricultural production comes from Nile-irrigated land. Egypt needs to expand its agricultural land and reduce saltwater intrusion from the Mediterranean Sea to the Nile delta, (Christine Drake, 2000).

Egypt is very concerned about its relationship with Ethiopia since roughly 85 percent of the Nile River's flow in Egypt originates with the Blue Nile. Egypt has frequently warned Ethiopia not to take any steps that would affect the Blue Nile's discharge. Ethiopia has responded on numerous occasions that it reserves sovereign right to use the Blue Nile for the benefit of its own population. Ethiopia has broad plans to develop fifty irrigation and hydroelectric generation projects. As Ethiopia claims a larger share of the Nile headwaters, Egypt will likely experience a slight reduction in Nile water flow (*Ibid*).

Egypt is also apprehensive about Sudan. Incapable of expanding its water use at the present, this situation could change in the future. With increased use of Nile waters for agricultural irrigation, Sudan could become the breadbasket of the Middle East. The Nile Waters Agreement of 1929 is one of the most important agreements between the two countries allocating the Nile's waters. The Sudano-Egyptian Agreement of 1959 adjusted the 1929 allocation, reducing Egypt's share (Raj Krishna, 1988). Regional economic improvement will require cooperative management of the Nile River and its tributaries.

Egypt has protection of its Nile water resources as one of its key strategic objectives (Kemp and Harkavy, 1997).

Table: 4.1 Population and Growth Rate of Nile Riparians

Country	Population (in million)	Growth Rate (percentage)
Egypt	**68.4**	**1.72**
Ethiopia	**64.1**	**2.76**
Sudan	**35.1**	**2.84**

Source: CIA-The World Factbook, (2000).

At a length of 4,160 miles, the Nile is the longest river in the world. One of the major sources of the river is Lake Victoria, which is bordered by Kenya, Tanzania, and Uganda. From Lake Victoria, the Nile flows northward through Uganda, Sudan, and Egypt before emptying into the Mediterranean Sea. From Lake Victoria, the river is known as the Victoria Nile until it enters Lake Albert, after which it is known as the Albert Nile. At the border of Sudan, the river becomes the Bahr al Jabal until it merges with the Bahr al Ghazal to become the White Nile. At Khartoum, the White Nile joins the Blue Nile. From here, the Nile course towards its distributaries as it empties into the Mediterranean Sea. Numerous dams have been built on the Nile River, the first one was the Aswan Dam built in 1902. Aswan High Dam was completed upstream of its predecessor in 1971. The new dam created Lake Nasser, one of the largest reservoirs in the world. Other dams are the Sennar Dam on the Blue Nile and the Jabal Awliya Dam on the White Nile, both in Sudan.

The Nile River supplies 55.5 million cubic meters of water, this accounts of 86 percent of the water used in Egypt annually. The Nile River's importance to Egypt is not in its water alone, but also the flow of the river's water. Twenty-eight percent of the

country's power is produced from hydroelectric plants on the river. Flood irrigation from the Nile River supplies water for almost all of Egypt's food production. Already Egypt imports fifty percent of its food requirements. Despite these factors, Egypt's water needs will continue to increase. Egypt's population will shortly exceed seventy million, increasing by more than one million per year. Egypt and Sudan are likely to face water deficits within the next ten years. Both currently require about five billion cubic meters per year.

As stated above, the Nile is Egypt's primary source of water for meeting consumption demand-Egypt's reliance on the river's water is absolute. Coupled with the striking seasonal variation in river flow, Egypt suffers from insufficient water during the long, dry summer months. The storage capacity of the Aswan High Dam is essential for coping with periods of low flow levels. Settlement in the Nile basin is intimately associated with the river. In Egypt, most of its population is crowded in a habitable, thirty thousand square kilometres, narrow corridor of arable land along the Nile River and in the Nile Delta (Miriam R. Lowi, 2000). Moreover, Egypt is the furthest downstream state in the Nile River Basin.

The Nile River is comprised of two major tributaries, the Blue Nile and the White Nile. The two branches of the Nile merge at Khartoum, Sudan, to become the Nile River, which continues its northward course to the Mediterranean Sea through Sudan and Egypt. Fortunately for Egypt and Sudan, the states upstream have shown little interest in exploiting the White Nile and other Nile tributaries. On the other hand, Egypt's position downstream of Ethiopia, on the Blue Nile, is troublesome. The Blue Nile's flow represents over eighty percent of the total discharge of the Nile River. Recently, because of population growth and declining food security, Ethiopia needs to develop the waters of the Blue Nile *(Ibid)*.

Miriam Lowi uses Egypt to highlight the variety of related features that illustrate the degree to which water scarcity may be considered a national security concern. These features are: the quantity and quality of the water resource relative to present future

demand; the nature of water dependency; and, in the case of transboundary rivers, the number of riparian states involved, the nature of relations with the other riparians, and finally, geographic position within the basin. For Egypt, arid climate, high population growth, complete dependence on one transboundary body of water, in downstream position, and the threat of important extractions upstream combine to create the perception that water is a vital security concern. Harmful changes to the water resource would threaten Egypt's welfare and would likely generate a hostile response. Egypt's relative economic, military, and political power makes it unlikely that any of the other states involved would take action to provoke a hostile response.

The principal causes for concern in the Nile River Basin are environmental and economic. Lack of written agreements between users of Nile water is largely a result of Egypt's insistence on its overriding needs. Rapid population growth in the states of the Nile River Basin means that demand for water will increase. Existing water resources will have to be used and allocated more efficiently to meet demand. Otherwise, the consumption and development requirements of some states will not be met. The combination of high population growth and a scare resource is not be sustainable and may prove to be highly unstable. Consequently, 25 years from now, when the population has doubled and there is a lack of water resource cooperation, there could be conflict over control of the waters of the Nile River Basin (Lowi, 2000).

4.4.1 EGYPT

The Nile River is the whole life of Egypt. The country owes its existence to the river, which provides water for agriculture, industry, and domestic use. Nearly the whole population of Egypt resides along the Nile and cultivation is dependent on irrigation from the river. Egypt relies on the Nile River for 97 percent of its water needs, despite 95 percent of the discharge originating from upstream states. The Blue Nile, with headwaters in Ethiopia, accounts for 85 percent of the Nile's discharge. Egypt's water use exceeds annual renewable resources within the country (Kemp and Harkavy, 1997).

Egypt uses its annual allocation of *55.5* million cubic meters of water from the Nile, and an additional six million cubic meters of Sudan's allocation, due to Sudan's inability to use its full allocation. Groundwater resources are sizeable: 300 million cubic meters in the Nile Delta and 200 million cubic meters in the Nile Valley aquifer. Unfortunately, the groundwater supplies are not economically recoverable and have to be managed closely to prevent a decline in the water table and saltwater intrusion. These two water sources are being used at half the annual renewable rate. Eighty percent of Egypt's water use is for the irrigation of agriculture where water loss is significant due to inefficient water delivery systems.

The Aswan High Dam, completed in 1971, gives Egypt a large measure of control over its national water supply. However, high evaporation rates due to the location and climate reduce the efficiency of the dam. Additionally, the hydroelectric production of the dam only accounts for twenty-two percent of total electrical production in Egypt.

Egypt's land reclamation projects, both in the Nile Delta and Valley, and between the delta and the Suez Canal, and in the Sinai, is considered a priority. Only thirty percent of the lands reclaimed become economically productive. Agricultural expansion is largely a response to the country's growing food deficit. Large portions of Egypt's bulk food needs are met by imports despite an increase in domestic food production. Self-sufficiency is exhibited in fruits and vegetables, and Egypt is able to export a portion. While the results of land reclamation and agricultural expansion are questionable, they are clearly a national interest (Beschomer,1992.)

4.4.2 ETHIOPIA

Ethiopia's water supply situation is quite favourable relative to its neighbours, Egypt and Sudan. Total surface water supply is 112.6 million cubic meters, of which 55 million cubic meters can be exploited. There are fourteen river basins with a flow rate of over 100 million cubic meters annually across Ethiopia's borders. The problem for

Ethiopia is poor distribution of an abundant water resource. One-third of Ethiopia is prone to drought while 540,000 hectares of land is prone to flooding.

Limited irrigation projects have been undertaken as Ethiopia lacks a comprehensive water and agriculture management program. Hydroelectric production is an area of great potential; however the ideal sites for dams are a large distance from centers of consumption. Water projects will be a cause of concern for Egypt and Sudan (Beschorner, 1992).

4.4.3 SUDAN

Sudan is allocated 18.5 million cubic meter of Nile water annually by agreement with Egypt, but only uses 12.5 million cubic meter. Over eighty percent of allocated water is used for irrigation of agriculture. The few dams that have been built store eight million cubic meters and satisfy most of Sudan's electricity needs.

Sudan has been developing irrigated agriculture since the 1970's in its plan to become the "breadbasket" of the Middle East. The agricultural schemes have largely failed but great potential still exists provided large investments in infrastructure and proper management are made available. The agriculture sector employs over sixty percent of the population, and accounts for almost forty percent of gross domestic product and 95 percent of exports. However, drought and population displacement have caused widespread food shortages. Misdistribution has also been a factor. Sudan's economic and political situation jeopardizes irrigation development plans (Beschorner, 1992).

4.5 WATER AS A RESOURCE: CONFLICT AND COOPERATION

Water is a fugitive resource, moving in both time and space (Frederick, 1996; Ashton, 2000). While many think of water as a stock, it is in fact a flow (Shaw, 2005), otherwise known as a flux. By virtue of crossing national boundaries, water forces

riparian States into a situation of inter-dependence. The difficulties encountered with managing and sharing a common resource such as water is well known. Conflicts over water evolve in complex environments. More significantly, however, the linkage between high demographic growth rates and the degree of economic diversification is a key factor in the context of benefit-sharing. Water-related issues have been analyzed from many distinct perspectives by different authorities. However, the perception of water as a global common good has triggered a debate on the need for collective action, some of which has a theoretical underpinning. In order to avoid a 'tragedy of the commons' (Hardin, 1968) or unilateral abuse of this finite resource, some have appealed for common forms of resource management (Ostrom, 1990).

However, a lack of cooperation in high politics can also lead to a similar deadlock in low politics (Lowi, 1993). Under regime theory, regional institutions act as efficient tools to manage cooperative regimes for natural resources (Young, 1989; Jagerskog, 2003). While international governance implies an agent-based resolution of collective problems at local, national and international levels (Medzini and Wolf, 2001), there is no deep understanding of the dynamics of governance, and the theoretical underpinnings of this therefore remain scanty (Turton and Earle, 2005).

The concept of Integrated Water Resources Management has been promoted by international institutions to attempt to engender economically viable and environmentally sustainable utilization of the common water resources (Claasen, 2005). However, some States refuse to be 'integrated' in any fashion, although their water resources should nevertheless be equitably and reasonably allocated and utilized.

Water can also be a source of conflict as riparian States strive to gain a maximum share of a finite (albeit fugitive) resource. This often occurs specifically where water issues are embedded in larger conflicts of a high politics nature, or where limited economic diversification limits the range of policy options open to Governments.

4.6 CONCLUSION

There can be no debate that the allocations of the Nile River basin (and by extension, also those to the co-riparians of the Kagera River basin upstream) as laid down by the present international agreements are inconsistent with the principles of customary international water law, although this in itself does not affect their legal validity). The 1929 and 1959 agreements are the key documents, with some parties considering that these remain relevant in all circumstances. However, the recent statements by many of the riparians fiercely contest this, laying the political foundation for refutation of the agreements on the ground that they were unreasonable, as they limited the rights of upstream co-riparians without consultation or the consent of those affected. The succession to the 1929 agreement by the former British colonies is also heavily contested by them on legal grounds.

The two downstream co-riparians (the Sudan and Egypt) are heavily favored by these agreements, to the clear detriment of the eight upstream co-riparians. The challenge is therefore to define the manner in which third-party actors can offer sufficient inducement for the co-riparians to alter their perception of threat, and their view of the world in which they live.

Egypt is widely documented to be the basin hegemon, having used a range of approaches to attempt to maintain its access to the upstream flows. It is interesting to note that the overall tactics and strategy adopted by Egypt reveal many similarities to those of Israel. Although the degree to which Egypt is willing to trigger armed hostilities in response to perceived threats over water resources is perhaps rather less than that of Israel currently. Many of the hydro-political dynamics are driven by posturing and rhetoric, rather than an actual resort to armed force, which is seen to be unsustainable and therefore unlikely in the context of the post- Cold War world of contemporary times.

The Kagera Basin offers a specific element to the general 'texture' of the Nile River Basin as a whole. Thus, it has a history of regime creation and institutional development that can form a valuable foundation for future benefit-sharing scenarios; the

upstream riparian states are characterized by relying heavily on endogenous water resources; and the issue of out-of-basin transfers as a right for any sovereign State is at the heart of the overall water problematique.

The Nile Basin Initiative has attempted to defuse the potential and actual conflicts over water resources in the basin since 1998, with only limited success. Recent categorical statements on water allocations by certain of the upper co-riparians (in both the White Nile and the Blue Nile) show that the problems concerning such allocations have not been solved, and the shifting of the discourse towards benefit-sharing has not been successful in assuaging the concerns of many of the upstream parties.

CHAPTER 5

ISSUES AND CONFLICTS OVER RESOURCES AND CONFLICT MANAGEMENT RESOLUTION

CHAPTER 5

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5.1 INTRODUCTION

Africa is a land of transboundary waters, with international river basins covering fully 62 percent of the continent's landmass. Africa is also a continent with a long history of transboundary water management and a voluminous body of transboundary water law, which at least partially regulates the use of many of its basins particularly Nile basin (Lautze and Giordano, 2005). While an understanding of the scope and nature of the continent's transboundary water law supplies an important tool to improve future management of the its shared waters, an examination of the factors which have driven the formation, orientation, and realization of that law can help to understand both why it evolved, in whose interests, and the likelihood for its meaningful implementation.

The economic and social underdevelopment of Nile riparian states is mainly the result of their failure to develop their water resources for irrigation and hydroelectric power. In addition to financial and technological limitations that hamper development of the water for irrigation and hydroelectricity, external political and economic interests of the region have directly affected these countries.

5.2 HISTORY OF GEOPOLITICS IN THE NILE BASIN COUNTRIES

The beginning of modern external pressure can be traced to the British interest on the Nile after the occupation of Egypt and Sudan. Initially, the presence of British colonialism in Egypt and Sudan in the 19th and early 20th centuries dictated Nile River

affairs in the region. British colonialism in North and East Africa sought to secure its interest on the Nile water to ensure the production and export of long-staple cotton from Egypt and Sudan for its industry at home.

Later, Egypt's scarcity of water alarmed the British and led to an agreement with Sudan to regulate and use the water between them without consulting any of the upper riparian states. As a result of this agreement, Egypt and Sudan insist that the upper riparian states do not undertake works that directly or indirectly affect the volume of water without their consent, although 86 percent of Nile water reaching Sudan and Egypt originates in Ethiopia. Sudan's contribution to the Nile water is minimal, and Egypt contributes virtually nothing. This unequal distribution of the Nile water among the riparian states has been one of the ambiguities in the region.

The Nile has fascinated philosophers, geographers, historians, engineers and politicians for centuries. In 450 BC Herodotus, known in the West as 'the father of history', described Egypt as an acquired country, a 'gift of the River Nile'. Historically, there have been frequent clashes between Egypt, Sudan and Ethiopia over sharing the Nile water. Since their arrival in the Red Sea port in the 13th century, the Turks have done their best to prevent Ethiopia from having a seaport of its own, and from controlling the Nile waters. At one point both Turks and Egyptians spread rumours around the Red Sea Muslim society, alleging that: If the Christian Ethiopians were to succeed in taking the Sea-coast, the war would then turn into one of religion, as Mohammed prophesied in the Koran, that should the Ethiopians take the Sea-coast, that they will invade the Hedjaz, take Mecca, and destroy the Caaba or Holy Temple this being one of the signs of the end of the world and the Mohammedan faith (British Foreign Office: 41:3, pt1).

This allegation was so strong that, to date, Ethiopia is considered an enemy state by surrounding Muslim countries of North and East Africa. Moreover, 'in modern times an ideology arose, inspired by the Egyptians, but eventually adopted by some Sudanese as their own, which claimed, "all the peoples of the Nile Valley (but not the Christian

populations of the Ethiopian highlands) are one"' (Waterbury 1979). Only the nefarious designs of outside forces have kept them apart.

British were the most obvious of the spoilers. In general, the Egyptians incited sixteen major wars against Ethiopia in the period from the Battle of Gadarif in 1832 and the Battle of Gura in 1876.

At present, there is no comprehensive agreement on the Nile that binds all the watercourse states, and no measure of integrated planning has been carried out to develop its basin. The few existing agreements were entered between some of the watercourse states, mainly with the aim of securing the interest of one riparian state (Egypt) or to some extent (Sudan). If Egypt and Sudan did constitute an integrated economic and political unit, then all of the midstream and downstream sections of the Nile would be subject to the domestic planning of a single political authority. Moreover, other concerned states, especially Ethiopia with its sovereignty over the headwaters of the Blue Nile, would have to tread with great caution in any matters that might affect the interests of what would be one of the largest states in Africa in geographic terms and nearly the second largest in terms of population. But today Egypt and Sudan are not unified politically or economically, and the reasons for this say much about the difficulties both states encounter in attempting to exploit the Nile rationally. Unity of sorts has been achieved in the past, but always through the imposition of Egyptian or at least Egypt-based rule on Sudan. Egypt and Sudan are still not one.

The revival of European interest in the Nile water was not a unique phenomenon. It was part of the general European penetration of Africa in the nineteenth century. Thus, in Ethiopia, as elsewhere in Africa, the European officials who came into contact with Ethiopian emperors were above all ambassadors of commerce. This was true of the first European official to set foot on Ethiopian soil in 1804: Sir George Annesley, later Viscount Valetia, from Britain. The promotion of commerce was the dominant theme of the first treaties concluded between King/Negus Sahla-Sellase and the British Captain W

Cornwallis Harris (1841) and the French Rochet D'Hericourt (1843), and between Ras Ali II and the British Walter Plowden (1849) (Zewde, 1991).

From the time of the Italian settlements on the Red Sea coast in 1889, which influenced economic and political dynamics in the Horn of Africa, the British and the French have been persistently interested in this region (Abir, 1980). The problem of Eritrea and Ethiopia dates back to 1889, when in a belated attempt to join the scramble for Africa, the Italians established a colony by that name on the Red Sea coast. The territory of the new colony was the highlands, inhabited mainly by Tigrinya speaking Christians, which had historically been part of the Ethiopian Empire (Ottaway & Ottaway, 1978).

Europeans began to trickle into Egypt in 1815 when the end of the Napoleonic wars brought universal unemployment as armies dissolved and arsenals closed down. Egypt under Muhammad Ali Pasha offered a future for these European unemployed (Santi & Hill 1980:169). Foreign capital particularly French, began to penetrate Egypt in the 1850s. The Khedive of Egypt granted the Suez Canal concession to De Lesseps, a French subject. The canal was completed in 1869, by which date British and French financial and industrial groups were opening up Egypt: port works at Suez and Alexandria; railway construction; irrigation canals; roads; bridges; and sugar mills and, behind all of these, loans to the Khedive of Egypt (Emile, 1935). After the opening of the Suez Canal and the British occupation of Egypt in 1882, safeguarding the route to India became an important object of British government action and diplomacy. But the victory of the British in Egypt was bitterly resented by the French, and the struggle between them was transferred to the region south of Egypt-Sudan, Ethiopia, and the African coasts of the Red Sea and Indian Ocean. British officials, then in charge of Egyptian affairs, were fully aware of the new development. Their traditional policy (after 1868) of minimizing relations with Ethiopia had to be altered, and the newly adopted diplomacy sought Ethiopia's active cooperation to obtain a stable frontier and assistance. But the French government, embittered by the British occupation of Egypt and already in fairly close contact with Ethiopia, started to undermine the British Mission (Erlich, 1982).

In 1881, the French government occupied a port on the Somali coast, and in subsequent years it extended its influence by the usual methods, a combination of force,

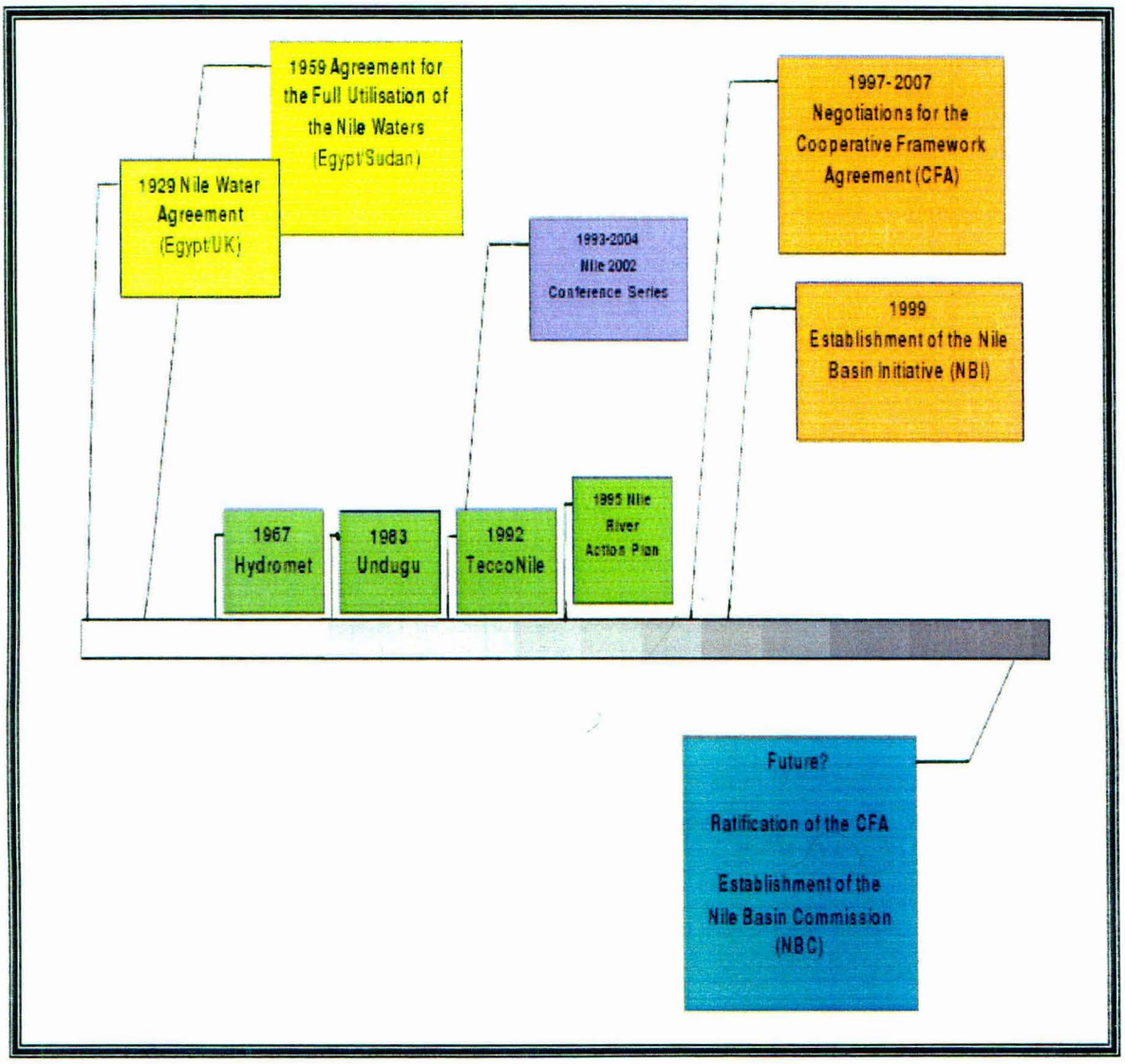
fraud and purchase, until French Somaliland was established. This territory is at the southern end of the Red Sea, opposite the narrow strait joining the Red Sea to the Gulf of Aden. By the nature of its location French Somaliland commanded an important point on the route to India. But it was also the first European foothold on the coast between the Red Sea and Ethiopia. And apart from its strategic location for docking ocean-going ships and because French Somaliland was adjacent to Ethiopia, which is the chief source of the Nile, France's penetration of the Red Sea route was considered extremely dangerous to British interests in Egypt. Somaliland is part of the modern Somalia, though it claims to be independent.

5.3 AGREEMENTS OF THE NILE BASIN

An examination of post-colonial transboundary water treaties applying to the Nile river basin reveals a rich and evolving set of drivers. Clear correlations are evident between internal agreement drivers, the time in which an agreement was signed, and the portion of the Nile to which a treaty applied. As shown in Table Below, developments concerning downstream portions of the basin, generally Egypt occurred earlier and was very often focused on harnessing additional water to facilitate increases in irrigation and hydropower. Upper basin developments occurred later and were driven much more by a desire for joint management and environmental sustainability.

After independence in the 1960s, Egypt feared that the use of the waters of the Nile by other Nile basin states would threaten its national security. Given Egypt's 98 per cent reliance on the Nile for irrigation and its fast-growing population, securing these waters was its main objective. Consequently, in 1959 Egypt and Sudan signed an agreement on the 'full utilisation of the Nile water'. In it, Sudan, as a junior partner, was allotted 18.5 billion cubic meter of water, while Egypt retained 55.5 billion m^3. Sudan would be allowed to undertake a series of Nile development projects, such as the Rosieres Dam. Egypt would be allowed to build the High Aswan Dam, near

Figure: 5.1 Time Line of Hydropolitical Relations in the Nile Basin Counties



the Sudanese border, which would regulate the flow of the river into Egypt, provide water during droughts, and harness the hydroelectric power of the river. The High Aswan Dam has performed several notable services. Above all, it has guaranteed Egyptian agriculture a steady and predictable water supply year-in, year-out. The 1959 treaty also formed a joint committee to supervise and direct development projects related to the flow of the river.

Table: 5.1 Temporal and Spatial Variations in Nile Basin International Water Agreements[5]

Year	1925-1960	1977-2003
Number of Agreements	9	6
Portion of the Nile to which agreement applies	100% Downstream	83% Upstream
Creates or Assumes Joint Management Structure	22%	83%
Provision for Water Development	89%	33%
Environmental Sustainability	0%	50%
Water Sharing/Division	44%	0%

Source: Jonathan Lautze, Mark Giordano, and Maelis Borghese, (2005).

The 1959 agreement was bilateral and did not include any of the other riparian countries of the Nile, although it portioned out all of the Nile's water. The upper riparian states, once again, had not been consulted, and no water was allotted for future usage. All of the Nile's average water flow was divided between the two countries that lay furthest downstream. Construction of the dam at Aswan began in 1959 as soon as the agreement was signed with Sudan. Accordingly, the Soviet Union agreed to build the dam and finance the construction.

When the dam was finally completed in 1970, it stretched 4 km across the river's path, rose over 100 m from its base, and was almost 1 km wide at the base. Behind it, the waters formed Lake Nasser, which is 600 km long and 50 km wide in some places. This reservoir was the largest man-made lake in the world at that time. In addition, in the 1970s Sudan and Egypt began joint construction of the Jonglei Canal, which would have increased the flow of the Nile waters by diverting the river. Unfortunately, in 1980 construction was stopped 100 km short of completion because of 'rebel action'. Over US$100 million had been spent on the project. Meanwhile, the 1959 agreement forbade

[5] That this classification system allows for a treaty to be motivated by multiple drivers, e.g., water development and water sharing/division. Hence the percentage values for each of the four drivers may sum to more than 100.

upstream nations to conduct any activity that threatened the water quotas of Egypt and Sudan and prohibited the use of even 1 litre of water by upstream riparian states.

The East African countries complained for years about the treaty. Ethiopia repeatedly rejected the 1959 agreement between Egypt and Sudan. In 2004, Tanzania unilaterally announced the establishment of a 170 km pipeline from Lake Victoria (where 14 percent of the Nile originates) to supply water to some dry areas in the country. According to the Cairo Times, the project was said to be a direct violation of the 1929 treaty. Egypt's minister for water and natural resources, Mahmoud Abou Zeid, wrote that the country had reasonable grounds for worrying about threats to the use of the river. The same year (2004), the government of Kenya had asserted that it would 'not accept any restrictions on the use of Lake Victoria and River Nile', and would withdraw unilaterally from the 1929 treaty. Abou Zeid branded the move a breach of international law, and described it as an 'act of war'. Kenya, Tanzania, and Uganda claimed that the treaty was an outdated relic of colonial times because foreign rulers negotiated it without reference to their country's best interests (Ze Ethiopia: March 2004).

Irrespective of the objections raised against the hitherto existing colonial and post-colonial treaties and agreements by other co-basin states, Egypt still considers them legally binding and non-amendable. Tension among the Nile Basin countries arises whenever a new Nile project is proposed. The water needs of the upper riparian countries are barely being met. In addition, Egypt believes that it is most in danger of losing access to the Nile waters by development projects in the upper riparian states, and remains willing to intervene militarily to maintain the status quo (Efoyta, 1996). The biggest fear is that Ethiopia will develop its water resources. For a long time the Egyptians have labored to prevent Ethiopia from using the water, particularly for irrigation. They believe that Egypt would be exposed to danger if Ethiopia started to use the waters of the Nile. The Egyptian scenario for the Nile is a classic example of the politics of 'I win if you lose', the zero-sum game.

The most complete agreement on the use of the Nile waters appears to be the 1959 agreement between Sudan and Egypt. But this agreement did not put an end to the conflict over the rights to the waters. In the absence of a serious challenge, Egypt continues to carry out a series of major water projects that not only appropriate large portions of the Nile waters, but also bring the flow within its sovereign jurisdiction. It has deployed human, material, and scientific resources to put in place the legal and institutional framework that could enable it to acquire a monopoly over the Nile River. Egypt has always believed that the capacity for autonomous economic growth lies within its borders. In this light, attempts at political union or economic integration with other Arab countries have been undertaken primarily to generate advantages along the margins of national development and support the process of undergirding the regime.

In total, fifteen substantive transboundary water agreements[6] were signed between 1925 and 2003 which apply to portions of the Nile river basin; notably, not one of these applies to the entire basin. Nine agreements were signed between 1925 and 1960. All of these agreements included downstream Egypt as signatory and were chiefly concerned with water development and water allocation by which Egypt's needs were satisfied. Between 1977 and 2003, six additional agreements were signed. Five applied to upstream portions of the basin while one was signed between Egypt and Ethiopia concerning downstream areas. Of the five treaties applying to upstream portions of the basin, three were concerned with joint management to achieve environmental preservation of Lake Victoria. Two agreements sought to install a joint management structure to facilitate water development in the Kagera river basin, a tributary of the Nile.

It can be asserted that the temporal trends in Nile basin treaty drivers reflect a common phenomenon in upstream-downstream river basin relations. For example, several authors

[6] The only transboundary, and not trans-national (i.e. involving a non-riparian state), agreements are considered here. That is to say, agreements signed by one riparian state on one non-basin state are not considered unless the non-basin state was signing on behalf of a territory in the watershed. Further, all agreements considered involve at least one post-colonial power.

(e.g., Molle, 2003; Turton, 2003) have identified a recurrent pattern in which upstream water abundance leads to downstream establishment of a historic use of a river's waters. Then as water abundance turns to water scarcity, downstream riparians seek to codify and enhance their position vis-a-vis upstream counterparts. Egypt epitomizes the downstream country seeking to preserve and advance its claim to prior use.

While this theory contains important points, it fails to explain how Egypt mobilized substantial international support for its position. That is, not only was outside backing necessary for Egypt to codify its historic water allocations, substantial foreign aid was required to construct the dams which increased the country's water endowment. Clearly, external forces intervened to advance Egypt's position. The country's geostrategic importance, initially as controller of the Suez Canal and later due to its proximity to Israel and the centrality of the Arab-Israeli conflict in the Cold War, helped to make power brokers in the USA, the USSR, and Western Europe more inclined to favor Egyptian interests (Godana, 1985). The country's location led outside powers to make allowances for what most would consider a disproportionately large share of the Nile's waters.

In addition, as the "hydraulic mission" water management paradigm was very much in force between 1925 and 1960, foreign aid provided to obtain Egypt's favor is manifested in agreements (Allan, 1999) in the form of dam construction projects, such as those at Owen Falls and Aswan. The "hydraulic mission" paradigm similarly impacted the two agreements applying to the Kagera sub-basin of the Nile watershed. Signed in 1977 and 1981, both or these agreements sought to jointly manage and develop, i.e., though water harnessing, the resources of the Kagera river basin (World Commission on Dams, 2000; Allan, 1999).

Between 1994 and 2003, three agreements were signed which applied to Lake Victoria in the Nile's upper reaches. Consistent with the evolving paradigm in water resources management, these treaties were all driven by a desire to promote better management of environmental resources. These environmental agreements were largely facilitated if not directly initiated by international actors such as the World Bank and the

Global Environmental Facility (GEF) (Okaru-Bisant, 1998). Indeed, increasing international concern with the environment has sparked much of the legal development in the upper reaches of the basin. Okaru-Bisant (1998), for example, has noted how external interests exerted pressure on African countries to sign agreements over water so as to obtain financial or other support for their national goals.

A final note should be made concerning recent efforts to form a basin-wide management structure for the Nile within the framework of the Technical Committee for Promotion of the Development and Environmental Protection of the Nile (TECCONILE). The TECCONILE, formed in 1993, initiated a series of "10 Nile 2002" conferences, which can be seen largely as the result of four separate drivers: one internal and three external. Internally, there was a desire to collectively manage and share the benefits of the Nile's waters, particularly among upstream countries disgruntled with their disproportionately small water allocations. Yet such complaints from upstream countries were nothing new (Godana, 1985). What was new was an international (donor) community increasingly concerned with the potential for conflict over scarce water resources, a post-Cold War international community in which Egypt's geostrategic importance had declined[7] and an international community increasingly concerned with the environment (Ilomaki, 1999; Allan, 1999; Okaru-Bisant, 1998). Hence these external drivers substantially influenced the process of dialogue on the collective management and environmental protection of the Nile's waters and may eventually result in a new agreement.

5.3.1 Geopolitics behind the Nile Water's Agreement

Shifting political boundaries can turn intra-national disputes into international conflicts, exacerbating tensions over existing issues. Downstream riparians are not necessarily at a political disadvantage to their upstream neighbors. While in many cases

[7] It is probable that Egypt's geostrategic location, while still important, nevertheless declined with the end of the Cold War. Hence international actors were likely less inclined to protect Egyptian interests under the provisions of previous Nile basin agreements.

relative riparian positions results in comparable power relationships, with upper riparians having greater hydropolitical maneuverability, Egypt's geopolitical strength was able to forestall upstream attempts to sway its position. The individuals or governments involved can make a difference in the pace of the negotiations. Negotiations made little progress between 1954 and 1958, even given Sudan's independence in 1956. It was only after pro-Egyptian General Ibrahim Abboud took power in a coup in 1958 did negotiations move towards resolution, finally gaining for Sudan water allocations greater than those of their initial bargaining point.

5.4 BROAD OVERVIEW OF THE EXISTING AGREEMENTS IN THE NILE RIVER BASIN COUNTRIES

While many historical agreements exist for the Nile River basin as noted above, no basin-wide agreement exists on the utilization of the watercourse as a whole, despite decades of effort involving several international programmes. Most of the existing agreements are of a bilateral nature, with a few extending (or purporting to extend) to additional co-riparians, chiefly by virtue of these countries having been administered by Britain during the colonial era. The 1929 and 1959 agreements are the only documents detailing specific volumetric allocations of the Nile River waters, and both of these involve only the Sudan and Egypt, with little or no consideration of the development needs of upstream co-riparians. There has been extensive comment in recent years concerning the applicability of the earlier agreements signed by colonial powers, with various Kenyan, Tanzania and Ugandan Government representatives stating that these are not considered to bind the current independent States (Okoth- Owiro, 2004)[8].

[8] Also McGrath, C. and Inbaraj, S. (2004), *Unquiet flows the Nile,* at <http://www.ipsnews. net/interna.asp? idnews=21932>; also Defegu, Gebre Tsadik (2004), The Nile waters: Moving beyond gridlock, at <http:www. addistribune.com/Archives/2004/06/11-06-04/NILE.htm>.

This attitude stems originally from the so-called Nyerere Doctrine on State Succession, formulated by President Julius Nyerere of Tanganyika at the time of independence, shortly before Tanzania was formed through the unification of Tanganyika and Zanzibar. The Nyerere Doctrine was crystallized in a 1961 declaration by the Government of Tanganyika to the Secretary General of the United Nations, reading as follows:

As regard bilateral treaties validly concluded by the United Kingdom on behalf of the territory of Tanganyika, or validly applied or extended by the former to the territory of the latter, the Government of Tanganyika is willing to continue to apply within its territory on a basis of reciprocity, the terms of all such treaties for a period of two years from the date of independence unless abrogated or modified earlier by mutual consent. At the expiry of that period, the Government of Tanganyika will regard such of these treaties which could not by the application of rules of customary international law be regarded as otherwise surviving, as having terminated.

Similar sentiments were expressed in a letter dated 04 July 1962 from the Tanganyika Government to the Governments of Britain, Egypt and the Sudan, and also in a 1963 letter from the Government of Uganda to the Secretary General of the United Nations. Various authors have since debated this matter at considerable length in legal terms (Seaton and Maliti, 1973; Okidi, 1982; Godana, 1985; Brownlie, 1990; Okoth-Owiro, 2004), with many commentators debating the validity and/or precise meaning of Articles 12 and 34 of the Vienna Convention on Succession of States in Respect of Treaties of 1978. However, the issue is a fundamental element of the hydro-political dynamics of the Nile River Basin and is of great importance to any future solution to the allocation of the Nile flows and/or to the sharing of benefits from the river system. It is clear that the division of the Nile River waters on the basis of the 1929 and 1959 agreements is neither equitable nor reasonable at present.

5.5 CONFLICTS AND COOPERATION IN THE NILE RIPARIANS

Conflict over the Nile's waters could fan existing conflicts in the Greater Horn of Africa, making them more complex and harder to address. Tensions in the Greater Horn of Africa are of great concern to the international community, due to its volatility and proximity to the Middle East. Conflicts emerging here might spread political, social, and economic instability into the surrounding areas. In a river basin, conflict is most likely to emerge when the downstream nation is militarily stronger than nations upstream, and the downstream nation believes its interests in the shared water resource are threatened by actions of the upstream nations. In the Nile basin, the downstream nation, Egypt, controls the region's most powerful military, and fears that its upstream neighbors will reduce its water supply by constructing dams without its consent.

The basin has had a turbulent political history in the last 15 years in particular. With relevance to the Nile basin as a whole, Bulloch and Darwish (1993) reviewed the long-term military preparedness of the Egyptian authorities in the event that upstream parties might attempt to divert the flow of the Nile River. This extends allegedly to developed and regularly updated plans for military intervention by Egypt in several of the upstream States, and even externally to the basin under some circumstances. Nevertheless, at least some of the more recent statements by Egyptian diplomats have suggested that a peaceful solution should be sought. The logic of this is based on Cold War thinking which has since been proven to be unreasonable and improbable.

Despite this gloomy scenario, interstate war is unlikely, according to history: no nations have gone to war specifically over water resources for thousands of years. Instances of cooperation between riparian nations outnumbered conflicts by more than two to one between 1945 and 1999 instead of war, water fuels greater interdependence. By coming together to jointly manage their shared water resources, countries build trust and prevent conflict. In the face of potential conflict and regional instability, the Nile basin countries continue to seek cooperative solutions. The political will to develop a new legal framework for managing the Nile should continue. In principle, the countries of the Nile River basin agree that the situation should change. However, they do not agree on

how. To help reach a consensus, they developed the high-level Nile Basin Initiative (NBI) in 1999. Originally designed as a way to share scientific information, the NBI today brings together ministers from the basin countries "to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile basin water resources," as stated in its shared vision. The NBI has served as a catalyst for cooperation in the search for a new legal framework for the management of the Nile.

The recent move by Egypt towards diplomacy is certainly distinct from its past statements. This is in keeping with the changed political reality of the post-Cold War era, and reflects the validity of viewing the problematique through the conceptual lens of a Regional Security Complex. For its part, Ethiopia has refused to accept the validity of either the 1929 or the 1959 agreements between Egypt and the Sudan, and has asserted/ reserved its right to utilize the waters of the Blue Nile, without recognizing any limitations on this (Whiteman, 1964; Kendie, 1999). The partial (minor) diversion by Ethiopia of waters of the Blue Nile and the Sobat River in the late 1970s triggered threatening statements by President Anwar Sadat of Egypt, and these were continued thereafter on a number of occasions (Waterbury, 1979; Bulloch and Darwish, 1993; Shapland, 1997; Kendie, 1999; Erlich, 2002).

In 1980, the Ethiopian Government sent a statement to the Organization of African Unity accusing Egypt of mis-using the waters of the Nile, and President Sadat countered publicly with a threat of war (Kendie, 1997; Erlich, 2002). One element of such disquiet was the previous statement by President Sadat that 1% of the waters of the Nile would be delivered to the Negev Desert in Israel for irrigation purposes and possibly also to serve water needs in Jerusalem. This offer was made as part of the process leading to the March 1979 Peace Treaty between Israel and Egypt, but was never taken up by Israel as it was contingent upon finding a solution to the Israeli-Palestinian conflict. Despite this, it is interesting that such a hydrological link between the first and second Case Studies discussed in the present report has in any event almost been created, as the extreme north-eastern end of El-Salam Canal. The earlier forms of rhetoric may be

interpreted in the light of Cold War political posturing that was fashionable at the time, and should not be extrapolated into the future with any degree of certainty. Similar bellicose rhetoric from Egypt was evident in the early 1990s, during a presentation to Parliament by Hamdi el-Taheri concerning his earlier report to a Parliamentary Select Committee.

The study suggested that both Ethiopia and Uganda present a threat to downstream flows on the Nile River, and that continuing unrest in the Sudan would threaten the completion of the Jonglei Canal. Ethiopia and the Sudan both protested thereafter in 1993 over the Egyptian plans for the Northern Sinai Agricultural Development Project, leading the Egyptian Foreign Minister to make warning statements to the Sudan's Islamic leader Hassan al-Turabi, and the Egyptian Water Resources Minister Abdel-Hadi Radi to comment that the 1959 agreement was a "red line that can never be crossed." The 'warm conflict' continued through to the end of the 1990s, with President Mubarak threatening to bomb Ethiopia if its plans to build a dam on the Blue Nile were continued (Scheumann and Schiffler, 1999; EIPD, 2000).

Further veiled threats were exchanged between Egypt and Ethiopia during and following both the eighth Nile 2002 Conference in Addis Ababa in June 2000, and the meeting concerning the International Consortium for Cooperation on the Nile (ICCON) in mid-2001. Several other upstream co-riparians have recently threatened again to ignore previous agreements on the allocations of flows from the Nile River. In February 2004, a Parliamentary Committee in Uganda endorsed a motion by Member of Parliament Amon Muzoora, seeking to abrogate the colonial-era agreements on the Nile River.26 Similar events occurred in Kenya at the same time period, with a call for the inclusion of a new requirement in the draft Constitution for Kenya that all international treaties should be reviewed. In Tanzania, the same mood has led the Government to commence an US$85 million project to take water from Lake Victoria out-of-basin to Kahama in the Shinyanga region through a 170 km pipeline, with the China Civil Engineering Construction Corporation being awarded the contract (Beyene and Wadley, 2004). The relevance of this out-of-basin issue has been noted earlier, as has that of the Nyerere Doctrine. Such upstream activities could certainly be considered to infringe some of the

previous agreements on the Nile basin as a whole, but (as noted) the parties concerned have stated frankly that they do not consider themselves to be bound by these. It is in this context that the strategic relevance of the Nyerere Doctrine must be understood, because the core logic of that doctrine is that States which obtained sovereign independence are not necessarily bound by agreements entered into by their former colonial masters, unless they expressly agree to be bound by those conditions as attested to by various agreements in southern Africa (Ashton *et al.,* 2005). It is in this context that the main hydro- political dynamics in the Nile Basin become most evident.

While Burundi and Rwanda have not been centrally involved in this debate to the present, it is clear that at least some co-riparians of the Kagera River are becoming increasingly impatient for a solution to the dilemma created by the historical agreements. This has the potential to lead to further unilateral action similar to the recent decision of Tanzania to transport water out of the basin, and the Kagera co-riparians may well begin to compete for the limited resources unless new initiatives defuse the situation.

Amongst the other co-riparians of the Nile, the stance of the Sudan is particularly interesting. On the one hand, the Sudan was a party to the two main agreements of 1929 and 1959, and benefited significantly from the second of these in particular which allocated to the Sudan the majority of the flows created by the construction of the Aswan High Dam and Lake Nasser. Against this, the per capita allocations from the Nile system for the Sudan in the 1959 agreement were only about 65% of those for Egypt if calculated on current-day populations. The higher population growth rate in the Sudan (2.6% at present, as opposed to about 1.8% for Egypt;) continues to widen this gap over time, and this is reminiscent of the bilateral situation between Palestine and Israel. The requirement in Article 5 of the 1959 agreement that the Sudan should reach a 'unified view' with Egypt to counter any claims by upper Nile co-riparians also acts as at least a theoretical constraint to the creation of friction between these two parties.

The recent cessation of the civil war in southern Sudan will also alter the regional geopolitics, and it appears possible that the completion of the Jonglei Canal may now be

countenanced, which would enhance downstream flows markedly. This would trigger new environmental concerns, however, bringing in different actors and thereby changing the hydro-political status quo. In essence, this implies that the completion of the Jonglei Canal would probably have to be internally funded, because multilateral finance agencies would be unlikely to support it for fear of becoming the target of attack by powerful environmental activist groups.

However, high-level negotiations like the NBI are not enough; civil society must be involved. Since the inhabitants of a river basin play critical roles in the success of any international agreement, interstate negotiations should also include stakeholders beyond the national governments. Civil society engagement and participation in the development of the Nile basin have been facilitated not only through the NBI's Civil Society Stakeholder Initiative but also through the Nile Basin Discourse (NBD). The NBD's National Discourse Forums, established in each of the basin countries, provide a venue for all the Nile's users to air their expectations and grievances. Through these forums, stakeholders can provide input into development projects along the river basin. The NBD involves a broader array of stakeholders than the traditional state representatives, thus allowing users at the lowest levels, including farmers, women's groups, fishers, and existing community based organizations, to participate in the development of a legal framework (Patricia Kameri-Mbote, 2007).

5.6 MAIN TRANSBOUNDARY ISSUES

5.6.1 Formal Issues

On the transboundary level, the Nile Basin Initiative is the most important acting forum. The council of Ministers of Water Affairs of the Nile Basin or the Nile Council of Ministers (Nile-COM) is the highest authority of the NBI and is supported by a Nile Technical Advisory Committee (Nile-TAC) and a Secretariat (Nile-SEC) located in Entebbe (Mohamoda 2003; Nile Basin Initiative 2005a).

The Shared Vision Programme (SVP) comprises eight projects (Nile Basin Initiative 2005a):

1. The Applied Training Project to build the skills needed in each NBI country to take a basin-wide or integrated (IWRM) approach to managing the Nile water resources.

2. The Nile Transboundary Environmental Action Project to promote cooperation among the Nile Basin countries in protecting and managing the environment and the Nile River Basin ecosystem.

3. The Nile Basin Regional Power Trade Project to establish the institutional means to coordinate the development of regional power markets among the Nile Basin countries.

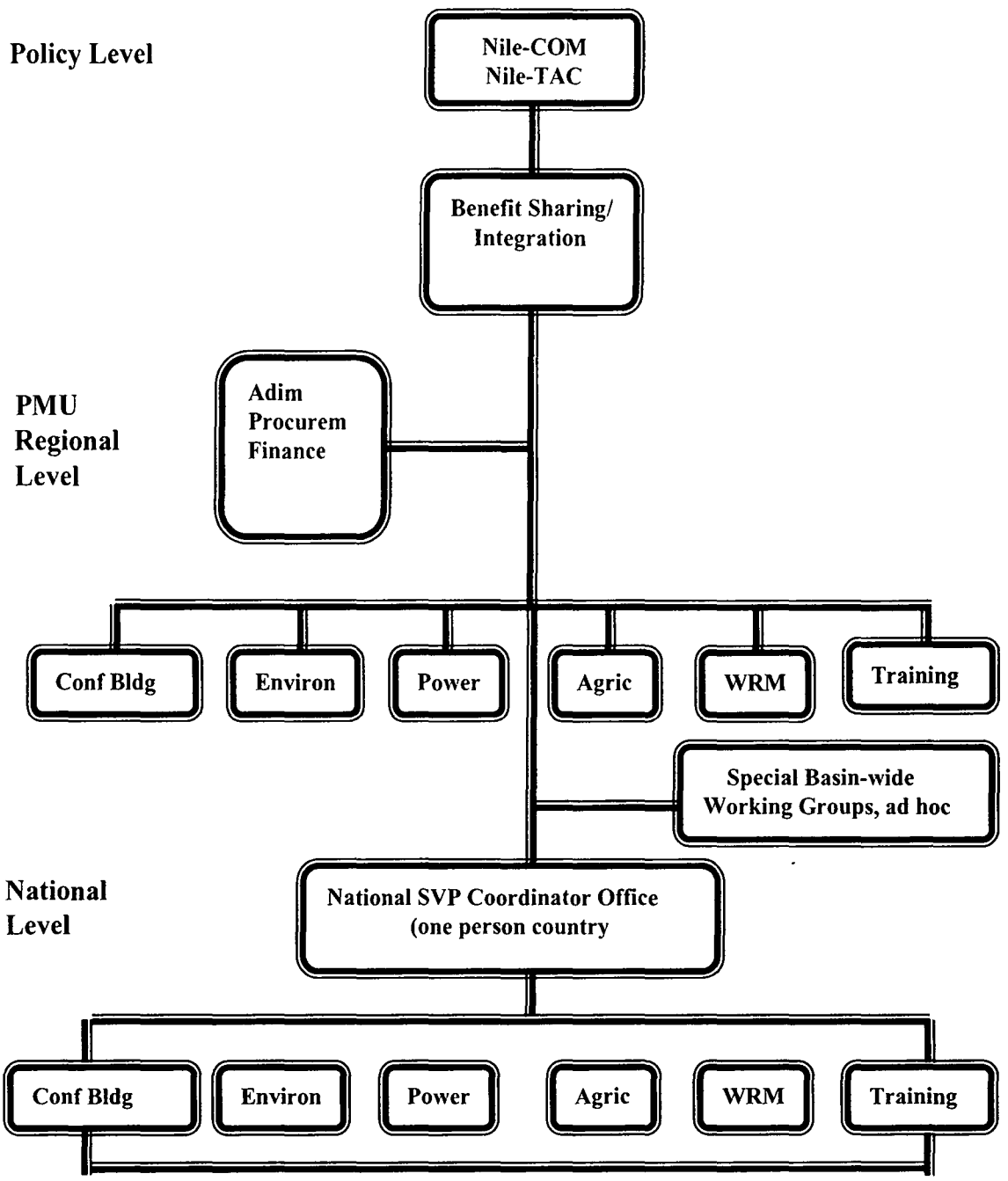
4. The Water for Agriculture Project to provide a sound conceptual and practical basis to increase the availability and efficient use of water for agricultural production.

5. The Water Resources Planning and Management Project to build the skills in each country to analyse the hydrology, characteristics, and behaviour of the Nile Basin river system.

6. The Confidence-Building and Stakeholder Involvement Project to increase the involvement of a broad range of stakeholders from policy and decision makers, to small business men and women, to fishermen and farmers, to religious and youth groups, in and public awareness of the Nile Basin Initiative's programs and future investments.
7. The Socio-economic Development and Benefit Sharing Project to build a network of professionals from economic planning and research institutions, technical experts from both the public and private sectors, academics, sociologists, and representatives from civic groups and NGOs from across the basin to explore alternative Nile development scenarios and benefit-sharing schemes.

8. The SVP Execution and Coordination Project to strengthen the capacity of NBI institutions to carry out basin-wide programs and to ensure effective oversight and coordination of the SVP.

Figure 5.2 Organizational Chart Shared Vision Program



Source: Nile-COM (2001b).

Figure 5.2 provides an overview of the organizational arrangements of this programme and the respective projects. The projects work both on a regional and national level. A large number of national governments and NGOs will participate in the different components of the project. Relevant actors in the program include (a) national governments; (b) local governments for sub-national jurisdictions within the Basin; (c) local (and community based), national and international NGOs active in the Basin; (d) the private sector; (e) universities and other research institutions; (f) other donors active in the Basin and (Mason 2003; Nile-COM 2001b; Rizzolio Karyabwite, 2000).

On the country level, Egypt, Sudan and Ethiopia are the most important actors in the Nile basin, Egypt and Sudan because the Nile waters are their most important source of water and Ethiopia because around 86% of the Nile waters originate from that country and Ethiopia is intending to utilise more of the waters in the near future (Mohamoda, 2003). The TEA project, as an example, will involve a wide range of stakeholders, ranging from government institutes to research institutes to NGO's. The project will seek involvement and cooperation with some 110 NGO's and academic institutions that are listed in the TEA project implementation plan (Nile Basin Initiative, 2002).

5.6.2 Informal Issues

Today, the Nile Basin faces the challenges of poverty (4 of its riparian countries are among the 10 poorest in the world), instability (conflicts in the Great Lakes, Sudan, and the Horn of Africa), rapid population growth, and severe environmental degradation (especially in the East African highlands). But joint regional development of the Nile offers significant opportunities for cooperative management and development that will catalyze greater regional integration for socioeconomic development, making it possible to meet these challenges. These socioeconomic benefits will exceed the direct benefits from the river alone (Economic Commission for Africa, 2004). The main issues are as follows:

5.6.2.1 Agricultural Water Use

Agricultural water use is the most important use of the water in all the Nile basin countries. On average 85 percent of the water use is utilised for agricultural purposes. In Egypt and Sudan the amount of water used for irrigation is almost as much as the total annual renewable water resources. Approximately one third of the total water abstraction from the Nile River is used for irrigation in Egypt (El-Sebae, 1989).

The loss of water in agriculture is large because water is not used efficiently. Improvement of irrigation techniques is needed to avoid wasting water. Experiences in arid countries show that farmers who passed from furrow or spray irrigation to more efficient drip systems can reduce their water consumption about 30 to 60 per cent, while simultaneously increasing their productivity, and decreasing infiltration towards ground water. These drip systems may however be too expensive for the poorest farmers. Cultivation of crops that require a great deal of water like the growing of rice and sugar cane in Egypt is under discussion. In hot climates, the return on agricultural yield per unit of water evaporated is poor and thus inefficient. The prevalent method of irrigation in the region is surface flooding of basins or furrows in which about 50 percent of the water is lost. Alternatives like sprinkler irrigation can be operated at an efficiency of 70 percent or more, while drip irrigation can attain efficiency as high as 90 percent, if competently managed (Rizzolio Karyabwite, 2000).

Groundwater is used more and more to irrigate during the dry season. In the most arid zones groundwater can be the only supply source for all types of farm activities. However, groundwater resources are under pressure from increased water demand because of rapid population growth and surface pollution. Unsustainable quantities of water are being extracted in many areas and this is seriously diminishing the reservoirs. Moreover, phreatic waters are more and more polluted. The most common pollutants are nitrates, salt, soluble organic compounds and, under some conditions, certain faecal pathogens. Land use can also cause waste of chemicals to the water bodies, thus polluting the water. Proper management therefore, demands land and water management to be integrated. The basin nations therefore need to cooperate in their respective agricultural

planning, e.g. through distribution of different crops to areas of the basin where they would be most adapted. Water intensive or long season crops could for example be grown in the upper basin while crops requiring less water and growing time could be produced in the lower basin (Rizzolio Karyabwite, 2000).

5.6.2.2 Hydropower Development

The Nile River is an important source of hydroelectric power. Several dams have been constructed for this purpose. The power production and the hydroelectric power consumption change between 1990 and 2000 in the Nile Basin countries. It is clear that hydroelectric power will play an increasing role in water management.

The Nile Basin has large potential for hydropower development, especially in the Blue Nile. This would entail the construction of a series of dams, among others in Ethiopia. It is argued that for instance Egypt's development is constrained more by lack of power than lack of water. There are consequently trade-offs between water and power, whereby Egypt would agree to a greater water allocation for Ethiopia and to the construction of Blue Nile Reservoirs on the condition that a certain percentage of the electricity generated would be sold to Egypt at a specified price. Reservoirs would also control Blue Nile floods, which could be particularly beneficial to agricultural development in Sudan. This would enable an arrangement whereby Ethiopia would trade electricity to Egypt and Sudan in return for agricultural products (Pottinger, 2004; Rizzolio Karyabwite, 2000).

5.6.2.3 Navigation

The Nile River is a vital waterway for the transportation of people and goods. The river and its tributaries are only partially and seasonally navigable. River steamers still provide the only means of transport facilities especially in Sudan south of latitude 15° N during the flood season, when road transport is usually not possible. Most of the towns in

Egypt and Sudan are situated on or near riverbanks. In Sudan steamer service on the Nile and its tributaries extends for about 3,800 km. The Blue Nile is navigable only during the high-water season and then only as far as Ar-Rusayris. Because of the presence of the cataracts north of Khartoum, the White Nile is navigable in Sudan only in three stretches. The first of these is from the Egyptian border to the south end of Lake Nasser. The second is the stretch between the third and the fourth cataract. The third and most important stretch extends from Khartoum southward to Juba. In Egypt, the Nile is navigable by sailing vessels and shallow draft river steamers as far south as Aswan. Canalisation takes place for navigational purposes and flood protection. Canalisation also takes place in the wetlands in the Sudd to reduce the evaporation. The Jonglei Canal project as the first project of this kind is however not progressing since the 1980s because of the civil war. Submerged weeds and water hyacinths hinder navigation and herbicides are used to control these. The Equatorial Lakes Plateau contains a number of falls that obstruct the river channels, rendering them unsuitable for navigation. Navigation risks are accidents (collisions, groundings, wreckage) and associated pollution risks because of poorly separated traffic, lack of mapping, limited navigational devices and aids and lack of technology, old and poorly constructed ships and additional overloading as well as non-qualified boat owners, insufficient maintenance of waterways (e.g. no regular dredging), and no emergency response system because of a lack of government control (Mason, 2003; Nicol and Shahin, 2003; Nile-COM 2001b; Rizzolio Karyabwite, 2000).

5.6.2.4 Erosion and Siltation

Agricultural and grazing lands are being degraded through erosion and siltation, and wetlands and forests are being lost. Deforestation and soil erosion can lead to increased sedimentation and greater flood risks downstream, while sediments also accumulate in wetlands and reservoirs. Also, the water quality is declining while pollution from urban, industrial and agricultural sources is increasing. Urbanisation and industrialisation often lead to greater pollution of the Nile River and its tributaries as pollution prevention and treatment measures generally do not keep pace with this development. Increased use and improper application of pesticides and fertilizers,

especially in the large irrigation schemes in the northern reaches of the Basin, lead to increased runoff and pollution of drainage canals.

5.6.2.5 Ecosystem (Flora and Fauna)

Water dependent ecosystems throughout the Nile Basin contribute to the stability, resistance and resilience of both natural and human systems to stress and sudden changes. In particular, significant transboundary benefits derive from the Basin's wetlands in maintaining water quality, trapping sediment, retaining nutrients, buffering floods, stabilizing micro-climates and providing storm protection. Key plant and animal species often have habitats in adjoining countries, requiring cross-border protected areas and other conservation measures for effective management. For example, the Nile is a principal flyway for birds migrating between central Africa and Mediterranean Europe, and Nile wetlands in a variety of countries provide indispensable habitats for these birds. Water hyacinth and other invasive aquatic weeds have spread throughout many parts of the Nile Basin, impairing the functions of natural ecosystems, threatening fisheries and interfering with transportation. The overexploitation of natural resource is continuing, and waterborne diseases are proliferating. Water-borne diseases such as malaria, diarrhea and bilharzia (schistosomiasis) are prevalent throughout the Basin and thus of major concern the Nile countries. Finally, the harmful impacts of floods and droughts are intensifying (Nile-COM 2001b).

Tropical rain forest is found along the Nile-Congo divide, in parts of the Lake Plateau, and in southwestern Ethiopia. Heat and copious rainfall produce thick forests with a great variety of tropical trees and plants. Mixed woodland and grassland (savanna), characterised by a sparse growth of thinly foliaged trees of medium height and a ground covering of grass and perennial herbs, occurs in large parts of the Lake Plateau, in parts of the Ethiopian Plateau, in the area that fringes the Blue Nile near Ar-Rusayris, and in the southern Al-Ghazal River region. On the Sudanese plains, a mixture of thin bush, thorny trees, and open grassland prevails. This area is swampy during the rainy season, particularly in the Sudd region of the south-central Sudan. The vegetation there

includes papyrus, tall bamboo-like grasses, reed mace ambatch, or turor, water lettuce, a species of convolvulus, and the South American water hyacinth. North of latitude 10° N there occurs a belt of thorny savanna or orchard shrub country characterised by small scattered tree stands, thorn-bush, and, after rain, grass and herbs. North of this, rainfall decreases and the vegetation thins out, so that the countryside is dotted with small thorny shrubs, mostly acacias. From Khartoum northward there is true desert, with scanty and irregular rainfall and no permanent vegetation at all except for a few stunted shrubs. Grasses and small herbs may be scattered along drainage lines after rainfall, but these die away in a few weeks. In Egypt the vegetation near the Nile is almost entirely the result of irrigation and cultivation (Rizzolio Karyabwite, 2000).

Many varieties of fish are found in the Nile system. Most of these species are found as far upstream as Lake Victoria. Many schools of fish that feed in the waters of the Nile in Egypt during the flood season have been reduced or have disappeared since the construction of the Aswan High Dam. Most of the species of the Nile fish were migrants, and the dam has prevented many from migrating to Lake Nasser. The diminution in the number of anchovies in the eastern Mediterranean has also been attributed to the serious reduction in the outflow of waterborne nutrients due to the dam. Lake Nasser, however, has been developed into a commercial fishery, where the Nile perch and other species thrive (Rizzolio Karyabwite, 2000).

The Nile crocodile, found in most parts of the river, has not yet penetrated the lakes of the upper Nile basin. Other reptiles found in the Nile basin include the soft-shelled turtle, three species of monitor lizard, and some 30 species of snakes, of which more than half are venomous. The hippopotamus, once common throughout the Nile system, is now found only in the As-Sudd region and to the south (Rizzolio Karyabwite, 2000). The construction of reservoirs and change of land use has direct effects in terms of habitat loss, elimination of flora and fauna and, in many cases, land degradation, but also feedback effects on the reservoir through alterations in hydrologic function. The resulting loss of vegetative cover leads to increases in sedimentation, storm flow, and annual water

yield; decreases in water quality; and variable changes in the seasonal timing of water yield (Mason, 2003; World Commission on Dams, 2000).

5.6.2.6 Dams

The Aswan High dam is an example of a dam that stores the flood. It can store 1.5 times the average annual flow of the Nile River (150-165 km^3) in the artificial Lake Nasser and has provided a high degree of protection to the lower Nile simply by retaining the whole flood. At the same time the beneficial aspects of natural flooding for example restoring the fertility of the floodplain have been lost (World Commission on Dams, 2000).

5.7 INSTITUTIONS FOR THE NILE RESOURCES UTILIZATION

Several attempts have been made among different countries over the years to cooperate on the use of the resources of the Nile. The Hydromet project launched in 1967 as well as the Undugu project in 1983 are regarded as first steps of international cooperation in the basin. The first attempt to focus on a longer-term development agenda was the Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE), created in 1993. A series of 10 Nile Conferences was launched in 1993 to provide an informal mechanism for dialogue among the Nile Basin countries and with the international community. As a result, TECCONILE prepared a Nile River Basin action plan in 1995. Recognising that sustained cooperation on the Nile requires a permanent institution with a development focus and agreement on core legal principles, the Nile basin countries established a forum for a process of legal and institutional dialogue in 1997. In 1998, all Nile Basin countries (with Eritrea observing) in partnership with key external agencies, including the World Bank and bilateral donors joined in a dialogue to create a regional partnership to facilitate the common pursuit of sustainable development and management of Nile resources. The countries jointly established an inclusive transitional mechanism for cooperation that was officially named the Nile Basin Initiative (NBI). The establishment of the NBI was an

important milestone as for the first time all the ten countries agreed to cooperate on development of the Nile Basin to promote common benefits, in recognition that cooperative development holds the greatest prospect of bringing mutual benefits to the region (Mohamoda, 2003; Nile Basin Initiative 2002; Nile Basin Initiative 2005a).

A Shared Vision "to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources" guides the NBI. The NBI strategy is to cooperate where cooperation is possible despite differences in other areas, such as over legal issues. There is a focus on interests, rather than only on legal positions. At the same time these positions and the tricky legal questions are not ignored, as they were in past multilateral initiatives. Addressing the challenge of moving towards greater cooperation and joint development has been central to the NBI. The NBI has both built on and added to a basic underlying set of enabling relations between states and the willingness of key basin states to move from "unilateralism" to "multilateralism" in resource development. The Initiative provides a unique forum for the countries of the Nile to move forward a cooperative process to realize tangible benefits in the Basin and build a solid foundation of trust and confidence. Some of the early external facilitation of Nile Basin cooperation focused on issues including the need to "level the playing field" through building national capacity and identifying national priorities, as well as correcting what it saw as "information asymmetry." A second focus was to move from dialog to actions, within which there was a need to develop dialogue on different tracks (for instance, information, capacity, technology) as well as to start with the achievable and avoid getting bogged down in formulae. This also sought to recognize that progress on complex water systems may be slow, but dialog needs to be sustained and trust needs to be established. Finally there was the aim to seek opportunities for mutually beneficial programs or projects. This latter concept has come to dominate much of the thinking on the NBI, particularly in terms of win–wins in benefit sharing. The premise of much of the NBI cooperative framework is that win–wins are achievable, and demonstrably so, through integrated project development. This involves the creation of cooperative frameworks that enable links between cooperation and development to be made, not just in terms of joint funding,

management, and the development of projects the easy part of cooperation, but in terms of joint benefit sharing from such projects (Mason, 2003; Nicol and Shahin, 2003; Nile Basin Initiative, 2002).

In this shift from cooperation to development, there needs to be more than just commitment to national development; it has to address the question of economic and social equity and the inter- and intra-national levels. Even developments generated within the basin perhaps trade in power or better environmental management do not necessarily enable poverty reduction. The underlying causes of environmental threats are often related to institutional, governance, awareness and information issues as well as sectoral and macroeconomic policies. Yet poverty reduction is the major factor to achieve progress. Environmental impacts of macro and sectoral policies on the Nile Basin's land and water resources, including transboundary impacts linked to trade, transport and migration are poorly understood. Therefore, in the coming years cooperation needs to be grounded in wider development concepts (Nicol and Shahin, 2003; Nile-COM 2001b).

It may be easier to reach cooperation on development options between states than it is to get local-level agreement within states as lack of awareness and understanding of the transboundary environmental consequences of the decisions being taken over land and water resource management in all of the riparian countries is a major barrier to strengthening environmental management. As a general rule this is likely to apply to a whole range of major infrastructure projects on the river identified under the NBI. Success of the NBI will, in large part, rest on being able to meet this challenge. NBI development projects need to be mainstreamed within regional, national, and local development processes, and not simply exist in parallel, labelled as "water resource-" or "river basin-" focused (Nicol and Shahin, 2003; Nile-COM 2001b).

The differences between the countries can limit cooperation. Sudan for instance does not have a pressing water shortage, rather a shortage of the economic and political capacity to use the available resources. Sudan will cooperate internationally to gain access to international finances for building dams, managing siltation problems and

increasing irrigation efficiency. Due to the limited economic and political capacity, often projects are planned but not implemented. The countries have to find a consensus over different water development options, e.g. the weight given to hydroelectric power versus irrigation, the priority given to pond-sized, small-scale or large-scale irrigation projects. Ethiopia for instance has two options for developing its water resources: to cooperate internationally in order to gain access to finances, or to strike bilateral funding agreements with countries outside of the basin and go ahead unilaterally. The conditions made by international development banks can prevent upstream development (Mason, 2003).

5.7.1 Institutionalizing Cooperation- The Nile Basin Initiative (the NBI)

In spite of the glasnost in relations between formerly belligerent co-riparians, moving from relations characterized by political conflict to new forms of cooperation required significant institutional development. It was not sufficient that the countries were now in a position to develop institutional cooperation; they required external assistance in order to facilitate this process. In 1997, the Nile Ministers requested that the World Bank establish a fundraising group for cooperative projects on the Nile. The Nile Basin Initiative that developed out of this request represented a re-emergence of the earlier Nile River Basin Action Programme (NRBAP). It now forms the most important basin-level approach to cooperative development of the Nile waters ever undertaken, and its significance extends well beyond the basin itself.

The Nile Basin Initiative describes itself as a "transitional arrangement until a permanent legal and institutional framework is in place" (NBI, 2000) and comprises a Council of Ministers of Water Affairs of the Nile Basin (Nile-COM), a Technical Advisory Committee (Nile-TAC) and a Secretariat (Nile-SEC), the latter located in Entebbe.

Focusing on a process-oriented approach, the NBI firstly sought to establish a common point of departure for all stakeholders, namely the NBI "Vision." This aimed at framing the tasks to be institutionalized within subsidiary action programs (SAP) at a

sub-basin level. These SAPs aimed to "identify and implement investment projects that confer mutual benefits at the sub-basin level and that the riparians agree to pursue cooperative activities" (NBI, 2000). The "visioning process" took six months to complete, and the wording of it required major revision, discussion, and fine-tuning. Nevertheless, the importance of establishing the "vision" lay as much in the process undertaken as in the end result, and by bringing together all the co-riparians (except for Eritrea which, at the time, remained an observer) raised important discussion on key legal and development issues.

The success to date of the NBI lies in one of its institutional innovations, namely the application of the principle of subsidiarity, or management of the basin at the lowest appropriate level. This has led to institutional division into an "eastern Nile" comprising Ethiopia, Sudan, and Egypt (and Eritrea too, were it to formalize its participation), and the Nile "equatorial lakes" countries (comprising Kenya, Uganda, Tanzania, the DRC, Rwanda, and Burundi as well as Egypt and Sudan). The inclusion of the latter two represents recognition of the importance of the White Nile to both countries. The basic rationale is that in reducing decision-making complexity the process of cooperation can be facilitated.

Under this principle, the NBI established two Subsidiary Action Plans, much of which emerged out of the earlier NRBAP project. The Eastern Nile program and the Nile Equatorial Lakes program aimed to express the vision in terms of actions on the ground, bringing high level political engagement and agreement to socioeconomic development within the states themselves. In tandem with these action programs, a shared vision program would help to continue to support the process of cooperation. This program was envisaged to "create an enabling environment for cooperative management and development, through a limited but effective set of basin-wide activities and projects" (NBI, 2001).

The NBI in 2003 appropriately the International Year of Freshwater is now at the stage of moving from the development of cooperation and the institutionalization of this process to the achievement of development through joint multilateral and bilateral projects. This is a crucial test for the whole initiative and the principles on which it is

built. The credibility of the external facilitation process is also at stake. Proof of success will not, in the long term, reside in cooperative frameworks or even the absence of major international conflict; rather it will lie in the capacity of processes and institutions to translate cooperation into development, and development that achieves poverty reduction from the local level upwards. One of the major challenges to ensuring the sustainability of the NBI is in creating a process of institutional support at all levels, including civil society at regional, national, and local levels. The importance of this challenge has been emphasized within the Nile Basin Discourse Project (undertaken since 2001) that attempts to facilitate dialogue about the NBI and to establish learning processes for institutions involved in Nile Basin related activities be they environmental, socioeconomic, or cultural. In 2003 a formal Nile Basin Discourse Desk was established in Entebbe.

Success of the NBI will, in large part, rest on being able to meet this challenge. NBI development projects need to be mainstreamed within regional, national, and local development processes, and not simply exist in parallel, labeled as "water resource-" or "river basin-" focused. This urgent challenge has yet to become effectively internalized within the process.

The Nile Basin is at a key juncture in its history. There is a major need to maintain the integrity of the river system itself in the face of rapidly rising demand, while at the same time demonstrate how the river can be utilized more productively and equitably. If the NBI is to work it also needs to be able to demonstrate early success. This will also help in the spill-over effect on a range of development issues, including increasing the social and economic stability that is essential to helping to achieve political stability in conflict-prone regions.

As an end in itself the NBI does not go far enough, cooperative processes need to be geared to specific goals of development, and poverty reduction related to wider socioeconomic development. But it has traveled a long way to date. A reassessment of direction and impact may soon be required, in order to steer the process from successful cooperation to successful development.

5.8 EFFECTS OF TREATIES AND POLICIES ON THE NILE BASIN WATER USE

During the colonial period, Britain effectively controlled the Nile through its military presence in Africa. Since Egyptian independence, Sudan has renegotiated with Egypt over the use of the Nile waters. The 1959 agreement between Sudan and Egypt allocated the entire average annual flow of the Nile to be shared among the Sudan and Egypt at 18.5 and 55.5 billion cubic meters respectfully, but ignored the rights to water of the remaining eight Nile countries. Ethiopia contributes 80% of the total Nile Flow, but by the 1959 agreement is entitled to none of its resources. Since the early 1990's, Ethiopia has successfully countered Egyptian and Sudanese resistance to water development projects in Ethiopia to increase irrigation and hydroelectric potential.

5.9 CONCLUSION

There can be no debate that the allocations of the Nile River basin (and by extension, also those to the co-riparians of the Kagera River basin upstream) as laid down by the present international agreements are inconsistent with the principles of customary international water law although this in itself does not affect their legal validity). The 1929 and 1959 agreements are the key documents, with some parties considering that these remain relevant in all circumstances. However, recent statements by many of the riparians fiercely contest this, laying the political foundation for refutation of the agreements on the ground that they were unreasonable, as they limited the rights of upstream co-riparians without consultation or the consent of those affected. The succession to the 1929 agreement by the former British colonies is also heavily contested by them on legal grounds.

The two downstream co-riparians (the Sudan and Egypt) are heavily favored by these agreements, to the clear detriment of the eight upstream co-riparians. The challenge is therefore to define the manner in which third-party actors can offer sufficient

inducement for the co-riparians to alter their perception of threat, and their view of the world in which they live.

Egypt is widely documented to be the basin hegemon, having used a range of approaches to attempt to maintain its access to the upstream flows. It is interesting to note that the overall tactics and strategy adopted by Egypt reveal many similarities to those of Israel, although the degree to which Egypt is willing to trigger armed hostilities in response to perceived threats over water resources is perhaps rather less than that of Israel currently. Many of the hydro-political dynamics are driven by posturing and rhetoric, rather than an actual resort to armed force, which is seen to be unsustainable and therefore unlikely in the context of the post-Cold War world of contemporary times.

The Kagera Basin offers a specific element to the general 'texture' of the Nile River Basin as a whole. Thus, it has a history of regime creation and institutional development that can form a valuable foundation for future benefit-sharing scenarios; the upstream riparian states are characterized by relying heavily on endogenous water resources; and the issue of out-of-basin transfers as a right for any sovereign State is at the heart of the overall water problematiue.

The Nile Basin Initiative has attempted to defuse the potential and actual conflicts over water resources in the basin since 1998, with only limited success. Recent categorical statements on water allocations by certain of the upper co-riparians (in both the White Nile and the Blue Nile) show that the problems concerning such allocations have not been solved, and the shifting of the discourse towards benefit-sharing has not been successful in assuaging the concerns of many of the upstream parties.

CHAPTER 6

CONCLUSION

CHAPTER 6

CONCLUSION

Summarising, Geopolitics of transboundary water resource management is a main concern for the political system at the level of the governments (geopolitics, foreign affairs) although the Egyptian water authorities for a long time tried to establish a basin-wide water flow regime. Governmental stakeholders (i.e. ministries, governmental bodies) are much involved in international projects (i.e. Nile Basin Initiative sub-projects). Negotiations regarding transboundary River Basin Management (RBM) are conducted between delegations mainly representing the water sector, the foreign affairs ministry and legal experts. Other ministries can bring in their interest mainly (but still to a limited extent) in the process of national policy making. In Egypt an Ethiopia, international RBM is considered a highly salient issue and the heads of states take a strong personal interest. Links between actors and policies from water management and other sectors like housing, land use planning and agriculture exist on the top levels (cabinet) and have been established more recently on lower levels in policy preparation groups in charge of designing 'national water policies'. Often the links between the sectors are more dependent on the persons in charge than their positions within the institutions. At least in Egypt and Ethiopia there are attempts to integrate policies of different sectors referring to river basins as the appropriate unit. Meanwhile the power balance is shifting towards a less prominent role for Egypt, which can improve the cooperation as it can build on equality. The public at large is not at all involved in transboundary RBM management other than through the laborious Nile Basin Discourse.

From the above it becomes clear that the Nile River Basin regime cannot be characterized as adaptive. Despite the NBI, it is also not expected to become very much adaptive in the near future. The NBI provides an essential step towards a more adaptive regime and contains much of the necessary elements that could be defined as adaptive from the transboundary management point of view. Implementation of the NBI is

ongoing and a definite conclusion on the adaptiveness of the new situation after implementation is consequently not possible.

Judging from the ongoing activities it is concluded that the cooperation between the formal and informal actors in the basin is in progress and could yield much progress underway. The information management seems to be approached in a rather traditional way that will still leave much development into a more interdisciplinary and communicatory approach needed. Also exchange of information is not developing rapidly. The policy development is progressing and contains many impulses towards a more flexible and inter-sectoral approach.

However, not much achievement in implementing these approaches is expected, due to the unbalanced political and socio-economic situation in most of the Nile Basin countries and the huge gap between the existing and desired context. Furthering this, it is not expected that the legal framework will be altered soon. As long as the political setting is not ready for a real transition there will be little determination to change the legal settings.

In transboundary water management it is important to look beyond the watercourse and towards the river basin to capture the benefits of other available water resources beyond the water in the river. Green water provided by direct use of rainfall and atmospheric water should be an integral element in the assessment of potential renewable water resources.

Enhancement of rain-fed agriculture, groundwater use, and use of non-conventional water resources such as re-use of waste-water are essential elements to consider for providing food security and conflict resolution on transboundary water basins. Reasonable and equitable utilization of transboundary basin waters should consider factors such as available water resources at the basin level and at the national level, and the number of population depending on the transboundary water resource in each country. The obligation of no harm to riparian states on transboundary waters should

be emphasized, and prior, historical, or existing uses on transboundary waters should be protected and maintained.

A legislative framework for an international water law should be elaborated to fairly support the above mentioned technical and legal aspects of transboundary water management. It should reflect proper water resources assessment and consideration of consumptive and non-consumptive uses and benefits of water at the national level within the riparian states sharing a transboundary water basin. The Helsinki Rules and the UN Convention are both framework documents that provide useful guidelines for future agreements and policies on the utilization of transboundary waters. However, the scientific community in the engineering and legislative fields needs to contribute more to the enhancement and elaboration of a comprehensive, reasonable and scientific international water law.

Transboundary cooperation on water as one aspect of good water governance will become increasingly important in the future. A global legal framework for cooperation on water exists; yet it lacks binding force in many parts of the world. A variety of factors, ranging from hydrogeographical features of the basin to the socio-political realities and donor commitment, determine the likelihood and eventual shape of transboundary water cooperation.

Cooperative institutional arrangements can be categorized according their purpose and their cooperation intensity, including a greater or lesser transfer of authority to a joint body. It must be recognized that cooperative institutional arrangements in this context cover an extremely broad spectrum, a fact that is not always clear because of the different uses of the term 'institution'. And despite growing attention to and support for this topic, the institutional capacities of transboundary cooperative mechanisms are often weak compared to the challenges they face.

By coming together to jointly manage their shared water resources, countries build trust and prevent conflict. In the face of potential conflict and regional instability, the Nile basin countries continue to seek cooperative solutions.

Cooperation is essential for the effective governance of transboundary water resources. This is because the governance of transboundary water resources requires interaction and trust building between basin states. Law plays an important role in this regard, because it establishes the framework for cooperation. But while the establishment of legal frameworks is critical, progress will only made where, as in the case of Southern Africa, countries deem it to be in their best interests to cooperate in the governance of shared water resources. But even where cooperation is evident, the implementation of the principles of transboundary water governance is bound to face formidable challenges, including turf wars, bureaucratic legal regimes and legal regimes.

However, these challenges can be overcome. Areas in which policy makers and the international community can intervene include giving the national and regional institutions in charge of implementing IWRM more financial resources, and devoting better resources to enhancing the participation of local citizens in reform processes. Better resources and efforts also need to be devoted to the process of promoting cooperation, for example, in the Nile Basin.

For over ten years now, the Nile Basin Initiative has failed to accomplish its primary original goal, which was to form a permanent body to jointly govern and manage Nile waters. The question now is how long all ten countries will remain patient and committed to the difficult process of reaching a consensus in order to form a legal agreement. It is becoming increasingly plausible that frustration with lack of progress may reach its pinnacle, and there is a danger that particular countries may give up on the process. This would be extremely detrimental to the future sustainability of the Nile. Since the initiative has largely failed to involve civil society, it lacks a broad commitment from the community. This creates a rather fragile situation in which the future of dedication towards joint management is placed in small number of hands. The

dependence of Egypt and Sudan compounded with Ethiopia's high level of need distinctly separate these three from the other riparian countries. Widely considered by Nile scholars to be the states most prone to future conflicts over scarce water resources, this is the area, which demands the most immediate attention. Therefore, the most feasible and effective short-term solution may be to focus solely on the rights and needs of these three nations before moving on to address the entire basin. By using a sub-basin approach negotiations can be handled on a smaller scale, which should facilitate agreement and allow these nations to agree upon allocation rights and uses.

The political will to develop a new legal framework for managing the Nile should continue. In principle, the countries of the Nile River basin agree that the situation should change. However, they do not agree on how. To help reach a consensus, they developed the high-level Nile Basin Initiative (NBI) in 1999. Originally designed as a way to share scientific information, the NBI today brings together ministers from the basin countries "to achieve sustainable socio-economic development through equitable utilization of, and benefit from, the common Nile basin water resources," as stated in its shared vision. The NBI has served as a catalyst for cooperation in the search for a new legal framework for the management of the Nile.

However, high-level negotiations like the NBI are not enough; civil society must be involved. Since the inhabitants of a river basin play critical roles in the success of any international agreement, interstate negotiations should also include stakeholders beyond the national governments. Civil society engagement and participation in the development of the Nile basin have been facilitated not only through the NBI's Civil Society Stakeholder Initiative but also through the Nile Basin Discourse (NBD). The NBD's National Discourse Forums, established in each of the basin countries, provide a venue for all the Nile's users to air their expectations and grievances. Through these forums, stakeholders can provide input into development projects along the river basin. The NBD involves a broader array of stakeholders than the traditional state representatives, thus allowing users at the lowest levels including farmers, women's groups, fishers, and

existing community-based organizations, to participate in the development of a legal framework.

In studying the Nile River Basin and the Nile Basin Initiative, most encouraging is the willingness of all the riparian countries to explore and discover new ways in which the Nile can support the local populations. Although at times this means different states are looking in different directions as to what steps should be taken, all of the riparian countries recognize the possible benefits of cooperation. In fact, what is surprising is not that the Nile riparian countries have failed to reach a consensus, but that other river basins have succeeded. Further research on this topic should attempt to differentiate between necessary and sufficient conditions for successful cooperation. This dissertation has looked at some of the ways in which the Nile Basin is developing, how the NBI is currently failing and possible paths toward addressing these issues. The future of the Nile River Basin will depend on finding innovation solutions to the complex problems of integrated basin management.

BIBLIOGRAPHY

(* Indicate the Primary Sources)

- Ahmed, S. (1993), "*Principles and Precedents in International Law Governing the Sharing of Nile Waters*", In Howell, P. P and Allen, J.A. The Nile: Sharing a Scarce Resource. Cambridge: Cambridge University Press.

- Alemayehu, B., F. Hagos, A. Haileslassie, E. Mapedza, S. Gebreselasse, S. B. Awulachew, and D. Peden. (2008), "*Prospects for Payment for Environmental Services in the Blue Nile Basin*", Paper prepared for the CPWF Conference.

- Allan, J. A. (1999), *"The Nile Basin: Evolving Approaches to Nile Waters Management"*, Occasional Paper 20, SOAS Water Issues Group: University of London, UK.

- Alula, Yohannes (2001), "*The Politics of the Nile*", a paper presented to East African Forum cited in http://www.nile politics.htm.

- Amare, G. (1997), "*The Imperative need for Negotiations on the Utilization of the Nile Waters to avert Potential Crises"*, In Proceedings of the 5th Nile Conferences, Addis Ababa, Ethiopia.

- Amare, G. (2000), *"Nile Waters-Hydrological Cooperation v/s Hydropolitics*", Proceedings of the VIII Nile 2002 Conference, Addis Ababa.

- Andjelic, M. (1998), "*Water Resources Management and Flood Monitoring in the Nile River Basin"*, Proceedings of the Regional Workshop on Flood Management and Mitigation in the Mekong River, Vientiane, Laos.

- Andjelic, M. (2000), *"Competitive Bidding for Development of the Nile-DST"*, Guiding Principles to be used and minimum capabilities of the system, First Regional Workshop of the Nile Basin Water Resources Project, Entebbe, Uganda.

- Arsano, Y. (2000), *'The Nile Basin: Upstream Perspective of Cooperation in the New Millennium"*, Proceedings of the VIII Nile 2002 Conference, 26–29 June, Addis Ababa.

- Barret, S. (1994), *"Conflict and cooperation in managing international water resources"*, The World Bank, Washington.

- Bernauer, T. (2002), *"Transboundary Fresh Water Management: When and Why Does It Succeed or Fail?"* UNESCO (ed.), Selected Papers of International Conference 'From Conflict to Cooperation In International Water Resources Management: Challenges And Opportunities'. Delft, Netherlands, UNESCO-IHE.

- Beyene, Tazebe, Dennis P. Lettenmaier, and Pavel Kabat, (2009) *"Hydrologic Impacts of ClimateChange on the Nile River Basin: Implications of the2007 IPCC Climate Change"*, UW Land Surface Hydrology Research Group. <http://www.hydro.washington.edu/SurfaceWaterGroup/Publications/Tazebe_Nile_Aug07.pdf>.

- Beyene, Z. and Wadley, I. L. (2004), *"Common Goods and the Common Good: Transboundary Natural Resources, Principled Cooperation, and the Nile Basin Initiative"*, Breslauer Symposium on Natural Resource Issues in Africa, University of California, Berkeley.

- Blatter, Joachim and Helen Ingram. eds. (2001), *"Reflections on water: new approaches to trans-boundary conflicts and cooperation"*, Cambridge. Mass: MIT Press.

- Block, P., Strzepek, K. And Rajagopalan, B. 2007. *"Integrated management of the Blue Nile basin in Ethiopia: Hydropower and irrigation modeling"*, IFPRI Discussion Paper 700. Washington, DC: International Food Policy Research Institute.

- Cascao, A. (2008), *"Ethiopia-Challenges to Egyptian Hegemony in the Nile Basin"*, Water Policy, 10(2).

- Collins, R.O. (2002), *"The Nile"*, New Haven & London: Yale University Press.

- Collins, R.O. (2003), *"The inscrutable Nile at the beginning of the new millennium"*,http://www.history.ucsb.edu/faculty/Inscrutable%20Nile1.pdf.

- Collins, R.O. (2006), *"Negotiations and Exploitation of the Nile Waters at the end of the Millennium"*, Water International, 31(1).

- Collins, Robert O. (1990), "*History, Hydropolitics, and the Nile: Nile Control*": *Myth or Reality*", in P.W. Allan, *Proceedings of the Conference on the Nile* convened at the Royal Geographic Society and at the University of London (SOAS).

- Collins, Robert O. (1990), "*The Waters of the Nile: Hydropolitcs and the Jonglei Canal"*, Oxford: Clarendon press.

- Conway, D. (2000), "*The climate and hydrology of the Upper Blue Nile River*", The Geographical Journal, 166(1).

- *Council of Ministers of Water Affairs of the Nile Basin States, (2001). (NILE-COM), "*Nile basin initiative shared vision program: socio-economic development and benefit sharing*", Project document.

- Dammaka, Mettaferia. (1994), "*The Nile River, Need for Equitable Use of its Waters*", *Ethiopian Register,* (five serialized articles).

- Daniel, Kendie. (1999), "*Egypt and the Hydropolitics of the Blue Nile River*", Addis Tribune: 7 and 14 August.

- De Silva, J.E., F.N. Correia, and M.C. da Silva, (1998), *"Transboundary issues in waterResources"*, In Correia, F.N. (ed.), Selected issues in water resources management in Europe, Volume 2, Balkema, Rotterdam, The Netherlands.

- Development Forum/DES (1998), "*International Round Table: Transboundary Water Management – Experience of International River and Lake Commission"*, Berlin. (Taken from <http://www.thewaterpage.com/berlinrecom.htm>).

- Dinar, Areil, Alemu, Senai. (2000), *"The Process of Negotiation Over International Water Dispute: The Case Study Of Nile Basin"*, International Negotiation Vol. 5, No. 2.

- El Monshid, Badawi E.F. *et al,* (1997), *"Environmental Impact of the Blue Nile Sediment on Reservoirs and Irrigation Canals, in Ethiopia*", Ministry of Water Resources 1998, *Comprehensive Water Resources Development of the Nile Basin: Basis for Cooperation*, Proceedings of 5th Nile 2002 Conference, Addis Ababa.

- El Zain, Mahmoud. (1997), "*Development Priorities for the Nile Basin Countries: What Difference can the Nile Basin Initiative make*?", paper presented at the 5th Nile 2002 Conference, Addis Ababa 24-29 June.

- El-Fadel, M., Y. El-Sayegh, K. El-Fadl, and D. Khorbotly. (2003), *"The Nile River Basin: A Case Study in Surface Water Conflict Resolution"*, Journal of Natural Resources Life Science and Education, 32.

- Erlich, Haggai (2000), "*Egypt, Ethiopia and 'The Abyssinian Crisis', 1935-1936*", in Erlich, Haggai & Israel Gershoni, (eds), The Nile: Histories, Cultures, Myths, Lynne Rienner Publishers, Boulder/London.
- Erlich, Haggai (2002), "*The Cross and the River: Ethiopia, Egypt, and the Nile*", Lynne Reinner publishers, Boulder, Colorado.

- Ethiopia, MWR, Ministry of Water Resources. (2000), "*A Short Report on the Process of Cooperation of the Nile Basin Countries*", Consultative Workshop on the Nile Basin, Debra Zeit, Ethiopia.

- Gathaju, Devis. (2006), "*The Nile Basin*", World Today, Vol. 62, No. 8-9.

- Girma, Amare. (1997), "*The Imperative Need for Negotiation on the Utilization of the Nile Waters*", A paper presented at the 5th Nile 2002 Conference, 24-26 February.

- Girma, Amare. (2000), "*Nile Water Hydrological Cooperation v/s Hydropolitics*", A paper presented at the 8th Nile 2002 Conference, 24-26 June.

- Gleick, P. (1994), "*Water Wars and Peace in the Middle East*", Policy Analysis, 36 (4).

- Gleick, P. (2000), "*The World's Water: 2000–2001*", Washington, D.C.: Island Press.

- Godana, Bonaya Adhi. (1985), "*Africa's Shared Water Resources: Legal and Institutional Aspects of the Nile, Niger and Senegal River Systems*", Frances Pinter, London.

- Hailu, Wolde Amanuel. (1997), "The Headwaters of the Nile Basin: Toward a Concerted Action for Integrated Development, Preservation and Conservation", Paper presented at the 5th Nile 2002 Conference, Addis Ababa, February.

- Hamad, Osman El Tom and Atta El Battahani, (2005) "*Sudan and theNile Basin*", *Aquatic Sciences, Research Across Borders*, vol. 67, No.1, Swiss federal Institute of Environmental Science-EAWAG.

- Hecht, Dorothea Elizabeth. (1986), "*Ethiopia Threatens to Block the Nile*", Azania; The Journal of British Institute in Eastern Africa.

- Hefny and I. Tamrat, (2005), "*Sustainable Development and International Cooperation in the Eastern Nile Basin*", *Aquatic Sciences,* 67.

- Hefny, M. and S. E. D. Amer, (2005), "*Egypt and the Nile Basin*", *Aquatic Sciences,* 67.

- Henderson, Conway W. (1998), "*International Relations: Conflict and Cooperation at the Turn of the 21st Century*", Boston: Mcgraw-Hill.

- Heyns, P. (2003), "*Water Resource Management In Southern Africa*", in Nakayama, M. (ed.). International Waters in Southern Africa. Tokyo United Nations University Press.

- Howell, P. and Allan, J. A. (1994), "*The Nile: Sharing scarce resources: A historical and technical review of water management and of economic and legal issues*", Cambridge, New York: Cambridge University Press.

- Hurst H.E. (1957), "*The Nile: A General Account of the River and the Utilization of Its Waters*", Constable, London.
- Johnston, Sir Herry. (1903), "*The Nile quest. A record of the exploration of the Nile and its basin*", London.
- Kagwanja, P. (2007), "*Calming the waters: the East African community and conflict over the Nile resources*", Journal of Eastern African Studies, 1(3).
- Kendie, D. (1999), "*Egypt and the hydro-politics of the Blue Nile River*", Northeast African Studies, 6(1-2).
- Knobelsdorf, V. (2006), "*The Nile Waters Agreement: Imposition and impacts of a Transboundary Legal System*", Columbia Journal of Transnational Law, Vol. 44, Issue 2.
- Laki, S.L. (1998), "*Management of Water Resources Of The Nile Basin*" International Journal Of Sustainable Development And World Ecology, 6.
- Le Marquand, D. (1976), "*Politics of International River Basin Cooperation And Management*", Natural Resource Journal 16.4.
- Ludwitg, Emil. (1936), "*The Nile, The story of a River from the source of Egypt*", Wnwin Brothers Ltd London.
- M. El, Fadel. (2003), "*The Nile Basin: A Case Study in Surface Water Conflict Resolution*", Journal of Natural Resources and Life Sciences Education.
- Mageed, Yahia. (1994), "*The Nile Basin: Lessons From The Past*", In Biswas, Asit, ed. International water of the middle east. Oxford: Oxford University Press.

- Mason, S. (2005), "*Riparian Perspectives of international cooperation in the Easstern Nile Basin*", *Aquatic Sciences*, 67.

- Mason, S.A. (2003), *"From conflict to cooperation in the Nile basin"*, Thesis, Center for Security Studies, Swiss Federal Institute of Technology, Zurich, Switzerland, ISBN:3-905641-95-X.

- Metawie, Abdel F. (2004), *"History of Co-operation in the Nile Basin"* International Journal of Water Resources Development, 20.

- NBI, (Nile Basin Initiative), (2002), "*Nile Basin Act*", www.faolex.fao.org/docs/pdf/uga80648.pdf (accessed 29 March 2010).

- Nebiyu Dagne, *et.al.* (1998), "*Towards a Cooperative use of the Nile: a Legal Perspective*", Cambridge Review of International Affairs, 12:2.

- Nicol, A. (2002), "*The Dynamics of River Basin Cooperation: The Nile and Okavango Basins"*, In Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin (Turton, A.R., Ashton, P.J. and Cloete, E., Eds.).

- Nicol, A. (2003), *"The Nile: Moving Beyond Cooperation"*, With additional material from M. Shahin. UNESCO Technical Documents in Hydrology, PC-CP Series, No. 16. UNESCO, Paris.

- Nicol, A. (2005), "*Concept of Benefit Sharing as Applied to the Nile River Basin*", World Water Week, Stockholm, SIWI Seminar on benefit sharing from integrated land and water use in river basins.

- Nile Council of Ministers (1999), *"Policy Guidelines for the Nile River Basin"*, Strategic Action Program, 22 February, Dar-es-salam.

- Nile Council of Ministers (2001), *"Nile Basin Initiative, Shared Vision Program: Confidence Building and Stakeholder Involvement, Project Document"*, Nile-Sec., Entebe.

- Okidi, O. (1995), *"History of the Nile and Lake Victoria Basins through Treaties"*, in Howell, P.P and Allen J.A. (eds). The Nile: Sharing a Scarce Rresource. Cambridge, Cambridge University Press.

- Okot, A.O. (2003), *"What is the Law that Governs the Management of the Nile Water Resources?"*, Master's Degree thesis, CEPMLP, University of Dundee, Scotland.

- Okoth-Owiro, A. (2004), *"The Nile Treaty: State Succession and International Treaty Commitments: A Case Study of the Nile Water Treaties"*, Konrad Adenauer Foundation, Nairobi, Kenya.

- Panel of Experts, NBI (1999), *"Nile Basin Cooperative Framework: Draft of the Cooperative Framework Version 2"*, Imperial Ethiopian Government, Addis-Ababa, Entebe.

- Rangeley, A. *et al.* (1994), *"International River Basin Organizations in Sub-Saharan Africa"*, World Bank Technical Paper 250, World Bank, Washington D.C.

- Raphaeli, Nimrod. (2004), *"Rising Tensions over the Nile River Basin"*, The Middle East Media Research Institute.

- Sadoff, C.W. and Grey, D. (2002), *"Beyond The River: The Benefits Of Cooperations in the International Rivers"*, Water Policy, 4.

- Sadoff, C.W. and Grey, D. (2005), *"Cooperations Of International Rivers: A Continuum For Securing And Sharing Benefits"*, Water International:30(4).

- Shady, A.M. and Adam A.M., Ali, Mohamed Kamal. (1994), *"The Nile 2002: The Vision Towards Cooperation In The Nile Basin"*, Water International:19(2).

- Shahin, Mamdouh. (2002), "*Hydrology and Water Resources of Africa*", Springer.

- Sudan, Ministry of Irrigation & Hydroelectric Power (1955), "T*he Nile Waters Question, The Case for the Sudan, The Case of Egypt and the Sudan's Reply"*, Sudan Survey Department, Khartoum.

- Swain A. (2002), *"The Nile River Basin Initiative: Too many cooks too little broth*", SAIS Review, Vol. XXII, No.2.

- Swain, A. (2004), "*Managing Water Conflict – Asia Africa and the Middle East"*, Routledge, London.

- Swain, Ashok. (1997), "*Ethiopia, the Sudan, and Egypt: The Nile River Dispute*", The Journal of Modern African Studies. 35:4. Swiss Federal Institute of Technology 2001 "Case-Study: Southeastern Anatolia" Project cited in online.

- Swain, Ashok. (2008) *"The Nile River Basin Initiative: Too Many Cooks, Too Little Broth"*, SAIS Review Summer-Fall XXII (2002), Project Muse.

- Swain, Ashok. (2008), *"Mission Not Yet Accomplished: Managing Water Resources In The Nile River Basin"*, Journal of International Affairs, 61.

- Swatuk, L.A. and Wirkus, L. (2009), *"Transboundary Water Governance In Southern Africa: An Introduction"*, in L.A. Swatuk and Wirkus (eds), Transboundary Water Governance In South Africa- Examining Unexplored Dimensions, BICC/DCAF series on Sustainable Peace And Global Security Governance No. 2, Nomos Verlag, Baden-Baden.

- T, Tafesse. (2001), *"The Nile Question: Hydropolitics, Legal Wrangling, Modus Vivendi and Perspectives"*, London, Transaction Publishers.

- Tesfaye, Tafesse. (2000), *"The Hydropolitical Perspective of the Nile Question"*, a paper peresented at the eighth Nile 2002 conference, Addis Ababa, 26-30 June.

- The World Bank. (2008), *"Nile Basin Initiative"*,<http://web.worldbank.org/wbsite/external/countries/africaext/0,,contentmdk:20267231~menupk:538759~pagepk:146736~pipk:226340~thesitepk:258644,00.html>.

- Theroux Peter, (1997), *"The Imperiled Nile Delta"*, National Geographic, Vol.35, No.4.

- Timmerman, J.G. (2005), *"Transboundary River Basin Management Regimes: The Nile Basin Case Study"*, RIZA- Institute for Inland Water Management and Waste Water Treatment.

- Trolldalen J. M. (1992), *"International Environmental Conflict Resolution: The Role of the United Nations"*, World Foundation for Environment and Development, Washington D.C.

- Turton A.R. and Ohlsson L. (1999), *"Water Scarcity and Social Stability: towards a Deeper Understanding of Key Concepts Needed to Manage Water Scarcity in Developing Countries"*, Occasional paper, SOAS, London UNESCO Water Portal: http://www.unesco.org/water/.

- Turton, A.R. (2002b), *"Water and State Sovereignty: The Hydropolitical Challenge for States in Arid Regions"*, In Conflict Prevention and Resolution in Water Systems (Wolf, A. Etd.), Edward Elgar, Cheltenham, England.

- Tvedt, Terje. (2004), *"The River Nile in the Age of the British: Political Ecology & the Quest for Economic Power"*, I.B. Taurus, London.

- *UNEP (2002), *"Atlas of International Freshwater Agreements"*, United Nations Environment Programme, Nairobi.

- United Nations (1997), *"United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses"*, United Nations General Assembly, A/RES/51/869.

- UN-Water. (2008), *"Transboundary Waters: Sharing Benefits, Sharing Responsibilities"*, Zaragoza, Spain, UN-IDFA.

- Van Steenebergen, F. (2001), *"Transboundary Water Management as an International Public Good, in Water Security for Cities, Food and Environment-towards Catchment Hydrosolidarity"*, Proceedings of a SIWI Seminar, Stockholm.

- Varris, Olli. (2000), *"The Nile Basin in a Global Perspective: Natural, Human, and Socio-Economic Resource Nexus"*, Water International, 25.

- Waterbury, J. (1979), "*Hydropolitics of the Nile Valley*", Syracuse University Press, Syracuse, New York.

- Waterbury, J. (2003), "*The Nile Basin: National Determinants of Collective Action*", Yale University Press, New Haven and London.

- Waterbury, J. and Whittington, D. (1998), *"Playing Chicken on the Nile?"*, The implications of microdam development in the Ethiopian highlands and Egypt's New Valley Project. Yale F&ES Bulletin, 103.

- Waterbury, John. (1990), *"Legal and Institutional Arrangements for Managing Water Resources in the Nile Basin"*, The Middle East and North Africa: Essays in Honor of J.C. Hurewitz. New York: Middle East Institute, Columbia University.

- Waterbury, John. (1997a), *"Is Status Quo In The Nile Basin In The Nile Basin Viable?"*, Brown Journal of World Affairs.

- Wegerich K. (2001), *"Institutional Change: a theoretical approach*", Occasional Paper No. 30, SOAS, London.

- Whittington, D. and McClelland, E. (1992), *"Opportunities for Regional and International Cooperation in the Nile Basin*", Water International, 17 (3).

- Whittington, D., Waterbury, J. and McClelland, E. (1995), *"Toward a New Nile Water Agreement"*, In *Water* Quantity/Quality Management and Conflict Resolution: Institutions, Processes, and Economic Analyses (Dinar, A. and Loehman, E.T., Eds Praeger, Amsterdam.

- Williams, M.A.J. and Williams, F. (1980), *Evolution of Nile Basin.* In M.A.J. Williams and H. Faure (eds), The Sahara and the Nile, Balkema, Rotterdam.

- Wolf A.T. (2002), "*Conflict Prevention and Resolution in Water System*", in C.W, Howe. (Eds.), *The Management of Water Resources Series*, Elgar, Cheltenham.

- Wolf A.T., Natharius J.A., Danielson J.J., Ward B.S. and Pender J.K. (1999), "*International River Basins of the World*", International Journal of Water Resources Development, 15 (4).

- Wolf A.T., Stahl K. and Macomber M.F. (2003), "*Conflict and Cooperation within International River Basins: The Importance of Institutional Capacity*", in Water Resources Update, Vol. 125. World Bank, Nile Basin Initiative:World Water Council: http://www.worldwatercouncil.org/.

- Wolf, A. and Hamner, J. (2000), "*Trends in Transboundary Water Disputes and Dispute Resolution*", In Environment and Security, Discourses and Practices (Lowi, M. and Shaw, W.D., Eds.). MacMillan Press, London.

- World Bank. (1993), "*Water Resources Management: A World Bank Policy Paper*", Washington, D.C.: World Bank, 1993.

- Yacob Arsano, and Imeru Tamrat, (2005), "*Ethiopia and the Eastern Nile Basin*", *Aquatic Sciences*, 67.

- Yacob, Arsano. (2000), "*The Nile Basin: Upstream Perspective of Cooperation in the New Millienum*", A paper presented at the Nile 2002 Conference, Addis Ababa, 6-30 June.

- Yacob, Arsano. (2001), "*Legal and Institutional Predicaments of Cooperation in the Nile Basin*", A paper presented at the Seminar Organized by the Center for Security Studies and Conflict Research, Zurich 30th January.

- Yacob, Arsano. (2001), "*The Nile Basin: Predicaments of Upstream-Downstream Cooperation, Prospects for the 21st Century*", A paper sumitted at IWHA Conference, held at the University of Bergen, Bergen, Norway.

- Yoffe, S.B. (2001), "*Basins at Risk: Conflict and Cooperation over International Freshwater Resources*", Ph.D. dissertation, Department of Geosciences, Oregon State University, Oregon.

- Yoffe, Shira B. and Aaron T. Wolf, (1999), "*Water, Conflict and Cooperation: Geographical Perspectives*", in Baev, Pavel and Anthony Mc-Dermott, (eds,) Cambridge Review of International Aff airs, *Vol. 12, No. 2*, Spring/Summer 1999.

- Yohannes, Alula. (2008), "*The Politics of the Nile*", Media ETHIOPIA, Ethiopia. <http://www.ethiopians.com/abay/nilepolitics.html>.

- Zeitoun M. (2005), *"Hydro-hegemony: Power, Hydrology and Hydraulics in the* Middle *East and North Africa"*, Paper developed for the hydro-hegemony workshop, King's College, London.

- Zewdie, G Selassie. (2005), *"International Problem of the Nile Basin"*, Forum for Social Studies (FSS), Addis Ababa.

- Zewdie, G. Sellassie. (2000), "*The Nile Question in a New era of Cooperation among Riparian States*", proceedings of the Nile 2002 Conference, Addis Ababa, 28 June 2000.