# GEOPOLITICS OF NIGER RIVER BASIN: CONFLICT AND COOPERATION

*Dissertation submitted to Jawaharlal Nehru University*
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**MASTER OF PHILOSOPHY**

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## DECLARATION

I do hereby declare that the dissertation entitled, "**Geopolitics of Niger River Basin: Conflict and Cooperation**" submitted by me in partial fulfillment of the requirements for the award of 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 of any other university.

Mohd Firoz Ahamed

## CERTIFICATE

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

21/7/11

**PROF. SWARAN SINGH**
Chairperson,

**DR. S. S. DEORA**
Supervisor 21.7.2011

*DEDICATED*

*TO*

*MY GRAND PARENTS*

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Last but not the least; I take the responsibility for all the errors and mistakes that might have been committed.

Date:

Mohd Firoz Ahamed

Place: New Delhi

# LIST OF ABBREVIATION

| | |
|---|---|
| CPWF | Challenge Programme on Water and Food Economy |
| FAO | Food and Cultural Organization |
| GDP | Gross Domestic Product |
| ICJ | International Court of Justice |
| IWMI | International Water Management Iinstitute |
| JIA | Joint Irrigation Authority |
| JPWC | Joint Permanent Water Commission |
| LCBC | Lake Chad Basin Commission |
| LHDA | Lesotho Highlands Development Authority |
| LHWC | Lesotho Highlands Water Commission |
| NBA | Niger Basin Authority |
| NNJC | Nigeria-Niger Joint Commission for Cooperation |
| OCDE | Organization of the Cooperation and Development |
| ORASECOM | Orange/Senqu River Commission |
| SDAP | Sustainable Development Action Program |
| UNDP | United Nations Developmental Programme |
| UNEP | United Nations Environmental Programme |
| WCMC | World Conservation Monitoring Centre |
| WMO | World Meteorological Organization |
| WRI | World Research Institute |
| WWF | World Wildlife Fund |
| ZAMCOM | Zambezi Watercourse Commission |
| ZRA | Zambezi River Authority |

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# PREFACE

The present work is intended to understand and analyze the geopolitics of Niger River Basin. This study is presented to explore all those geopolitical issues of River Niger basin which play the key role in affecting the regional structure. These issues are also taken into consideration to visualize the hydro-dynamics of this region with its identities on the world geopolitical map of world.

How does a set of ten countries share the territorial portion of the specific basin of River Niger of West Africa and at what point and on what issues they quarrel with each other?, how they resolved the consequent conflicts and crisis are the questions which comes into the mind of a student of geopolitics. These questions generate attraction and curiosity to know more about the region and its geopolitics.

This research work has come out only in search of these answers. There is already a hypothesis in scholar's mind before research in detail. It seems that western Africa due to its harsh climate encompassing the aridity of desert of Sahara, and their colonial history has witnessed a situation of conflicts over natural resources of Niger basin which modify the geopolitics of basin. Regional cooperation among countries is due to their similarities in socio-economic environment.

To fulfill these objectives it has been tried to show the regional background and geopolitics of basin in a means of systematic distribution of topics in chapters in a sequential order.

Our first concern is on general concepts of geopolitics and river basin. What these concepts are? and how these two concepts are linked to each other ? is shown in very beginning of this work.

This is the first chapter which explains river basin concepts in detail, its definitions, genesis, and evolution as a unit for development examined. Other section of the same chapter features out the elements of geopolitics. The evolutionary path of development of geopolitical theories has been covered through this chapter. Implication of geopolitics in

river basin has also been discussed with the example of major river basin of Africa. This Chapter also describes African River basin disputes and trans boundary conflicts of regional states with citation of major river basins of continent and their associated problems.

Moving from this step, in the second chapter our study area has been introduced. The region of Niger basin with its geography and riparian countries and their salient features has been conceptualized. This chapter focuses on general geography of countries located in Niger River basin. Location, area, general demography of countries sharing the river Niger is the theme of this chapter. The issues of geopolitical conflicts among riparian states of Niger basin and process of resolving it are the main concerns of our exploration.

Water resource utility, irrigation and sustainability of environment are the major concern of third chapter. Chapter has tried to explore the rain fall condition, surface runoff in the region irrigation and cropping pattern. Sustainability of ecosystem is the important objective of this section of study.

The fourth chapter draws the nature of conflicts and disputes of among basin countries. Causes, types and Issues of conflict have been pointed out through this chapter. This chapter also examines the process of resolution of these disputes through institutions and other means.

Conclusion is the last section of our study which is overall assessment of this work. The major findings and outcome is extracted out in this conclusive chapter.

While working on this topic we lack systematic data in support of geopolitical process running in the basin, However A few pioneering collaborative projects have collected aggregate statistics on our subject of study most specifically project done by FAO, WORLD BANK, CPWR are very useful to provide data on water resource, rainfall, irrigation and cropping pattern of study area.

The study is generally based on secondary sources. The thought, views, arguments of various authors and eminent scholars on this topic is widely analyzed.

Methodology of this research is analytical and descriptive. However statistical technique has been adapted in tabulation of data of various facts about area, density, cropping pattern, distribution of rain fall, water availability, surface runoff condition and flows which are scattered in all the chapters of this research.

Maps are there to show the characteristics of basin area and its attributes. The numerical value of our data and the characteristics feature of region have also been represented with the help of diagrams.

It would be better in very beginning to confess that this research like other researches in academics may not be ever conclusive it is always tentative. Obliviously there might be some faults and mistakes in this dissertation and it is me who will responsible for that.

Mohd Firoz Ahamed

# CHAPTER 1

# RIVER BASIN, GEOPOLITICS AND GEOPOLITICS OF RIVER BASIN: CONCEPTUAL FRAME WORK

## Introduction

On this planet, Rivers have been very important and use full for humanity. Since very early times, its water has been providing for sustenance. It has been used to slake the thirst of an individual and to make their land irrigated and fertile. Rivers have also been utilized as a way of communication and transportation. The rivers have been a good medium for goods and people exchanges from one place to another in those days when the technology was not as rich as it is today. Civilization has also enhanced due to exchanges of culture.

However it's also true that rivers have sometime become the causes for misery and unhappiness for millions of people throughout the human history. With the medium of floods they destroy the human lives and property but it should also keep in mind that flood is not the continuous phenomenon. It caused once in a several years. Rivers are continued to be used as a drinking source, in industries as well as fertilizing land resources. For the formation of electricity rivers are very use full today. Therefore the benefit which is caused by rivers is so great than the damages which are confer on rivers.

With the virtue of their path they crossed and the tributaries which meet to them, rivers form the basin and catchment area. These rivers basin has been the cradle for civilization since early history. Like Nile, Indus etc. these river basin has been formed in the flood plain and very fertile for agricultural growth. These landscapes later modified as a political spaces. This political formation cannot be free from geopolitical influences of the time which occupied the land and resources of geographical area. Geopolitics of earlier world can be observed in these river basins through their mutual interaction in historical ages. We can enthusiastically watch a play of conflicting interests of the riparian states actor on this stage of river basins. The story covers a wider range of issues from boundary demarcation to infrastructure building. A process of conflict and cooperation has become the salient feature

among the neighboring nations.

Therefore In modern time River basin attracts more attention of scholars from diversified field. It provides the basic unit of study for spatial growth and development, Resource management of catchment area and a way of resource utilization with the adjustment of environment. It has always been a space of larger population settlement. The relations of state in the water basin are the subject to adjustment and distribution of water resources on shared manner.

This chapter has been selected to present a over view on geopolitical concepts and its relation to river basin. It started with definitions of each concept and ended with the case studies of river basins of Africa. Divided into segments as definitions, concepts, elements and implications of river basins, geopolitics and geopolitics of river basins are the prime this chapter has tried to build a back ground on further research studies.

**Defining the River Basin**

Everyone lives in a river basin. Even if we don't live near the water, we live on land that drains to a river or estuary or lake, and our actions on that land affect water quality and quantity far downstream. When the flow of river nourishes a segment of land from its origin to its mouth then whole drained land is known as a river basin. The dictionary defines "river basin" as the area of land drained by a river and its[1] branches, or tributaries, and traces its usage in English back to the last quarter of the 19th Century. A River basin is the portion of land drained by a river and its tributaries[2]

It encompasses the entire land surface dissected and drained by many streams and creeks that flow downhill into one another, and eventually into one river. The final destination is an estuary or an ocean. As a bath tub catches all the water that falls within its sides, a river basin sends all the water falling on the surrounding in land into a central river and out to the sea.[3]

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[1] Office of environmental education and public affair north Carolina
[2] Office of environmental education and public affair north Carolina.
[3] Environmental information center India.

Other terms that are used to describe a drainage basin are catchment, catchment area, catchment basin, drainage area, river basin, water basin and watershed. Rivers form a hydrological mosaic, excluding Antarctica there are an estimated 263 international river basins covering 45.3% of the land surface area of the earth.[4]

Out of these basins about 26 international basins are considered as most important on world map. Like Yukon, Mackenzie, Nelson, Mississippi and Saint Lawrence in North America. In Africa and west Asia Niger, Lake Chad basin, Congo, Nile, Zambezi, orange, Euphrates and Tigris are considered to be important. Amazon and Paraná are included in South America, Danube in Europe. In Asia and Australia the list of river basins are much more and among those Volga , Ob, Yenisei, Lena, Kolyma, Amur, Ganges, Brahmaputra, Yangtze Murray darling, hang he and Indus are listed.[5]

Therefore the river basin concept is, in itself, a precautionary principle, capable of sustaining us in the 21st Century, soundly established in theory and gaining in practice.

**The River Basin: A conceptual analysis**

The origin of the concept of river basin can be traced back in the literature of French scholar P. Buache, who was the official geographer of Louis Xiv th. This scholar has utilized the concept of "river basin" to divide the whole earth tracing watersheds or water divides. However it was so successful among the geographers and the river basin became the essential unit for geographers in the way regional subdivision was apprehended. The notion returned in the field of river Geo-morphology in English-speaking countries, and, following the early work by W. M. Davies, it was the research by R. E. Horton and later R. J. Chorley that diffused what then came to be referred to in scientific literature the "drainage basin" for the British and the "watershed" in US English.[6] The two concepts, it is true, are closely linked, since the parting lines delineate the drainage basin and form its boundary.

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[4] UNEP, WCMC, WRI; AAAS, Atlas of Population and Environment, 2001.
[5] UNEP, world conservation monitoring Centre (WCMC), world resource institute (WRI).
[6] Laurent Touchart drainage basin "hypergeo" page-1

However modern notion of the concept of river basin has drawn its views from the recent development in science and technology in the field of water resource management and regional growth. A theoretical application for integrated river basin was tried to build as a unit for water management.

This concept of river basin as a unit of water resource management was spurred at the beginning of this century by three factors: 1) improved technology in building concrete dams; 2) fear of the reckless depletion of many natural re- sources, including water; and 3) horrendous industrial pollution of rivers and lakes.[7] Construction of large dams permitted the harnessing of watercourses for several different purposes simultaneously. Power production, water supply, and irrigation utilized the natural interconnectedness of waters within a river basin more efficiently.

With the growth of river basin concept and its utility as a unit in the development engineers have also taken interest in it with the notion of river basin development in two ways first, they and their associates in the field of meteorology, geology, and soil science are responsible for the collection of the physical data of region which tell how much water are there is in the basin under consideration and how that water is distributed. Secondly, when these facts are known or can be estimated with reasonable accuracy, engineers try to plan a design to operate structure and control the water for the benefit of man.

To study the field engineers generally rely on following data sources, hydrological cycle, availability of water resources in the basin, precipitation, geological survey, stream flow analysis etc. engineers also try to control the problems which are related with water use and supply, domestic and industrial water supply, navigation, flood control, water power, irrigation, drainage, soil degradation, conservation and multipurpose project. So, the engineers' role in river basin is very important. From hydrological survey to construction, and operation of water-control works their works are valued much.

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[7] For a comprehensive history of the river basin concept, see, l. Teclaff, the river basin in history and law (1967)

While discussing the background of river basin development an analyst cannot neglect the role of geographers. Geographers have contributed much in this field. Geographical analysis is always needed in making the strategy of river basin development.

It begins in the Lower Mekong but then expands its view to other basins where geographers have taken a hand. The geographer may help correct this myopia by two types of studies. In his efforts to find homologue among the immensely diversified patterns of the Earth's surface he can identify situations which are similar to the basin under study. Thus, the arid homo climates of Meigs (Meigs, 1952), and the mapping of indices of economic development (Ginsburg, 1960),

Geographers have been involve in various projects of river basin in all the area of river basin management but most specifically their role can be categorized in the field of recommended investigations, Cooperative investigations, Strategies of river development, Resource estimates, Economic efficiency. Mapping spatial linkages, social guides and limitations, human and environmental consequences are the area where geographers are rich in their perception.

Now the environmental concern is widely associated with the concept of river basin in this technical world. Especially the concept of preserving and restoring habitat have given a new focus to the river basin and emphasized its true nature. The fact that a recent framework treaty for protection of signing of a pair of international agreements, which had been stalled in negotiation for the past quarter of a century, is evidence of the latest trends in state practice.

**Defining Geopolitics**

The term "Geopolitics" is nearly hundred years old. It was coined by Swedish political

scientist and conservative politician Rudolf Kjellen in the year 1899 and later it was extended by K. Haushofer from 1924 as an "applied science". During world war second it further enhanced as an instrument of politico-military training in morale. Term geopolitics was used to describe the broad relationship between geography, states, and world-power politics. It has been defined by the range of connotation from organic views of state to critical theory However twenty three centuries before the word "geopolitics" was coined Aristotle discussed many question we would classify as geopolitical. He considered the natural environment from the point of view of (a) its impact on human characters (b) its implications for the economic and military necessities of the ideal state.[8] Aristotle seems to be deterministic while explaining the relationship between natural environment and human being. Conventionally the conceptions of geopolitics were dominated as a unique form of knowledge or a power that sought to analyze the condition of world power in order to aid the practice of statecraft by great powers.

As we know that the term geopolitics has a wider connotation in its application where it shows a political manifestation through the geographical territories and geographical process. this views of utility of political processes in geographic perspectives are defined by various scholars as Leonhardt van Efferink (January 2009) who mentioned in his article "definitions of geopolitics" with analysis of scholars from classical to modern. Cohen (2003), notes that intellectuals such as Aristotle, Montesquieu, Kant, Hegel and Humboldt already had an understanding of Geopolitics. Nonetheless, Geopolitics as a concept emerged much later (Dodds and Atkinson, 2000): "Geopolitical thought emerged at the close of the nineteenth century as geographers and other thinkers sought to analyze, explain and understand the transformations and finite spaces of the world."

Kjellen (Swedish citizen, 1864-1922) was the first who coined the concept of Geopolitics in 1899 (Cohen, 2003), as: "the theory of the state as a geographical organism or phenomenon

[8] For a general survey of the geographical concepts in the ancient world see E. H. Bunbury page-15

in space"

This definition contains two elements that are crucial within the concept of geopolitics: power (influence, politics) and space (territory, soil). The central role for the state as only powerful entity is very typical for the definition of Kjellen. Cohen used this definition as "Geopolitics is the analysis of the interaction between, geographical settings and perspectives on the one hand, political processes. On the other hand .Both geographical settings and political processes are dynamic, and each influences and is influenced by the other. Geopolitics addresses the consequences of this interaction."

This definition focuses on the dynamic interaction between power and space. on the other hand a modern scholar Collin flint extensively discussed the historical development of the concept of Geopolitics. He noted that power has always had a central role in the definition, although its meaning has been subject to several changes:

"Geopolitics, the struggle over the control of spaces and places, focuses upon power. In nineteenth and early twentieth century geopolitical practices, power was seen simply as the relative power of countries in foreign affairs. In the late twentieth century, definitions of power were dominated by a focus on a country's ability to wage war with other countries. However, recent discussions of power have become more sophisticated."

Flint further stressed the need to define Geopolitics in various ways:

"So how should we define geopolitics, in the contemporary world and with the intent of offering a critical analysis? Our goals of understanding, analyzing, and being able to critique world politics require us to work with more than one definition."

He notes that "geopolitics is a way of 'seeing' the world" and disagrees with those geopolitical analysts that pretend that one individual can fully understand the world. He further remarked that feminists disapproved the partial, colored world views of male, white and rich theorists.

Finally, Flint mentioned a relatively new school within Geopolitics: "Critical Geopolitics". This school focuses on the underlying assumptions of geopolitical analyses: "the practice of

identifying the power relationships within geopolitical statements."

In analysis of these definition of geopolitics shows the changes in its approaches as well scope of the subject matter to deal with. From German scholars to modern critical geopolitics a larger ideological aspect are associated with them. A realist perspectives and strategic as well as security analysis are the view point of realist scholars in early 20th century. Later the notion has covered the modern issues and direction of geopolitics. Post modernist scholars are much concentrated on the recent ideologies such as feminism, constructivism and deconstrutivism and critical theory.These changes are very much important in influencing the conceptual dynamism of geopolitical concepts.

**Geopolitics: A Conceptual Analysis**

While discussing the concept of geopolitics its necessary to draw the picture of Ratzel and his contribution in our mind Haushofer always considered Ratzel and his theories of movement as the direct source of concepts of geopolitics. But Ratzel was not an isolated figure. He grew up with the neo-naturalism and positivism which developed from the evolutionary theories of the great biologists Lamarck and Darwin. In the sphere of biology these led to the monism of E. Haeckel. But two West European thinkers, August Comte, the founder of sociology, and Herbert Spencer, transferred them to social life, in which they saw social phenomena as the creation not of the human spirit hut of the biological organic world. In the transference of these theories from biology to sociology lies the origin of Ratzel's theories and of the predominance of the environment in earlier geographical thought.

Only with difficulty can Ratzel be held responsible for the use made later of his ethnography and anthropo geography.[9]

The real beginning of the concept of geopolitics can be taken from 1924. with the appearance of Zeitschrift fiir Geopoliti. While Kjelle'n define it "a science which treats of the State as a geographical organism or a spatial phenomenon," Haushofer wished to make it

[9] G. R. Crone A German View of Geopolitics: Review page no.107

an application of geography to politics requiring not only knowledge but art- "the ways which lead from the strong but rather static scientific citadel of political geography to the dynamic art of geopolitics." very interestingly few scholars like Lautensach, Mortensen, Schrepfer have examined that the concept of political geography is static, while that of geopolitics is dynamic.

Debates among the geopolitical schools are noted in this discussion. German schools were seems to be pioneer in delivering the modern concept of geopolitics. A german school is represented by scholars like Ratzel, Kjellen and Haushofer. Haushofer attracted a series of colleagues from among scientific geographers O. Lautensach, K. Sapper, F. Termer, H. Hassinger in his school. Later on ward the German geopolitics due to its organic conception criticized by other schools. The important name in American school of geopolitics is the Alfred Thayer Mahan, Homer and lea, Mitchell, General William, Sparkman and Renner etc.

Following the path of departure from deterministic notion of the concept of geopolitics which seems to be find in Aristotle and Jean Bodin as well as in Social Darwinism of Ratzel who has left a score of followers behind, possibilism has emerged a current notion of scholars of later period.

The contemporary geopolitical schools have, in general, abandoned the idea that the geographical environment can determine to any significant extent the nature of modern man and have, consequently, concentrated their attention on the prudential dictates of the environment. In other words, the modern geopolitician does not look at the world map in order to find out what nature compels us to do but what nature advises us to do, given our preferences.[10]

However the perspectives of modern geopolitical thought cannot be absolutely characterize as entirely accurate, since some geopoliticians even try to associate themselves as a

[10] Ladis K. D. Kristof,The Origins and Evolution of Geopolitics the Journal of Conflict Resolution, Vol. 4, No. 1, The Geography of Conflict (Mar., 1960), pp. 20

scholars to dictates of foreign policy, but they are never concerned solely with geopolitics per Se. They combine geopolitics with (or, more exactly, put it in the service of) certain ideas or theories, and it is only in combination with the idea of a master race, of the necessity for autocracy and expansion, of the necessity to combat or spread a religious or political gospel, that modern geopolitics ac quires a determinative character. Therefore geopolitics of this view has adapted the many facets of ages covering from Mahan and Theodore Roosevelt and ending with Hitler and Tojo. the first notion about geopolitics which comes out is the "organic concept of sate" that is the theory which holds that all components of the state "grow" together into one "body "which has a "life" of its own. Although the general conception on this views lies in the expansionist views of imperialism came from German scholar but explaining in different way some scholars has defined this concept as state is, in its essence, a spirit, or idea, in which, and through which, all nationals are bound spiritually into an organic oneness: into unity in multiplicity. All references to a state's birth, life, or death are references to spiritual phenomena which may or may not be related to the empirical fact of appearance or disappearance of political units on the world scene.

If we take a closer look at the writings of two most important among the founders of modern geopolitics-Ratzel and Kjellen-we see that much of the criticism to which they were, and are, subjected is not well founded. Neither of them submerges the individual within a state organism. Ratzel stresses that within the state, a "most imperfect" organism, "men maintain their independence and not even as slaves could they lay it aside." They may at most "sacrifice their free will when bending it at one occasion and putting it in the service of the whole at another." A second point on which Kjell6n can be justly criticized is his unconditional acceptance of the premise that autocracy is good and necessary. The concept of Lebensraum is intimately related to this premise. Similarly, the notion of what constitutes a "natural frontier" depends on whether autocracy is the set goal. Autocracy is, in modern times, an unattainable chimera, and it has led only to conflicts among nations; it assumes that international economic collaboration is impossible or undesirable; hence interdependence is dangerous.

On the other hand second orientation of geopolitics is associated with geographical determinism. There is undoubtedly a great sense among scholars that geopolitics or politics based on geography may lead to the acceptance of geographical determinism. This trend was recognized by Ratzel very long ago.
In the elements of state as a political organization we observe that territory has geographical notion and it is this concept geography determine the geopolitical structure.

The only material element of a state's unity is its territory. Consequently there is a strong temptation to base the political organization primarily on the territory of the state as it could be force into unity always discrete men. Geopolitics has been called upon in order to attract the attention of the statesmen to the geographical factors often neglected factors in geopolitics. But if one jumps from one extreme to another instead of integrating geopolitical knowledge with the rest of political knowledge, tries to subordinate all other factors geographical, then the picture must become distorted.[11]

The real difficulty in theory building process of geopolitics lies in the resolving the problem of co-existence of political and geographical concepts in geopolitics. So a geographical study is necessitated by political scholars as well as political education is required by geographers. That such an education of understanding of each other's field will enhance the horizon of geopolitics and political geography.

**Geopolitics of River Basin**

River basin has always been a center for attraction in geopolitics. On a geopolitical space river seems to be one of the important feature which characterizes the relations among surrounding states. in the form of boundary or in terms of water resource utility, rivers always play a central thematic role in geopolitical relationship of nation-states. The location and the path of movement of river demarcate the levels of importance in shaping the geopolitical structure of nations. If the flow of river is restricted within the boundary of state its importance would be regional, or national, but location of river near the international

[11] Ladis K. D. Kristof,The Origins and Evolution of Geopolitics the Journal of Conflict Resolution, Vol. 4, No. 1, The Geography of Conflict (Mar.,1960), pp. 24

boundary or river itself demarcate as a boundary then its importance increased as international.

The economic value of water is now in trend with acceptance which overshadowed its social value. Though political value of water and river is underestimated, recently, it was announced that Japan tried to buy Lake Ontario water from the US, but Canada objected. Similar protests from riparian states should be expected should Egypt, for example, undertake to build a pipeline to deliver the Nile water to Saudi Arabia which is running toward total depletion in the next 50 years.[12] In this study we can observe the role of geopolitics (influence of geography on politics) as well as hydro politics involve in it.

The role and influence of geopolitics on river basin is not very new. History of world civilization from ancient Egypt on the Nile, Mesopotamia with Tigris and Euphrates, the Senegal, Indus valley civilization on Hindus, the Niger, the Zambezi river basins etc, tells us the geopolitical importance of river basin.
Roman aqueducts are still objects of admiration as technological achievements. The rise of nations goes hand in hand with their ability to master water. Conversely, their decline is also accompanied by the loss of their ability to do so.

Due to differences in national perspectives, international rivers with shared freshwater resources pose particular problems and tend to suffer greater environmental damage and to experience less productive utilization than comparable exclusively national water resources. Thus the characteristics of international river basins combine to create the most complex challenge for effective resource management.

In general view, water acquires a geopolitical dimension when river basins are arbitrarily and unequally distributed among the territories of several States, in regional contexts characterized by increasing water scarcity due to demographic, environmental, and economic causes.

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[12] Princeton N. Lyman and J. Stephen Morrison, The Terrorist Threat in Africa, Foreign Affairs, January/February 2004, p. 77 (emphasis added)

There are more than 200 international river basins in the world, as well as underground aquifers extending under territories belonging to different sovereign entities. There exists a fundamental, intimate tension between the natural extension and geological borders of water basins, and the political borders of States. Whenever water crosses State borders, the need arises for a settlement of the conflicting interests of riparians, through adequate procedures for the partition, allocation and management of common resources.

If we see the other core problems and issues of river basin we will observe that besides political dimension which is related with the distribution of naturally available basin water; a technical dimension is also included which involves the adoption of measures by riparians to improve the management and expand the available water potential differences in the levels of development in terms of technology and economy, countries has faces the problems in determination of sharing of resources and its utility for socio-economic purposes.

Climatic determinants of geopolitics of river basin have also enhanced the concepts and theories theories geopolitics and its areal affect. Though climate weather has always been a central theme in the core of geopolitical analysis but its importance in the era of global warming and climate change has been enhanced. The characteristics of river flow and surface runoff has been reduced due to increasing temperature. Most river are no longer follow to their original course across the landscape because of infrastructure development in river basin. This is the reason that most rivers have changed their direction of historic flow. Building dam and hydroelectricity projects in river basin are one of the examples in larger infrastructural development causing somehow impact on river basin ecosystem.

Changes brought on by urbanization, excessive water withdrawals, or climate shifts that occur rapidly will have importance consequence for river ecosystem and the people o depend on them (Letten maer 1999, Palmer 2007). Native riverine biodiversity and productivity may decline, water quality for human consumption may be compromised and in some regions the risk of flooding, with concomitant damage to property and people may

increase (Bunn and Arthington 2002, Allan).

The above impacts of global warming and climate change has been listed only due to derive the perceptions of major countries on these issues. Although there is a differences among few nations about climate change but generally states of world today is agree upon its impacts. Few major world powers of world have different opinion but they are agree in some formations.

However it becomes the geopolitical issues when the study of impact has areal and regional dimension having political influences and it's absolutely true that whole world is a geographical zone.
Therefore in this context climate change, global warming and its areal and regional impacts have attracted a scholar of regional studies. Major River basins of world has seen the multipurpose projects, dam constructions, river valley irrigation system and other socio-economic infrastructure development. In this sense, conflicts on the reasons of changes in regional environmental habitat and causes of blaming each other by neighboring states etc attract the concern for geopolitical inquiry.

**Major Elements in Geopolitics of River Basin**

When we inquire the geopolitics of river basin we have to concentrate the segmental element that strikes the observer. The first element which comes into the mind is the condition of natural water availability and scarcity characterizing the area: if the region is facing an extreme scarcity of available resources, both of surface or underground water (Coastal Aquifer, Mountain Aquifer and so on) then it becomes the first fundamental cause of the regional water crisis.

Besides this, if water resources are asymmetrically distributed among riparian States and per capita consumption levels are extremely variable then it enhanced the problem.

Anyway, it is not only a matter of control over resources, but also of efficient use and investment in modern water technologies and infrastructure; on this specific aspect, also

matters among regional partners.

The second striking element is the condition of agricultural activities in the economies of all the Countries in the area. As a matter of fact, agriculture absorbs more percentage of the available water resources in the basin. The regional water crisis, then, is not only a matter of natural scarcity, but also of allocation of available water resources in favor of water-intense activities with limited economic value. At least, the choice of adequate, water saving crops, resistant to arid climates, could already represent an important step in order to reduce consumption levels.[13]

The third significant element of geopolitics of river basin is the water crisis in relation with the high demographic growth trends analyzing the issues of all riparian Countries. As far as water demand increases, the crisis becomes more intense and compelling. Between 1850 and 1990, the world population doubled while water use grew 300 percent. During the past 50 years alone the world population grew by more than 3 billion people: from 2.6 billion in 1950 to over 6 billion in 1999. According to Michael Klare, "If this rate of increase persists, we will soon be using 100 percent of the world's available supply" probably by the mid-21rst century.[14]

The fourth issues which come in to the form of the mental images are development and management of river basin and its implication on environment. Sustainability of river basin ecosystem in the changing climate is the great matter of concern today.

In modern time many river have experienced the changes in their flows. These changes are crossing the natural limit of adjustment and to absorb disturbances. The change in water

[13] M. Nerini, water in the jordan basin – a key element of the peace process and future cooperation in the region

[14] Michael Klare. Resource Wars. The New landscape of Global Conflict. (New York: A Metropolitan / Owl Book

discharge produces water stress. Many populated basin are facing this problems. On the other hand changing in climate generated the loss of biodiversity and natural ecosystem of basin area. Flood and water shortages are other extreme issues affecting the river basin. A kind of environmental geopolitics concentrated on basin area emerged in the era of globalization which focuses on these important issues.

In addition to the above counted elements of geopolitics of river basin a scholar of geopolitics of river basin cannot be underestimate the border and territorial issues of the basin. If a river crosses the boundary of two states or more than two states or it makes the boundary as territorial separation then basin observes a geopolitics game in its playground among the players of riparian states.

However, the regional organization, process of conflict and cooperation are the elements having more important. Organizational set up their limitations and other important actors are the center of geopolitical studies of river basin. Planning for the river basin management has nowadays included the issues of sustainability in the region.

**Africa's Major River Basin and Issues of Conflict**

From very beginning River basins of the world has been the causes for geopolitics. Due to its important and larger resource base such as water, fertile soil, natural habitat for living and areas for economic activities it has experience the geopolitical interest of riparian countries. We know that there are about 263 international river basins covering 45.3% of the land surface area of the earth, excluding Antarctica[15] Among them Africa constitute about more than 20 major River basins. In Africa, Congo/Zaire, Corubal, Gambia, Geba, Incomati, Kunene, Lake Chad, Limpopo, Mana-Morro,Niger, Nile, Nile (Lake Victoria sub basin), Nile (Kagera subbasin), Okavango, Orange, Senegal, Volta and Zambezi are the important river basin.[16] These all are facing the problems of clash of interests among riparian states. Among these River basins Lake Chad, Nile, and Niger River basin are very significant. A range of issues related to conflict and dispute can be seen among basin countries. The causes

[15] UNEP; WCMC; WRI; AAAS; Atlas of Population and Environment, 2001.
[16] www.transboundarywaters.orst.edu

of conflicts also varied from navigation, water quality, flood control, irrigation, infrastructure development, hydroelectricity, ethnic issues, border and territorial issues, technical cooperation and fishing.

Lake Chad is a large, shallow lake in Africa. It is economically very important, providing water to more than 20 million people living in the four countries which surround it - Chad, Cameroon, Niger and Nigeria. It is located mainly in the far west of Chad, bordering on northeastern Nigeria. The Chari River is its largest source of water, providing over 90% of Lake Chad's water. The lake possesses many small islands and mud banks, and its shorelines are largely composed of marshes. Because it is very shallow - only 10.5 meters (34 ft) at its deepest - its area is particularly sensitive to small changes in average depth, and it consequently also shows seasonal fluctuations in size.

There are five countries in Lake Chad basin, Cameroon, Central African Republic, Chad, Niger and Nigeria. The major area of conflict is noted as Water quality, water quantity, navigation, fishing, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance, border issues. For the management of interest of basin countries they have set up a regional commission named Lake Chad Basin Commission (LCBC)[17] on 22may 1964. This is an official organization. Other organization, Basin Committee for Strategic Planning (BCSP) has also developed to reconcile the core problems of region. It has been created for local initiatives by LCBC.

On global space Nile River has important role in Africa. The Nile is the longest river in the world, stretching north for approximately 4,000 miles from East Africa to the Mediterranean. Studies have shown that the River (Iteru, meaning, simply, River, as the Egyptians called it) gradually changed its location and size over millions of years. The Nile flows from the mountains in the south to the Mediterranean in the north.

Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Burundi Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda,

[17] See the website of Lake Chad Basin Commission (LCBC)

Kenya, Rwanda, Sudan (administered by Egypt) are the countries in river Nile basin. The geopolitical issues are concerning with Economic development, joint management, other: poverty eradication of the riparian countries. Nile Basin Initiative (NBI) is the organization which tries to resolve the problems among countries. Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE) has been established for the technical problems.[18]

The River Niger is an important river in western Africa. It ranks third in terms of length of rivers in African continent after Nile and Congo River. It is 4200 km long there are ten countries which comes under the basin of river Niger. But only nine countries are the members in the regional organization of basin countries which includes Benin, Burkina Faso, Cameroon, Chad, Ivory Coast, Guinea, Mali, Niger and Nigeria. While a small area of Algeria falls within the Niger Basin, it is not a member of the NBA. It is based in Niamey and works in both French and English. Water quality, hydro-power/ hydro-electricity, navigation, fishing, flood control/ relief, economic development, joint management, irrigation, infrastructure/ development, technical cooperation/ assistance are the important issues involving in the geopolitics of the region.[19]

Nigeria-Niger Joint Commission for Co-operation (NNJC) is another commission established in 18 july1990. Niger and Nigeria are the member states. This commission was set up to monitor the implementation of the provisions of the 1990 'Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the equitable sharing in the development, conservation and use of their common water resources'.

The Orange River is the longest river in South Africa. It raises in the Drakensberg mountains in Lesotho and then flows west through South Africa to the Atlantic Ocean. The river forms part of the international borders between South Africa and Namibia and between South Africa and Lesotho, as well as several provincial borders within South Africa. Although the river does not pass through any major cities, it plays an important role in the

[18] FAO, country case study - national water policy in the Sudan

[19] Official website of NBA

South African economy by providing water for irrigation, mining, industrial and municipal use, as well as hydroelectric power. The Vaal River basin, part of the broader Orange River basin, is the industrial heartland of South Africa, producing more than 25 percent of the country's gross domestic product (GDP).[20] Four countries lies in the basin of Orange River, Botswana, Lesotho (Kingdom of), Namibia and South Africa. Lesotho Highlands Water Commission (LHWC), Orange/Senqu River Commission (ORASECOM), Lesotho Highlands Development Authority (LHDA), Highlands Development Authority (LHDA) and Joint Irrigation Authority (JIA) are the organizations which are developed in response to generate cooperation among riparian states on the issues of Joint management, irrigation, technical cooperation/ assistance. Among these LHDA is oldest which is formed in 1930.

Zambezi River which flows in southern portion of Africa has also a geopolitical relevance in this context. It is Africa's fourth largest River system, after the Nile, Zaire and Niger Rivers. It runs through six countries on its journey from central Africa to the Indian Ocean. Its unique value is that it is less developed than others in terms of human settlement and many areas along its banks enjoy protected status. The Victoria Falls and zigzagging Batoka Gorge are the important feature on this river. Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of, Botswana, Namibia, Zambia and Zimbabwe are the countries in Zambezi basin.[21] Border and territorial issues are the most important geopolitical problems. To reconcile these problem basin countries has established Zambezi Watercourse Commission (ZAMCOM) in 13 July 2004. Though there is other organization Zambezi River Authority (ZRA) and Joint Permanent Water Commission (JPWC) formed in 1987. These organizations deal the issues related with Water quality, economic development, joint management, technical cooperation/ assistance. In this view Africa seems to be a land of geopolitical conflict. Rivers and the basin countries are facing with the various issues but they are also interested in the peace full cooperation for the judicious utilization of resources with the help of institutions.

Figure-1(i) River basins of world

[20] New world encyclopedia

[21] Bourgeois S., Kocher T., Schelander P. (2003), *Case study: Zambezi river basin*, ETH Seminar: Science and Politics of International Freshwater Management 2003/04

04

# Major River Basins of the World


**North America**
1 Yukon
2 Mackenzie
3 Nelson
4 Mississippi
5 St Lawrence

**South America**
6 Amazon
7 Paraná

**Europe**
25 Danube

**Africa and West Asia**
8 Niger
9 Lake Chad Basin
10 Congo
11 Nile
12 Zambezi
26 Orange
24 Euphrates and Tigris

**Asia and Australia**
13 Volga
14 Ob
15 Yenisey
16 Lena
17 Kolyma
18 Amur
19 Ganges and Brahmaputra
20 Yangtze
21 Murray Darling
22 Huang He
23 Indus

Source United Nations Environment Programme (UNEP), World Conservation Monitoring Centre (WCMC), World Resources Institute (WRI), American Association for the Advancement of Science (AAAS). *Atlas of Population and Environment*. 2001

**Conclusion**

In the discussion of River Basin and the geopolitics, we have tried to cover the multidimensional aspects of it concerning geopolitics at varied level. The importance of river in geopolitics is examined. From the point of view of history we have seen how a river basin concept has modified from a region of simple habitat of ancient civilization to the era of modern industrial set up and technological extraction of resources. Changing notion of river basin has added other socio-economic, environmental and cultural factors in its horizon.

Increasing number of population, climate change and global warming, issues of resource management and scarcity of fresh water etc are in the academic discourse while dealing with the geopolitics of resource basin. Before analyzing the geopolitics of river basin directly, it was better to evaluate geopolitics in segmental form. Concept of geopolitics has also followed the path of changes and dynamism. From organic concept of sate of Ratzel and Kejellen, geopolitics has now reached to the critical theory instead of geographical determinism and this showed how the various scholars has presented their views and concept during theory building process.



River basin of the world has acquired a greater attraction from the scholars of geopolitics. The regional play game, conflict and disputes over the range of issues are the matter of study in geopolitical dimension.

Africa is the continent where river water and its utilization as well as boundary related issues have been a point of conflicts among nations of river basins. In this study we have taken some river basins as river Nile, Niger, Orange, Lake Chad and Zambezi to discuss the issues of conflicts and organizational set up to resolve that is briefly examined in a general manner.

Therefore study of geopolitics of basins and specially related with African river basins has motivated us to observe the condition of specific river basin in detail. Niger River basin has been taken in this manner to show the picture of conflict and cooperation of riparian states. In this regard the next chapter will be solely concentrated with Niger River basin.

# CHAPTER 2

## NIGER RIVER BASIN- COUNTRIES AND PHYSIOGRAPHY

### Introduction

In previous chapter we have observed the concept of river basins, geopolitics and its implication on regional issues. A relationship between geopolitics and river basin has also been established. With significant theoretical analysis, issues related to river basin and regional conflict has also been derived. Africa as a land of world major river basin has also been a playground to be a game of geopolitics. A range of attraction in this study of knowledge has motivated to look forward in detail over the definite basin of Africa most specifically western Africa.

Niger River Basin with its magnitude and its larger expansion must be a relevant subject matter in terms of basin selection. Though this basin, somehow feels itself less attractive for the area focusing by the scholars and research analysts. However a few projects by World Bank, United Nation, Food and Agricultural Organization have tried to fill this vacuum. This general chapter comes on the floor with respect of special focus on Niger basin a life line of West Africa. The limitation of this segment of analysis is the countries and physiography of basin.

Connecting with the previous chapter, this is the time to focus on study area which is Niger basin of Africa. Political spaces of Niger basin means riparian states, their geography, physical and human environment and the major issues are the central subject of this chapter. Natural vegetations and soils are important attributes of physical features in this chapter. However the study of rain fall has found its space in third chapter where water resources are the important concern in this series of discussion.

## The Niger River Basin

The River Niger is an important river in western Africa. It ranks third in terms of length of rivers in African continent after Nile and Congo River. It is nearly 4180 km long.[1] and the fourteenth longest in the world, ranking ninth in terms of drainage basin size (2,170,500 square km, with an active watershed covering 1,500,000 square km).[2] The original name of river Niger is "egerou n-igereou", which means the "river of rivers". The drainage catchment is located between latitude 28 degree north in Algeria and 4 degree North in the Gulf of Guinea, where it discharges into the Atlantic. The river originated from the Fouta Djallon Mountains in Guinea at measuring at the height of about 800 meters. It flows in north east direction towards the fringes of the Sahara desert. It makes its own delta in the way having area of 8900 square km. At the fringe of Sahara, this river turns back forming a great bend flowing south -east to merge into gulf of guinea. Before reaches to the gulf Niger joins its longest tributary, The Benue, which brings the river Niger a heavy equatorial rainfall with its contact. The flow of Benue river is towards west of Cameroon. This tributary joins the river Niger at the city of lokoja in Nigeria. From this meeting point river Niger flows north-southward and enters into Atlantic Ocean through the numerous branches of its delta.

The basin of Niger covers 7.5% area of the continent and spreads over ten countries (FAO).The Niger River basin seems to be a great asset for 10 million population of the western and central African region. Benin, Burkina Faso, Cameroon, Chad, Ivory Coast, Guinea, Mali, Niger, and Nigeria are the countries which are located in this basin. These countries are not simply located in the basin but wherever it crosses it embodied the livelihood and geopolitics of nations.

This river is not simply water, but is also an origin of identity, a route for migration and commerce, a source of potential conflict, and a catalyst for cooperation.[3]

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[1] New world encyclopedia
[2] World meteorological organization (WMO)
[3] Michel Wormser page no.7 Niger river basin; a vision for sustainable management

As the number of population and economy of this region are growing in considerable extent, resource base of this basin will require a sustainable utilization and better resource management to address the increasing aspirations and needs of the people of the basin.

Regional co-operation among the member countries of basin is crucial to achieve the optimal and sustainable development.

## Countries of the Niger River Basin

There are ten countries which come under the basin of river Niger. But only nine countries are the members in the regional organization of basin countries which includes Benin, Burkina Faso, Cameroon, Chad, Ivory Coast, Guinea, Mali, Niger and Nigeria. While a small area of Algeria falls within the Niger Basin, it is not a member of the NBA.[4] It is based in Niamey and works in both French and English.

Each country has unique geographical setting having variety of resource material and different ways of its utility.

The active watershed of the Niger River is shared between nine West and Central African countries namely Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger and Nigeria. The inactive basin essentially concerns Algeria, Mali and Niger.

The countries can be clustered as "water resources producers"—Guinea, Cameroon, and to a lesser extent Benin; or "water resources consumers"—Mali and Niger. Nigeria is both a producer and a consumer. Ivory Coast, Burkina Faso, and Chad are part of the Basin but are minimally affected by the use and management of the river's water resources. (INGER ANDERSEN, OUSMANE D IONE, M ARTHA; 2005)

## Algeria

Algeria is located in northern Africa. Morocco and Tunisia is its neighbor. Algeria, the second-largest state in Africa, Land is mostly covered by high plateau and desert there are some mountains. A narrow, discontinuous coastal plain is also there. Mountains are facing the severe earthquakes. The climate of Algeria is arid to semi arid. Mild, wet winters with

[4] Niger River Basin Authority.

hot, dry summers are finding along the coast. On high plateau drier with cold winters and hot summers are found. A hot, dust/sand-laden wind called sirocco is especially common in summer.

The population of Algeria is about 36.3 million.[5] Algeria and Chad together cover about 9% of the total Niger River basin, but there are almost no renewable water resources in these areas.

## Benin

Republic of Benin is the important member of NBA. It is a small country in West Africa located between the Equator and the Tropic of Cancer. It lies between latitudes 6° and 13°N, and longitudes 0° and 4°E. Benin is bounded by Togo to the west, Burkina Faso and Niger to the north, Nigeria to the east, and the Bight of Benin to the south.It covers an area of 112622 square km with a population of approximately 9.05 million (FAO: JUNE-2010).

Benin occupies 2.0 percent of the total area of the basin (46384 squire km). This area is 41.2 percent of whole area of country. More than 1.95 million people live in the Niger basin in Benin. The land within the Benin is primarily used for grazing and livestock. Nowadays cotton farming, accounts one-third of the national production.

The Mekrou River a tributary of the Niger crosses the "W" international park an extensive protected sanctuary for the flora and fauna shared by Benin, Burkina Faso and Niger.

## Burkina Faso

This nation is located in western side of Africa, Covering the area of 274,200 sq. km. The terrain of the country is dominated by Savanna climate where brushy plains and scattered hills are important feature. Burkina Faso is a landlocked country where 16.3 million people belong to two major West African cultural groups--the Voltaic and the Mande (whose common language is Dioula) [6]

[5] (January 2011 official government est.)

However the basin region of Burkina Faso is the direst areas where pastoral and semi nomadic human life dominates generally in northern portion but sedentary life is the feature of southern belt.

There are several tributaries of river Niger which originate in Burkina Faso. About 28 percent of total area of country lies in basin. It represents 3.4 percent of total area of basin. One-fourth of Burkina Faso's population lives in the basin (FAO).

## Cameroon

Cameroon is a Central African nation on the Gulf of Guinea, bordered by Nigeria, Chad, the Central African Republic, the Republic of Congo, Equatorial Guinea, and Gabon. It is nearly twice the size of Oregon. Mount Cameroon (13,350 ft; 4,069 m), near the coast, is the highest elevation in the country. The main rivers are the Benue, Nyong, and Sanaga. The total area of country is about 475,440 sq km.

_The headwaters of the River Benue, a major tributary of the Niger River, lie within Cameroon which comprises 3.9 percent (89249, 000 square kilometers) of the Basin. Which is 18.8 percent of total area of country? A population of 4.46 million lives in this part of the Basin. The Benue watershed is dominated by agricultural activities as producing cotton and peanuts.

Here Livestock is also important for export purposes especially on the Plateau of Adamawa. High expectations for floodplain irrigation development have not been met, despite the construction of the Lagdo Dam.[7] This dam was also expected to add a few additional months of navigation on the Benue, The potential hydro power production from the Lagdo Dam, however, is significantly greater than the needs of the immediate region, providing an opportunity to export electricity.

Altitude grazing is in addition to tea, coffee, and corn production that added to the revenues of a densely populated area. Paddy rice is grown in the low- lands. Faro, Benue, and Boubandjida national parks are protected areas that ensure the conservation of flora and fauna and protection of the headwater areas of the upper Benue River.

[7] Katherin George Golitzen, Niger river basin, a vision for sustainable management page no.4

## Chad

Chad is also a land locked country situated in north-central Africa. Its neighbors are Niger, Libya, the Sudan, the Central African Republic, Cameroon, and Nigeria. Lake Chad, from which the country gets its name, lies on the western border with Niger and Nigeria. In the north is a desert that runs into the Sahara. The total area of country is The 1,284,000 sq km. Headwaters of the Mayo tributaries lie within Chad, comprising 1.0 per- cent (15,000 square kilometers) of the Basin. A population of 80,000 lives in this part of the Basin, extending through the upper Mayo Kebi and Kabia tributaries and the lakes of the Toubouris depression. The Basin supports a sparsely settled rural population that depends on subsistence farming and limited cotton production for its livelihood.

## Ivory Coast

The headwaters of the Bagoé, the Kankelaba, and the Baoulé tributaries lie within Ivory Coast comprising 1.2 percent (18,000 square kilometers) of the Basin. A population of 800,000 lives in this part of the Basin. The area is a southern extension of the cotton-growing areas of Mali. It also pro- duces kola nuts and is, above all, an area for raising livestock and a route for transporting cattle herds to the coast and to Abidjan. Locally, small development projects (ponds and small dams) provide opportunities for market gardening and aquaculture. The main cities are Odienne and Boundiali.

## Guinea

The Guinea highlands (Haute Guinea) and part of the high plateaus of Guinea Foresters are two geographic provinces in Guinea situated at the headwaters of the Niger River and its tributaries, comprising 4.6 percent (69,000 square kilometers) of the Basin. About 1.6 million people live in this part of the Basin, more than 80 percent of whom live in rural areas, with a density of fewer than 30 inhabitants per square kilometer. The alluvial valleys of these two provinces are fertile, yielding most of the country's agricultural production. The highlands and plateaus have fewer than five inhabitants per square kilometer, and are dedicated to raising livestock and limited rain fed farming, generally of sorghum and millet. Rainfall is sufficient for groundnut production in the Tinkisso watershed (about 60,000 tons

per year, which is about one-third of the production in Guinea), and paddy rice production in the valleys of the Niger, the Niandan, and the Milo Rivers (estimated at 300,000 tons per year). Coffee is also grown (20,000 tons per year) on the mountain ridges and in the upper Milo River region. These two geographic provinces are rich in diamonds. Bauxite deposits are mined on the Tinkisso and gold is mined close to Siguiri.

**Mali**

The longest reach of the Niger River (1,700 kilometers) extends through southern Mali, comprising 30.3 percent of the Basin (454,500 square kilo- meters). A population of 7.8 million lives in the Basin, with a large percentage living in the capital, Bamako that is situated on the river. This city, with its industrial and suburban areas and its market gardens, plays a significant role in the economic development in this part of the Basin. The Office of Niger, one of the largest and oldest irrigation schemes in West Africa, continues to provide opportunities for agricultural development.

Irrigated farming along the river produces 590,000 tons of rice and 303,000 tons of sugar cane per year. The Inland Delta is an undeveloped, flooded ecosystem with abundant freshwater fishing areas, high productivity pasture land, and fertile agricultural lands. Catches from freshwater

Fishing average about 108,000 tons per year, with an additional 10,000 tons harvested on the Selingue reservoir, depending on the water level and flooding in the Inland Delta. Its excellent pasture land makes the Inland Delta a grazing area for more than 2 million head of cattle. Cotton production covers an area of 122,000 square kilometers. On a yearly basis, Mali produces 400,000 tons of cottonseed and 218,000 tons of cotton fiber, surpassing Egypt as the largest producer in Africa. Whereas it is an irrigated crop in Egypt, it is a rain fed crop in Mali. Southern Mali also produces more than 230,000 tons of millet and sorghum, 215,000 tons of corn, and 18,000 tons of ground- nuts per year, all as rain fed crops.

**Niger**

Niger is located in West Africa's Sahara region. It is surrounded by Mali, Algeria, Libya, Chad, Nigeria, Benin, and Burkina Faso. The Niger River in the south west, flows through the country's only fertile area. Elsewhere the land is semiarid the total area of the land is

1,267,000 sq km. The river's reach through Niger is 540 kilometers, with a hydrologically active area of approximately 357,000 square kilometers occupying proportionally 23.8 percent of the Basin, with a population of 8.3 million. This area extends through the Maradi region, which is part of the Sokoto watershed. The left-bank tributary network, originating in the Aïr and the Azaouâk Mountains, is characterized by intermittent flows that are isolated from the Niger River without any hydrologic connection to the river network. The Niger River partially irrigates large alluvial plains and lowlands of the Dallol Bosso, the Dallol Maouri, and the Maradi area. Rice production is low, but production of traditional grains of the Sahel region, although subject to climate variations, is significant (more than 2.4 million tons). In many places, black-eyed peas have replaced groundnuts as an export crop and cotton is no longer grown. Agricultural practices have undergone significant changes since the severe droughts of the past several decades. Niger is dependent on the navigable waterways of the Niger River through Nigeria.

**Nigeria**

Nigeria is the most populous country in Africa. It is situated on the Gulf of Guinea in West Africa. Total area of the country is around 923,768 sq km. Its neighbors are Benin, Niger, Cameroon, and Chad. The lower course of the Niger River flows south through the western part of the country into the Gulf of Guinea. On southern coast we observe the Swamps and mangrove forests. Nigeria is also the largest oil-producing country on the African continent and the sixth largest in the world.

It is the final downstream country through which the Niger River flows, and contains 28.3 percent (424,500 square kilometers) of the Basin area. The Niger Basin extends across 20 of the 36 states of Nigeria and com- prices two main rivers, the Niger and the Benue, and 20 tributaries. Of Nigeria's major rivers, more than half are in the Niger River Basin. Their combined length accounts for almost 60 percent of the total length of all important rivers in Nigeria. Almost 60 percent of Nigeria's population, or about 67.6 million inhabitants, live in the Basin. These Nigerians comprise 80 percent of the population of the entire Basin. Given Nigeria's size and location, its agricultural production, both rainfed and irrigated, is substantial.

Table-2.1 Niger River basin: areas of countries and their share in basin

| Country | Total area of the country (sq. km) | Area of the country within the basin (sq.km) | As % of total area of basin (%) | As % of total area of country (%) |
|---|---|---|---|---|
| Guinea | 245857 | 96880 | 4.3 | 39.4 |
| Ivory coast | 322462 | 23770 | 1.0 | 7.4 |
| Mali | 1240190 | 578850 | 25.5 | 46.7 |
| Burkina Faso | 274000 | 76621 | 3.4 | 28.0 |
| Algeria | 2381740 | 193449 | 8.5 | 8.1 |
| Benin | 112620 | 46384 | 2.0 | 41.2 |
| Niger | 1267000 | 564211 | 24.8 | 44.5 |
| Chad | 284000 | 20339 | 0.9 | 1.6 |
| Cameroon | 475442 | 89249 | 3.9 | 18.8 |
| Nigeria | 923768 | 584193 | 25.7 | 63.2 |

Source- FAO (2004)

Algeria and Chad together cover about 9% of the total Niger River basin, but there are almost no renewable water resources in these areas.

Nigeria covers the largest area in basin which has 584193 square km (25.7%) in Niger basin. The second important country in the basin is Niger occupying about 564211 square km (24.8%) within the basin. Cameroon has very less proportion of their area in the Niger basin, representing only 20339 square km which is 18.8% of their total area.

The area of the Niger River basin in Guinea is only 4% of the total area of the basin, but the sources of the Niger River are located in this country. The quantity of water entering Mali from Guinea (40 km3/yr) is greater than the quantity of water entering Nigeria from Niger

(36 km3/yr), about 1800 hen further downstream. This is due among other reasons to the enormous reduction in runoff in the inner delta in Mali through seepage and evaporation combined with almost no runoff from the whole of the left bank in Mali and Niger.

The most important areas of the Niger basin are located in Mali, Niger and Nigeria (25 % in each of these three countries). Mali and Niger are almost entirely dependent on the Niger River for their water resources. In the case of Niger nearly 90% of its total water resources originate outside its borders (the Niger River and other tributaries from Burkina Faso and Benin).

Figure-2 (i) Countries in Niger basin

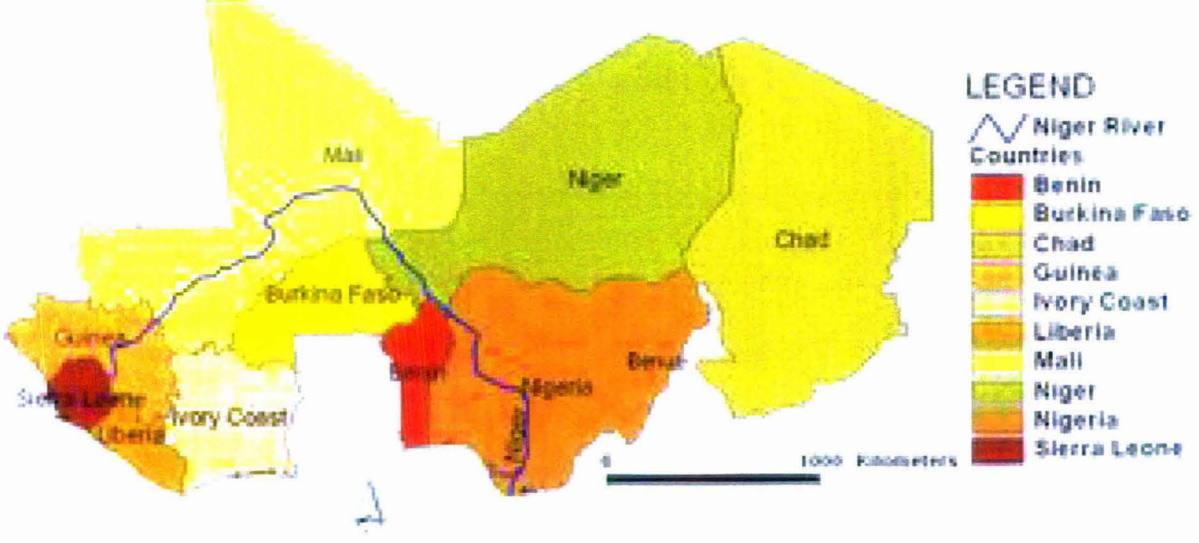


Diagram-2a: Area of riparian states of basin

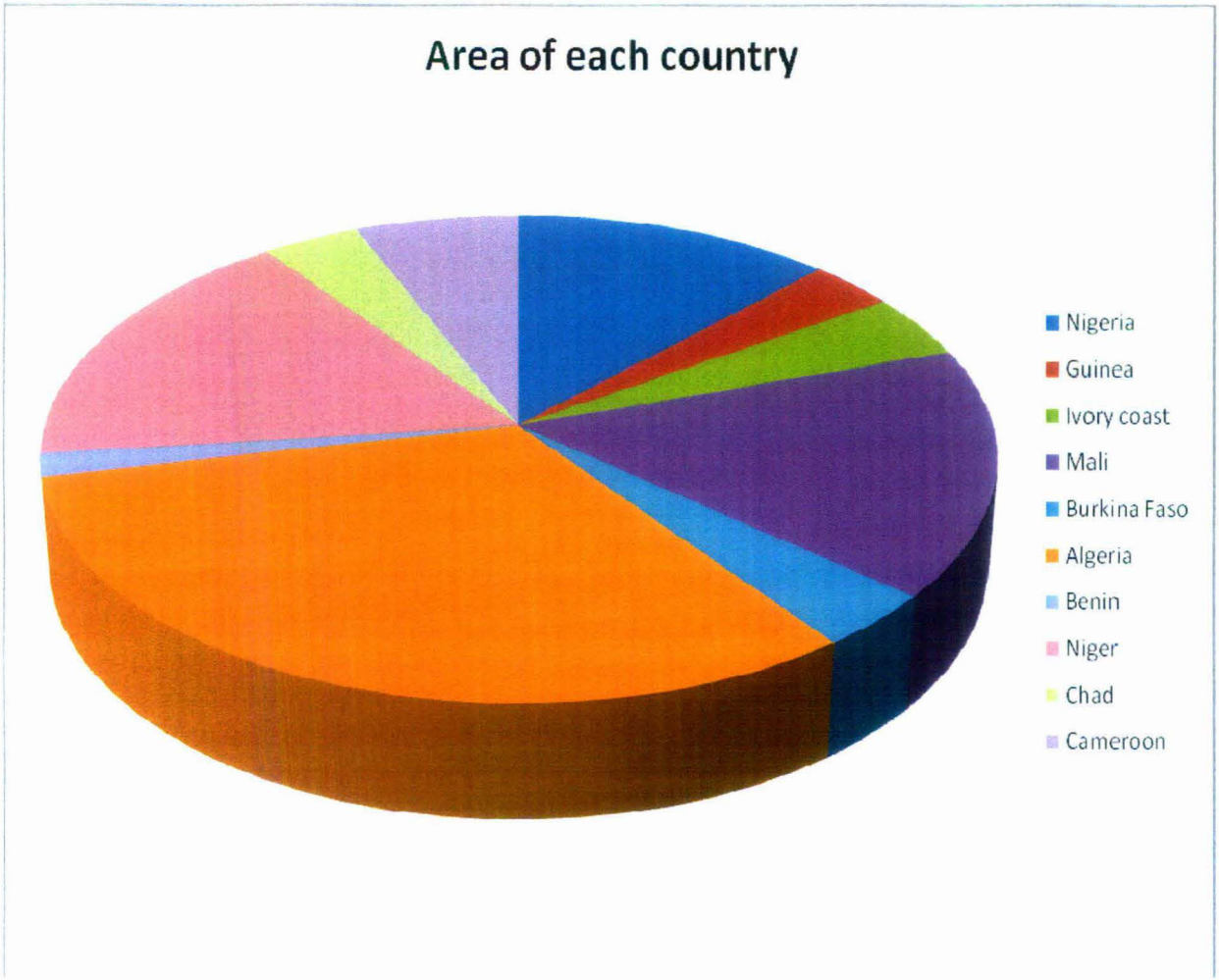
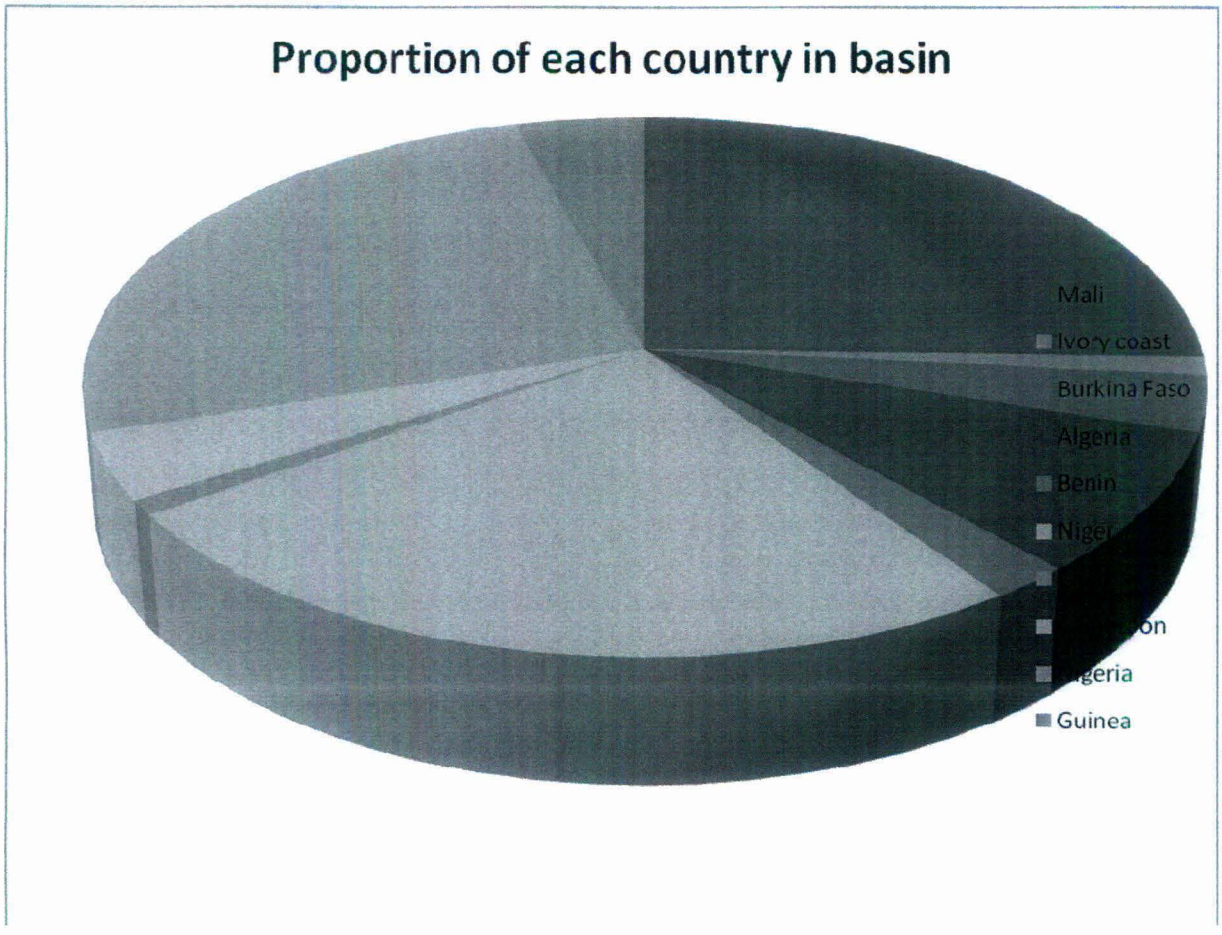


Diagram- 2b, Share of each country in Niger basin Area



## Physiography of River Basin

The physiography of Niger River basin is not homogeneous. It is diverse in nature. Within the region the environment ranges from lush tropical rain forested belt to arid desert. In general the climate gets wetter as we move to the south and drier as we move to north. The northern portion of basin is very dry making farming difficult. The middle portion of basin is occupied by the land of savanna. Southern segment of basin is dominated by forested land.

We can classify the whole Niger River basin into following physiographic division:

### Sahel belt: A Semi Arid Zone

A larger part of the basin is located in the Sahel, a semi arid area between the Sahara desert and Sudanian Savanna. The Sahel covers parts of the Niger river basin of (from west to east) Mali, Burkina Faso, southern Algeria, Niger, northern Nigeria and Chad .An ancient geologic landscape of crystalline rocks characterizes the upstream area of the Basin and most of the river's right bank. Groundwater occurrence is very limited in these rocks, which are generally impermeable except where they have been fractured or are weathered, which creates small aquifer zones. Groundwater replenishment from the headwaters is therefore generally very low (Fontes and others 1991).

The Sahel is 5400 km from the Atlantic Ocean in the west to the red sea in the east. It varies from several hundred to a thousand km in a width covering an area of 3,053,200 square km. It is a transitional eco region of semi-arid grasslands, savannas, steppes, and thorn shrub lands lying between the wooded Sudanian savanna to the south and the Sahara to the north. The topography of the Sahel is mainly flat, and the region mostly lies between 200 and 400 meters elevation. Several isolated plateaus and mountain ranges rise from the Sahel, but are designated as separate eco regions because their flora and fauna are distinct from the surrounding lowlands. Annual rainfall varies from around 200 mm in the north of the Sahel to around 600 mm in the south.[8]

[8] Magin, Chris (2001). "Sahelian Acacia savanna". Terrestrial Eco regions. World Wildlife Fund.

**Inner Delta (Macina)**

The Inner Delta of River Niger is also known as Macina, it is a area dominated lakes and floodplains in the semi-arid Sahel area of central Mali, just south of the Sahara desert. The delta consists of the middle course of the Niger River, between the bifurcated Niger and its tributary, the Bani, which runs from this zone towards the desert in north. The delta area is swampy and the soil is sandy.

A diverse mix of channels, swamps, and lakes, the delta expands to cover 20,000 $km^2$ during the rainy season and contracts to 3,900 $km^2$ during the dry season (Welcomme 1986). The delta extends for 425 km with an average width of 87 km, tapering into a braided river near Timbouctou where the Niger River curves to the east. The floodplain is remarkably level, dropping only 8 m over its course (Hughes and Hughes 1992). Delta topography is a complex mix of submerged lower areas and higher, unflooded areas known as tougérés. The floodplain consists of a vast network of river channels with levees separated by low, clay-based floodplains. As waters flow through the delta, they pass over Pleistocene and recent alluvium overlying Paleozoic sandstone (Hughes and Hughes 1992).

**Middle Niger River Basin**

Middle Niger Basin is also known as the NUPE or BIDA Basin. It is a plain area which lies between 60 and 180 meters in the Lokoja area. The basin occupies a gently down warped trough. It is a NW – SE trending intracratonic basin extending from Kotangora in the North to just south of Lokoja in the South. It stretches from the confluence of Niger and Benue Rivers to the dam lake of Kainji, where basement rocks separate it from the Sokoto Basin.

Three physiographic units are recognized in the basin. These are (a) The Niger River with its flood plain and distributaries, (b) a belt of means and (c) the plains. The Niger River runs in the southern marginal area of the basin. Its flood plains are broad and marked in most areas by a series of elongated ponds running parallel to the river. The belt of mesas is discontinuous. It runs from an area about 16 km. east of Mokwa to Lokoja and S.W. Dekina covering about 10% of the basin. The top lies between 260 and 500 metres around the

Niger / Benue confluence areas. Flat lying to gently rolling plains cover about 70% of the basin. The plains lie between 60 and 180 meters in the Lokoja area. Sediment thickness in the Middle Niger Basin is estimated to be between 3, 000 and 3, 500 meters (Whiteman, 1982; Braide, 1990).

## Niger Delta

Niger delta is a vast low lying region through which the waters of the Niger River drain into the Gulf of Guinea. Characteristic landforms in this region include oxbow lakes, river meander belts (see meander), and prominent levees. The Niger Delta is the product of both fluviatile and marine sediment build-up since the upper Cretaceous, and its low relief is responsible for the meandering and frequent shifting of the Niger and its tributaries. Over time, the decreasing slope gradient of the Niger River bed and associated lower stream velocities has resulted in an increase of tidal activity in the exits of the numerous Niger distributaries, resulting in the formation of the Coastal Barrier Islands.

Large freshwater swamps give way to brackish mangrove thickets near the sea coast. Leaving the border between Niger and Benin the river enters Nigeria, where it is joined by numerous tributaries. The most important tributary of the Niger is the Benue which merges with the river at Lokoja in Nigeria, and form a massive delta.

The Niger Delta, as now defined officially by the Nigerian government, extends over about 70,000 km$^2$ and makes up 7.5% of Nigeria's land mass within the delta the river breaks up into an intricate network of channels called rivers. The Nun River is regarded as the direct continuation of the river, but some of the other important.[9]

[9] Govt. of Nigeria document

**Natural Vegetation**

Natural vegetation in the Niger basin area, like other geographical region, is the byproduct of climate and its topographical features. Basin encompasses a range of forest community. In its south, tropical rain forest is the important category where rainfall occurrence is high. Moisture laded wind has become the causes for rain forest of this zone.

Grassland and savanna has covered most of the portion of Sahel. Specify with areas of woodland and shrub land. Grass cover is fairly continuous across the region; Sahel is dominated by annual grass species such as Cenchrus biflorus, Schoenefeldia gracilis, and Aristida stipoides. Species of Acacia are the dominant trees, with Acacia tortilis the most common, along with Acacia Senegal and Acacia laeta. Other tree species include Commiphora africana, Balanites aegyptiaca, Faidherbia albida, and Boscia senegalensis. In the northern part of the Sahel, areas of desert shrub, including Panicum turgidum and Aristida sieberana, alternate with areas of grassland and savanna. During the long dry season, many trees lose their leaves, and the predominantly annual grasses die.[10]

The mangrove forest of Nigeria is the third largest in the world and the largest in Africa; over 60 percent of this mangrove, or 6,000 square kilometers, is found in the Niger Delta. The freshwater swamp forests of the delta reach 11,700 square kilometers and are the most extensive in west and central Africa. The Niger Delta region has the high biodiversity characteristic of extensive swamp and forest areas, with many unique species of plants and animals. In the oil rich Niger Delta region of Nigeria (which is composed of 9 states), gas flaring as a component of climate change is a huge issue.

[10] Dai, A.; Lamb, P.J.; Trenberth, K.E.; Hulme, M.; Jones, P.D.; Xie, P. (2004), "The recent Sahel drought is real", International Journal of Climatology page 24

Figure-2 (ii) Topography of West Africa

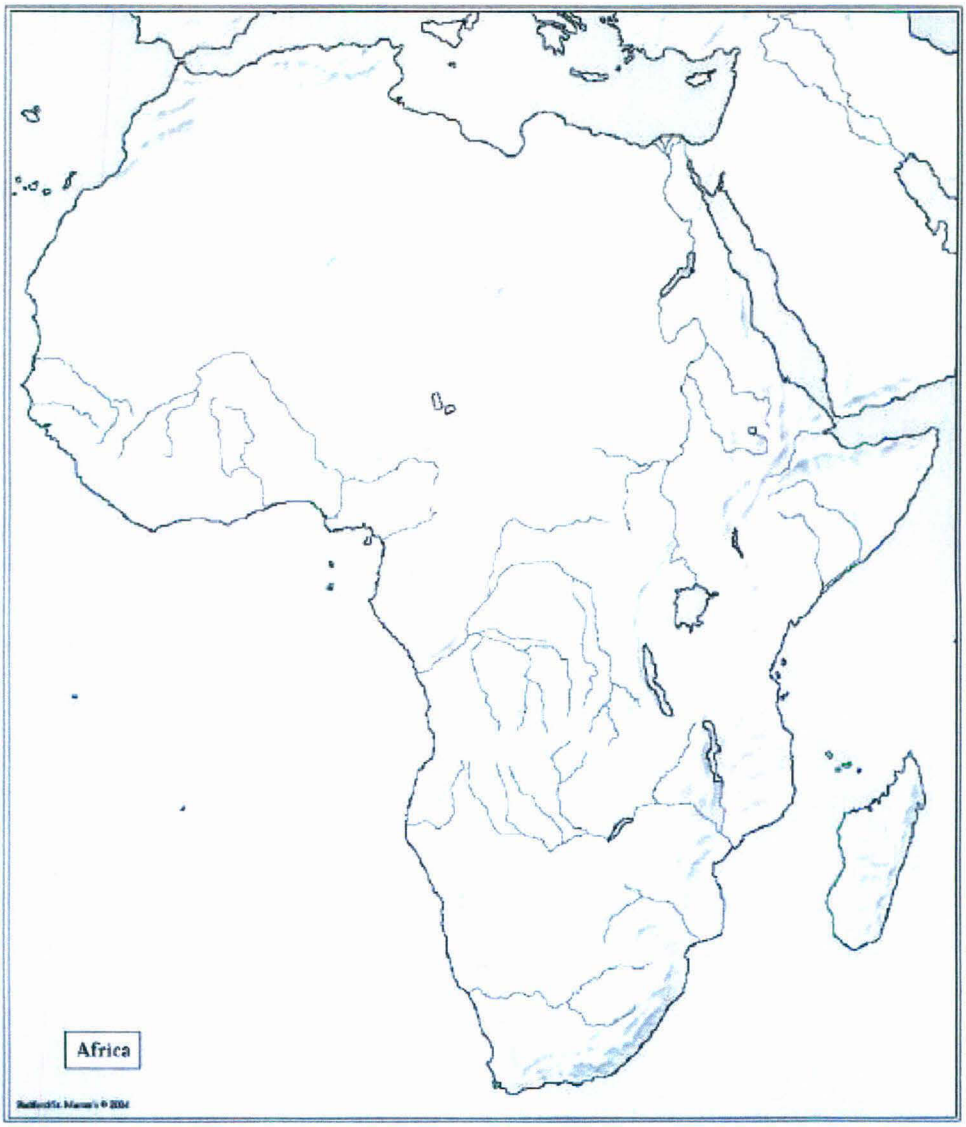
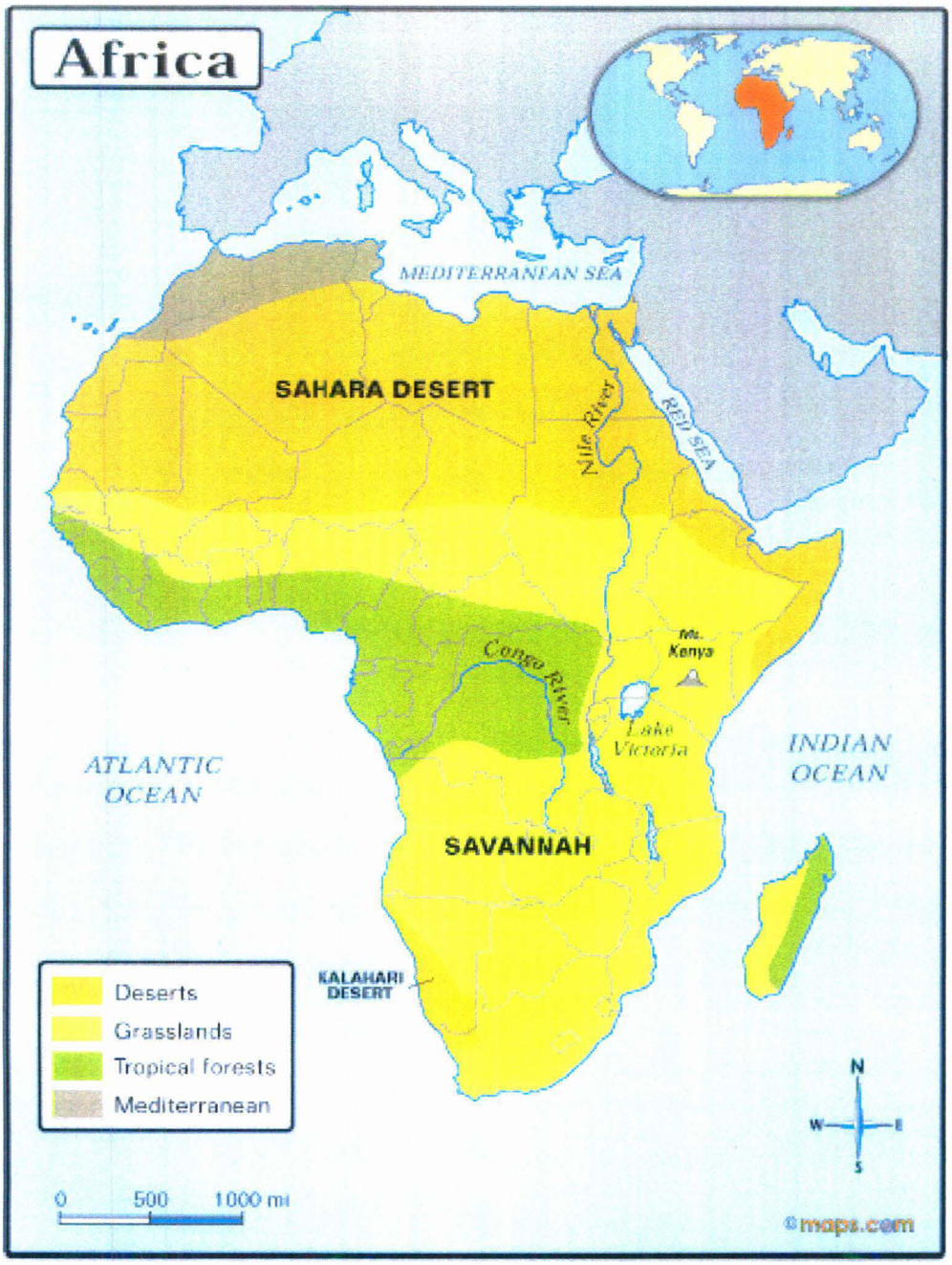


Figure-2 (iii) Vegetation zone of West Africa



## Soils of Niger River basin

There are three types of major soil in the Niger River Basin, according to the French soil nomenclature (World Bank 1986), are Ferralitic soils, tropical Ferruginous soils, and Hydromorphic soils. The characteristics of these three types of soils determine the nature of agricultural productivity in the Basin. As a result, agricultural development varies in the Basin with the geographic distribution of the specific soil. The characteristics for each soil type are described below:

### Ferralitic Soils

These soils are found are found in the extreme west of the Guinean basin of the Niger, in the south of the Bani watershed, in the north of Benin, and in the major part of the Niger River Basin in Nigeria, including the Benue watershed. These are thick soils (from 3 to more than 10 meters thick), where geochemical changes are extensive and spread over many millions of years.

The hardened lateritic layers can be seen on the surface or at short depths on top of a mix of the ferralitic and ferruginous soil. they are found in particular in Guinea and in southern Mali. This concreted and hardened horizontal layer results from an upward migration of ferrous oxides and from their precipitation. Limited spots of tropical brown soil or tropical black clay (vertisols) can also be found.

### Ferruginous Soils

Bleached layers of ferruginous tropical soils are seen in the north of the Bani watershed, on the periphery of the Inland Delta in Mali, in the east of Burkina Faso, and along the northern part of the Niger River Basin and Benue watershed in Nigeria and Cameroon. They are associated with ferralitic soils in the Upper Niger River Basin upstream of Bamako and in the Kaduna watershed in Nigeria. Alternating dry and wet seasons, characteristic of the watershed's climate, have caused discontinuous changes in the rock over time. The changing layers have a variable thickness but are always less than 3 meters deep.

The tropical ferruginous soil is the characteristic of a short wet season, which are little or

not at all bleached, cover a large band in the north, from Mopti to Niamey and Maradi. Even farther north, subarid isohumic brown soils are present from Gourma to Gao (Mali), and in Niger. Sandy dunes, poorly evolved subarid soils, and lithosols characterize this section and indicate that the Niger River has reached the Sahara.

**Hydromorphic soils**

Linked to the presence of a temporary or permanent aquifer that is close to the surface, it can be found in lake basins, riverbeds, and low clay plains. Almost all of the soils in the Niger's Inland Delta are of this type; 74 percent are flooded every season in the active Inland Delta (PIRT 1983).

It's not seems to be fare to overlook the environmental issues and problems which affects the region Niger Basin in a very negative manner. Environmental degradation of basin can be observed in various sphere of ecosystem. Drought, soil erosion, desertification, and deforestation are prominent and also interrelated environmental problems in West Africa. All of these contribute in some way to a lack of necessary natural resources for people's daily lives (i.e. food, water, firewood, etc.). As mentioned above, some regions of West Africa suffer much more from these problems than others in particular the Sahel region.

**Conclusion**

To conclude this study we have been able to extract larger levels of perception about Niger River basin. While studying this land portion of African continent, It can be very honestly said, that this basin has important potentials to attract the scholars of regional studies and geopolitics

Niger River while adapting its natural course provides sustenance to major segment of population of about ten countries. a fertile soil for agriculture in Savannah and neighboring areas, forestry, fisheries, water resources', etc are the gifts of nature through the medium of this river Niger.

It's very frank to say that this chapter does not examine the countries and issues of geopolitical problems in very detail ás well as due to some limitation of objectives of chapter; this study has only presented an overview of Niger basin. In the first section,

Countries of basin has pointed out and their general geography has explained. in this discussion we have seen that Nigeria, Niger, Mali and Guinea has larger share in the basin and their role in resource extraction has also been enhanced. Though ivory coast, Benin, Burkina Faso has lesser shares in percentage of the river basin but their economic and ecological importance cannot be neglected.

General geography of whole basin is needed to understand the elements of environmental problems. The semi arid land of Northern Sahel area, the inner delta and middle Niger are the upper physiographic division of basin. Niger delta is other division which has been focused by this study. Soils and natural vegetation are the important component of physical environment which has also be given space in this description. A set of environmental problems are listed out in this study for the purpose of further inquiry in detail in upcoming chapter. It is reasonable to concentrate on a core single issue which has a larger implication on the whole geopolitical structure and in a view of this scholar; water must be taken for further investigation.

## CHAPTER 3

## RIVER BASIN- A STUDY OF WATER RESOURCE- UTILITY, IRRIGATION AND SUSTAINABILITY

In the previous study we have observed the Niger River basin in detail. we have also been able to analyze the setting and pattern of riparian countries in terms of their location and their area sharing in Niger river basin. Covering the basin characteristics and its resource features, soils and vegetation, we have also focused on environmental problems facing by basin. it is very interesting to note that basin has a great potential of natural resources and among them water is most important which generate a curiosity in the mind to inquiry in detail. Therefore we are now able to observe water resources its availability, utility and irrigation in the present chapter.

Water is the most precious resource of this living planet. The blue color of Earth from space is only due to availability of water on the face of globe. Water is an essential resource for humankind. It is needed for drinking, personal hygiene, food production, and industrial activities.

In addition, it has important non consumptive uses, such as fishing, shipping, hydro power generation, and recreation. Water also often plays an important role in the cultural identity or the religious beliefs of local people.[1]

The richness of river basin seems to be enhanced with its capacity of holding the much amount of water in its channel and in its tributaries. Water resources in the catchment area are utilized in the various functions. From irrigation, domestic consumption, fishing and industrial uses; water has the important role in economy and livelihood of human civilization.

The geography and climate of river basin play a crucial role in water resource availability in the basin. All the water related activities are affected by these important determinants. The diversities in topographical condition as well as human influence on basin environment have

[1] Eric Mostert, Conflict and Co-operation in the management of international fresh water resources: a global review, Delft University of Technology, Delft, The Netherlands UNESCO, 2003.

affected the water resources and conditions of surface runoff.

The Niger River water system is one of the most impressive examples of the influence of topography and climate on the flow conditions of a water system. Such a large basin area cannot be expected to have uniform climatic and rain patterns, and the Niger River traverses almost all the possible ecosystem zones in West and Central Africa. A combination of human population growth, unsustainable resource use and development, and desertification threatens the Niger River's ability to supply crucially needed natural resources to the people of West Africa. The geology and soils of the Basin also influence groundwater availability. Significant rainwater deficits and the variable duration of the rainy season result in hydrological deficits that are not necessarily reflected in a direct response of the base flow (A NDERSEN AND MARTHA-2005).

The increasing number of population In Niger river basin, as well as larger demand in growing economy has produced a water scarce situation. Much of the populations are farmers, fishermen and pastorals who rely on the Niger River. These local communities and other stakeholders are increasingly facing water shortages as well as poor water quality and environmental degradation has enhanced their problem. The degradation of environment has exposed population food insecurity also.

The problems limit attempts to alleviate poverty and improve health care, food security, economic development and protection of the natural resources. The degradation has also resulted in loss of habitat for millions of migratory birds, aquatic fauna and flora. (WWF JULY 2003)

Given its large spatial spread, it is unsurprising that contrasting socio-economical situations exist in the Niger River Basin. The population of the Niger River Basin was estimated in 2001 at about 106 million persons and the average population density is 50 inhabitants/km$^2$. However, along the River course (where major cities are located: Kankan in Guinea, Bamako, Mopti, Segou and Gao in Mali, Niamey in Niger, Garoua in Cameroon and numerous cities in Nigeria) the population density often reaches values higher than 200

inhabitants/km$^2$. On the other hand, there are large un-populated zones at the North of the basin [BARRY B. eta l., 2003]. The population is three-quarters rural, though 87 to 97 percent of the Niger basin population of Burkina Faso, Ivory Coast, Mali and Guinea are rural, around 75 percent in Nigeria and Chad, and from 30 to 60 percent in Benin, Niger, Cameroon and Algeria (UNDP, 2003).

The problems of environmental degradation and increasing number of population has become the obstacle in the path to alleviate poverty and improve health care, food security, economic development and protection of the natural resources. The degradation has also resulted in loss of habitat for millions of migratory birds, aquatic fauna and flora.

In Niger basin Water as a resource, is generally used in the area of large scale irrigation in farm land, small scale farmers and pastorals on both sides of the basin.

On the other hand mining industry, small scale fishing activities, and urban and rural domestic water supplies are the other zone where water resources are required in the basin.

**Water Resources in Basin**

In the Sub-Saharan African region of River Niger Basin, where none of the major rivers is fully contained within the borders of a single nation, transnational water sharing is essential for survival. Even the globally proclaimed goals of sustainability and environmental security are unattainable in the absence of bilaterally negotiated water agreements.

In terms of water resource availability, the countries of Niger basin are grouped as "water resources producers" which includes Guinea, Cameroon, and to a lesser extent Benin; or "water resources consumers" where Mali and Niger are important. Nigeria is both a producer and a consumer. Ivory Coast, Burkina Faso, and Chad are part of the Basin but are minimally affected by the use and management of the river's water resources.

From the stand point of water resources, the Niger Basin can be divided into four zones with more or less homogeneous physical and geographical characteristics.

**The Upper Niger Basin:**

It is found in Mali, Guinea, and Ivory Coast. It covers a surface area of 257 000 km2 out of which 140 000km2 are situated in Guinea, serving as the watershed and is seen as the portion which can be used to

Partially regulate water flow throughout the length of the river.

**The Inland Delta**

Entirely situated in Mali, it covers a rectangular area facing south west and north east with a length of 420 km and a width of 125 km between Ke-Macina and San in the south and Timbuktu in the north. It has a surface area of 84000 km2 and comprises four agro-ecological zones: the living delta, the middle Bani-Niger, the dead delta and the lakeside zone between Gao and Timbuktu. It accounts for almost all of the rice cultivation which is the staple food in Mali. This is done thanks to the Markala Dam.

**The Middle Niger Basin**

It lies within Mali, Niger, Benin and Ivory Coast. It stretches from Timbuktu to Benin, covering an area of 900.000 km2, 230 000 km2 of which are inactive. It is made up of a series of irrigated terraces. Water flow in this basin largely depends on additional influx from the Inland Delta and navigation is hampered by waterfalls.

**The Lower Niger Basin**

It lies between Cameroon, Nigeria and Chad. Rainfall varies from 700mm in the North (Sokoto) to more than 3 000 mm in the South (Niger delta). It is characterized by big dams for hydro-electric power production, irrigation and by industrial activities on the rest of the basin. Energy production is mainly derived from the Kainji, Lagdo and Jebba dams which supply 68% of Nigeria's electricity needs and 22% of her total energy needs. The first two sections display endorheic behavior; whereas the total annual mean flow entering the Niger Inner Delta is estimated at 46 km3, the mean annual flow is only 33 km3 at Taoussa, immediately after the inner delta, which can reach 30,000 km² in flood season. Within the Middle Niger, the river loop receives 6 tributaries from Benin and Burkina Faso. The mean annual flow entering the Lower Niger is 36 km3, but with the contribution of its main

tributaries (above all the Benue River), the mean annual flow entering the sea at the mouth is 180 km3.

**Water Availability and Rainfall condition in the Basin**

Looking at water availability, we see that the basin covers a wide range of agro-climatic zones, from over 4000mm in the extreme south to less than 400 mm (0 mm some years) on the fringes of the Sahara desert. While a quarter of the basin is under semi arid climate, in the rest of the basin, south of the 13 degree north, rainfall exceeds 700 mm and is broadly sufficient for rain fed agriculture (CPWF).[3]

The rainfall regime of the Niger River depends on the fluctuations of the Atlantic Monsoon which generally occurs between May and November. The intensity of the phenomenon is relatively homogeneous on the east-west axis but experiences a serious gradient in the north- south axis. There are 530 rainfall stations and 105 climatic stations with at least 20 years of observations. Data from Nigeria and Guinea are difficult to recover. The average annual rainfall rises to 4000 mm in portions further south in the basin, while it decreases to less than 400 mm (0 mm some years) in the north under
Sahelian and semi desert climate.

Distribution of rainfall in the basin is not uniform. And this spatio-temporal distribution of rainfall also affects the nature of flow. Niger River is highly dependent on rainfall. Rainfall is very concentrated in the year, leaving northern part of basin very short growing season. In south short rain spell or excess rainfall causes crop failure.
Basin has observed frequent drought, after severe drought in the 1970 and 1980 rain fall increased after 1993 but levels are still low. Reduced rainfall affected runoff in the basin differently. In the upper basin, runoff deficit was high and more consequent than rainfall deficit, due to cumulative effect of reduced rainfall on ground water levels. In Sahelian parts runoff co-efficient increased. Partly due to reduced rainfall but mainly to increased agriculture and reduced natural vegetation. These variations in climate and river regime are essential. (CPWF 2009).

[3] Challenge Programme on Water and Food December 2009

**Average Annual Rainfall in Niger River basin**

Rain fall pattern shows the water availability condition which determines the surface flow and volume. In Niger basin, we observe the annual rainfall data provided by FAO in 2004. Niger River basin in total has 690 mm mean annual rainfall and Guinea constitute rank first among all the riparian states.1635 mm water is recorded as mean annual in Guinea. Maximum rainfall water in Guinea has been shown as 2180 mm though minimum is 1240 mm. It established a high range of annual rainfall. Ivory Coast has same story which also represent 1466mm as average annual rain fall. Cameroon, Nigeria and Benin have also a good record of rainfall condition as moderate pattern in the basin. Cameroon has 1330 mm, annual rainfall which is slightly lower than Guinea and Ivory Coast. Nigeria (1185mm), Benin (1055mm) has moderate value in rainfall occurrence. Carbonnel and Hubert (1992) detect a 19-year climate variation for the period 1970–89. L'Hôte and Mahé (1996) compare the rainfall average during the period 1951–69 with the period 1970–89 and determine a southward movement of isohyets in the range of 150–250 kilometers, depending on the Basin climate zone.

The countries like Mali (440mm), Burkina Faso (655mm), Niger (280mm), and Chad (975mm) are experiencing the water deficit situation. These countries located in the zone of water deficit climate.The extreme are the Algeria, where 20mm annual mean rainfall explains the pathetic condition. (table3.1)

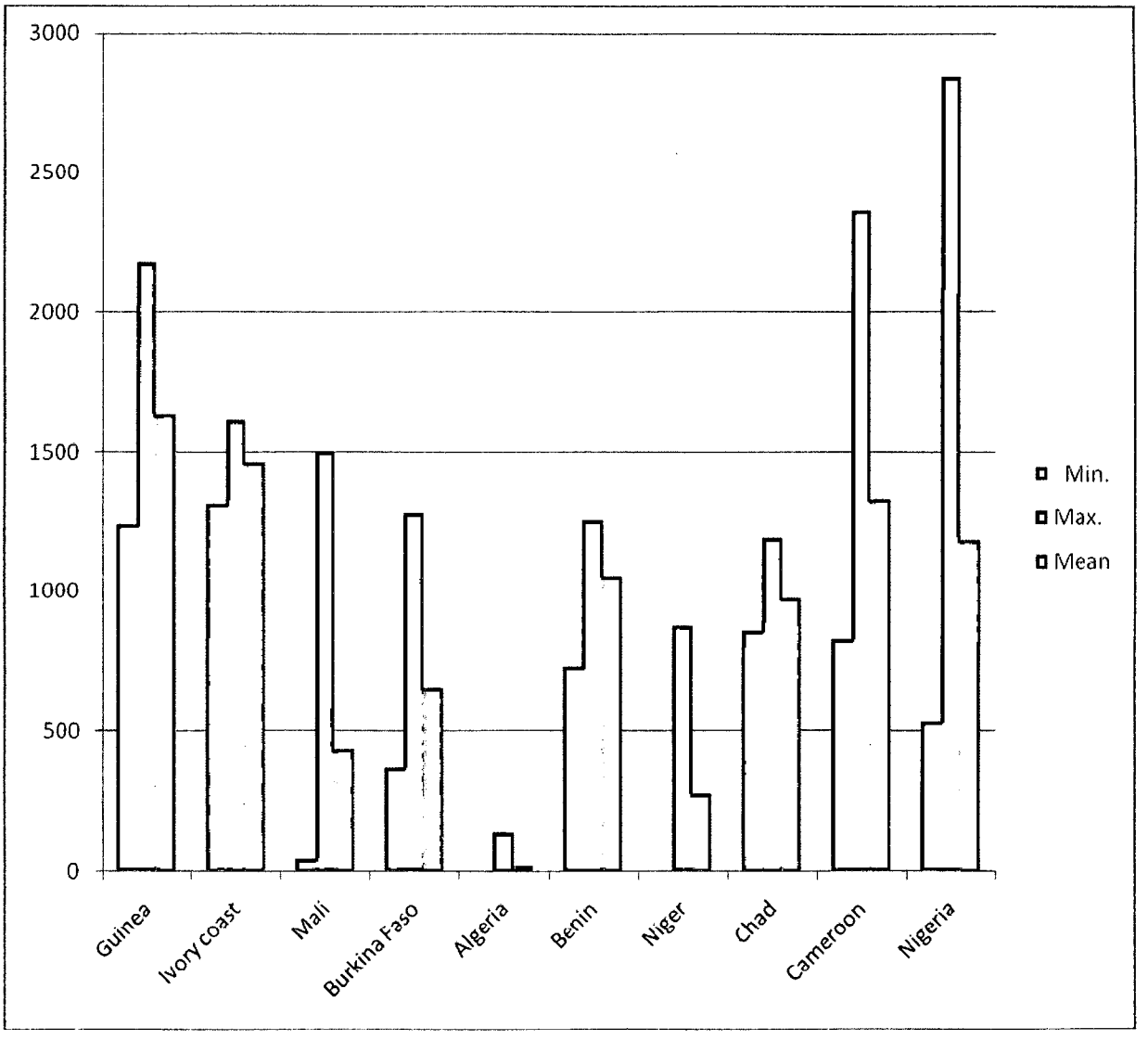
Table no .3.1 country wise, average rainfall in Niger River basin

| **Country** | **Average annual rainfall in the basin area** | | |
|---|---|---|---|
| | | (mm) | |
| | Min. | Max. | Mean |
| Guinea | 1240 | 2180 | 1635 |
| Ivory coast | 1316 | 1615 | 1466 |
| Mali | 45 | 1500 | 440 |
| Burkina Faso | 370 | 1280 | 655 |
| Algeria | 0 | 140 | 20 |
| Benin | 735 | 1255 | 1055 |
| Niger | 0 | 880 | 280 |
| Chad | 865 | 1195 | 975 |
| Cameroon | 830 | 2365 | 1330 |
| Nigeria | 535 | 2845 | 1185 |
| Niger basin Total | | | 690 |

Source-FAO (2004)

Therefore, the extreme arid north of the basin receives less than 50mm of rainfall per year, all of it exclusively during one rainy season, where as the humid southern parts of the basin, in Guinea and Nigeria, receive more than 2000mm.

Diagram-3a Average annual rainfall in the basin area in mm (y axis)




**Nature and characteristics of surface flow and annual discharge of Niger River and tributaries:**

The Basin is a unique and complex river system with an extensive network of tributaries. Because of climatic variations, the annual river flood does not occur at the same time in different parts of the Basin. There are usually high flows from the head waters in Guinea, a decrease in flow caused by evaporation and expansion in the floodplain of the Inland Delta, followed by an increase in flow from tributary input through the Middle and Lower reaches

as the river enters the Niger Delta.

Whereas the total annual mean flow entering the inner delta is estimated at 46 cubic km, the mean annual flow is only 33 cubic km at Taoussa, immediately after the inner delta, which can reach 30,000 km² in flood season. Within the Middle Niger, the river loop receives 6 tributaries from Benin and Burkina Faso. The mean annual flow entering the Lower Niger is 36 cubic km, but with the contribution of its main tributaries (above all the Benue River); the mean annual flow entering the sea at the mouth is 180 cubic km (CPWF 2009).

Table 3.2 Average Annual Flow and Flow Volumes in the Niger and Benue Basins from the Headwaters to the Niger Delta, Before 1960 and from 1980 to 2004.

| **Country, tributary and stations** | **Surface area (squire km)** | **Flows before 1960(cubicmeter /second)** | **Flows 1980-2004 (cubicmeter/second)** | **Annual volume before1960(cubic km)** | **Annual volume 1980-2004(cubic km)** |
|---|---|---|---|---|---|
| **Niger river** | | | | | |
| **Guinea** | | | | | |
| Tinkisso | _ | _ | _ | 220 | 160 |
| Niandan | _ | _ | _ | 260 | 189 |
| Milo | _ | _ | _ | 275 | 160 |
| Siguri station | _ | 67400 | 1015 | 755 | _ |
| Sankarani | 265 | _ | _ | _ | 405 |
| **Mali** | | | | | |
| Koulikoro station | 120000 | 1545 | 1040 | _ | _ |
| **Ivory coast** | | | | | |
| Bani | _ | _ | _ | 670 | 207 |
| **Burkina faso** | | | | | |
| Delta inflow | 222000 | 2195 | 1247 | _ | _ |
| Dire station | 330000 | 1110 | 750 | _ | _ |
| **Niger** | | | | | |
| Niamey station | _ | 1020 | 670 | _ | _ |

| | | | | | |
|---|---|---|---|---|---|
| **Benin** | | | | | |
| Malanville station | | 440000 | 1140 | _ | 800 |
| Nigeria | | | | | |
| yidere-bode | _ | _ | 820 | _ | _ |
| Sokoto | _ | _ | _ | 200 | 100 |
| Jebba station | 1370 | 1600 | 950 | _ | _ |
| Kaduna | _ | _ | 212 | 600 | 400 |
| Baro | 73000 | 2525 | 1370 | _ | _ |
| **Benue river** | | | | | |
| **Cameroon** | | | | | |
| Riao station | 27600 | 280 | 212 | _ | _ |
| **Chad** | | | | | |
| Mayo kebi | _ | _ | _ | 100 | 80 |
| **Cameroon** | | | | | |
| Garoua station | 64000 | 375 | 308 | _ | _ |
| **Nigeria** | | | | | |
| Gongola | _ | _ | _ | 200 | 120 |
| Taraba | _ | _ | _ | 500 | 380 |
| Donga | _ | _ | _ | 500 | 400 |
| **Cameroon** | | | | | |
| Katsina | _ | _ | _ | 800 | 675 |
| Nigeria | | | | | |
| Makurdi station | 305000 | 31,50 | 2380 | _ | _ |
| Lokoja station | _ | 34,00 | 25,00 | _ | _ |
| **Niger river** | | | | | |
| Lokoja station | _ | 3000 | 16,00 | _ | _ |
| Onitsha station | 1100000 | 7000 | 45,70 | _ | _ |

Source: Rodier 1964.

Note: — not available.

**Water Utility**

The larger section of water in the basin is agricultural activities. Predominantly agriculture relies on rain fall (95% is rain fed) and cropping pattern are in tune with the rainfall condition. In the extreme north where aridity is the feature of climate, land is just sufficient for occasional pasture; towards the south we find millet sorghum, then banana, plantain, cassava, yam and finally rice cultivation. Irrigation is well in areas of Inner Delta in Mali, in Niger and Nigeria.

Irrigation and blue water use are under developed with only 3% of agricultural land irrigated and river withdrawals representing 1.5% of annual flows. Large perimeters exist in Mali and Nigeria, but traditional systems such as recession flooding, lowland and free flooding dominate in terms of surface area. Farmers and donors now increasingly attempt to control water supply better. A number of small dams exist already in Burkina Faso, Mali, and Ivory Coast and are being actively developed as art of NGO and private projects. (CPWF DECEMBER 2009).

Livestock and fisheries are other areas where water is largely utilized in the basin. Livestock and fisheries are essential livelihood activities for millions of farmers/rural poor. Production is predominantly extensive and the North-South distribution of livestock is function of their resistance to drought and their aptitude to exploit natural rangelands.50 000000 herders breed 138 000000 livestock units (camels, bovines, small ruminants) across the basin.[4] There are two major livestock breeding modes: nomadic pastoralism which covers large distances annually and breed large herd of zebus, and the sedentary breeding, typically a few small ruminants and some larger bovines. The former is notably severely impacted by the development of agriculture, which notably restricts access to grazing land and water points.

Fishing activity is mainly concentrated around the large floodplains (Inner Delta) or reservoirs (Selingue, Kainji, Jebba, Lagdo). Out of 100 000 professional fishers in the basin supporting roughly 900 000 people, 62,500 are in the Niger Inner Delta and 13,000 in the

[4] Challenge Programme on Water and Food December 2009

large reservoirs. Total fish catch in the basin is about 240,000 tons per year (estuarine delta not included), with a value of almost 100 million US dollars. It has been estimated that fish represents a significant fraction of the animal protein in Africa, with 40% in Nigeria and 49 % in Cameroon.[5]

However, national or pro-poor policies have not, up to now, taken into account the fisheries sector, partly because their importance has not properly been evaluated. The projected demographic increase as well as the construction of dams and water withdrawals will exert increasing strain on fishers. Fish culture in
Ponds, around irrigated perimeters, and in cages in reservoirs can constitute a valuable solution to perturbed fisheries, however the communities presently involved in fishing are poorly prepared to manage this new activity.

There are some dams which collect water in the basin. These dams are great water reservoir. Dams are categorized as existing dams and projected dam in the report of CPWF in 2009. There are about 260 existing dams identified in Niger catchment area. These distributions are irregular and concentrated on the some section of Niger basin. Notably these dams are located in Burkina Faso and Nigeria. Burkina Faso has small dams and in Nigeria we see large size dams in basin. Seventy dams are projected in the basin of River Niger mainly on the middle and upper Niger valley in Niger, Burkina Faso Dali and Guinea. Nigeria currently holds the majority of dams, including large dams and there are currently only a few dams in the upstream section of the Niger River in Mali, Guinea and Côte d'Ivoire. There are however plans to build a number of dams (including some very large dams like Fomi in Guinea) in the coming years.

In view of of potable water we can observe that various water catchments areas have been set up on the Niger and its tributaries to supply many towns with potable water. These were sized based on 2005 populations and using 20 liters per inhabitant per day for the rural areas and 40 for the urban agglomerations. (CPWF, 2009)

[5] CPWF, project report, 2009.

The natural flow of the Niger River has been increasingly regulated by the construction of dams with the objective to generate hydropower and to store and use water for irrigation.[6] However, there is still room for increasing energy production through the construction of further dams. The World Bank estimates that 30,000 gigawatt hours could be generated in the Niger River and its tributaries, but only 6,000 have been developed.[7]

However, the impacts of the construction of new dams might also be harmful. For instance, the Inland Delta depends on floods from the Upper Niger. Flooded areas might play an important role in groundwater formation. Artificial reservoirs might also lead to a decreasing flow of the river, resulting increased evaporation and sedimentation. In addition, water hyacinths might proliferate in standing waters. Therefore, all impacts should be carefully considered before the construction of new reservoirs.

**Irrigation Potential and Water Requirements**

The rainfall and hydrological conditions in Guinea make it possible to exploit, with good chances of success for an annual rain fed crop, the alluvial plains of the Niger River and its tributaries. However, to be able to cultivate all year round, irrigation is necessary. The irrigation potential in this region is estimated at 185000 ha, of which 100000 ha are relatively easy to develop, though the construction of dams is necessary for the storage of the water. To date only about 6000 ha of rice are irrigated [FAO].

The irrigation potential for the whole of Ivory Coast has been evaluated at 475000 ha, without giving details of location[8]. It is estimated that 50000 ha are located in the Niger basin.

In Mali there are four climate zones in the basin area and rainfall ranges from 1500 mm in the south to less than 50 mm in the north.

The water in the Niger River is partially regulated through dams. The Sélingué dam on the Sankarani River is mainly used for hydro power, but also permits the irrigation of about

[6] UNEP 2005, p. 37
[7] World Bank 2005, p. 58
[8] FAO, 1995, Irrigation in Africa in figures. FAO water report 7 Rome, page no.336.

60000 ha under double cropping. Two diversion dams, one at Sotuba just downstream of Bamako, and one at Markala, just downstream of Ségou, are used to irrigate the area of the Office du Niger (equipped area of about 54000 ha). However, double cropping in this area would only be possible if the Fomi Dam, planned on the Niandan River in Guinea, were constructed to provide a supplementary and regular amount of water. However, the negative effects on the environment that would be caused by the construction of this dam seem to be important.

Several irrigation projects have been identified, especially related to the construction of the Tala and Djenné Dams on the Bani River and the Dam at Tossaye on the Niger River. However, the drying up of several watercourses during the low-flow period in the dry years 1983-85 requires a careful re examination of the projects identified, with the recent hydrological figures being taken into consideration.

The irrigation potential has been estimated at 556000 ha, of which about 200000 ha fully controlled and the rest for partially controlled schemes [FAO. 1992]. At present about 187000 ha are equipped in the Niger basin, but of this 57000 ha are already abandoned and of the remaining 130000 ha actually irrigated more than 60% need to be rehabilitated. Irrigation water requirements for double rice cropping in the Niger River valley range from over 30000 cubic m/ha per year in the southwest to nearly 50000 m3/ha per year in the northern part according to this study.

In Burkina Faso most of the irrigation is located outside the Niger basin. About 850 ha are irrigated in the Niger basin and the potential is estimated at about 5000 ha [FAO. 1991].

In Benin the irrigation potential has been evaluated at 300000 ha for the whole country, but no details about location are given. In the present study it has been estimated at 100000 ha in the Niger basin. The actual equipped area here is 1090 ha, of which 740 ha are cultivated.

The Niger River crosses the south-western part of Niger over a distance of about 550 hen with the final 150 km forming the border between Niger and Benin. There are no important tributaries in Niger, but there are two fossil valleys, the Dallols, where there is no permanent flow but where the water resources are quite important. Three other zones are considered as

being part of the Niger basin, although inftact they are rather valleys or depressions at a considerable distance from the Niger River with no streams reaching the Niger River: the Ader-Doutchi-Maggia (ADM) valley, the Goulbis valley and the Agadez region.

The total irrigation potential of Niger has been estimated at 222000 ha, of which 140000 ha in the Niger River valley and the remaining 82000 ha spread over the other zones [FAO. 1991]. At present about 54000 ha benefit from irrigation, of which 16000 ha are in the Niger River valley.

Irrigation of the 140000 ha in the Niger River valley and its tributaries on the right side would only be possible through the construction of the Kandadji Dam in the north, just downstream of the border with Mali. Without this dam it would be possible to irrigate only 15000 ha. However, construction of this multi-purpose dam has so far not been possible due to financial and economic constraints. Reports also indicate that the dam would have a negative impact on the environment [OCDE 1991][9]. Several other storage works on the tributaries are under consideration.

The irrigation potential in the Niger basin for Cameroon has been estimated at 20000 ha [FAO 1990].[10] The Lagdo dam on the Benue River, built primarily for hydroelectricity, regulates the flow of the river. It could also be used for irrigation. The irrigation sector in Nigeria can be divided into three categories[11]

1-Public irrigation schemes, which are government-executed schemes;

2- Farmer-owned and operated irrigation projects (improved fadamas).

3- Residual fadamas or floodplains.

About 275000 ha of public schemes are planned under the existing water infrastructure, but only 40540 have been completed and irrigated. As far as the fadamas crop production has depended traditionally on rainfall in the wet season and on residual moisture after flood recession in the dry season. In areas with easily accessible shallow groundwater or surface

[9] Organization of the Cooperation and Development Economics
[10] FAO/DDC Rapport 103/90 AF-CMR 29. Rome
[11] Japan International Cooperation Agency (JICA). 1993. The study on the national water resources Master plan. Federal Ministry of Agriculture, water resources and rural development.

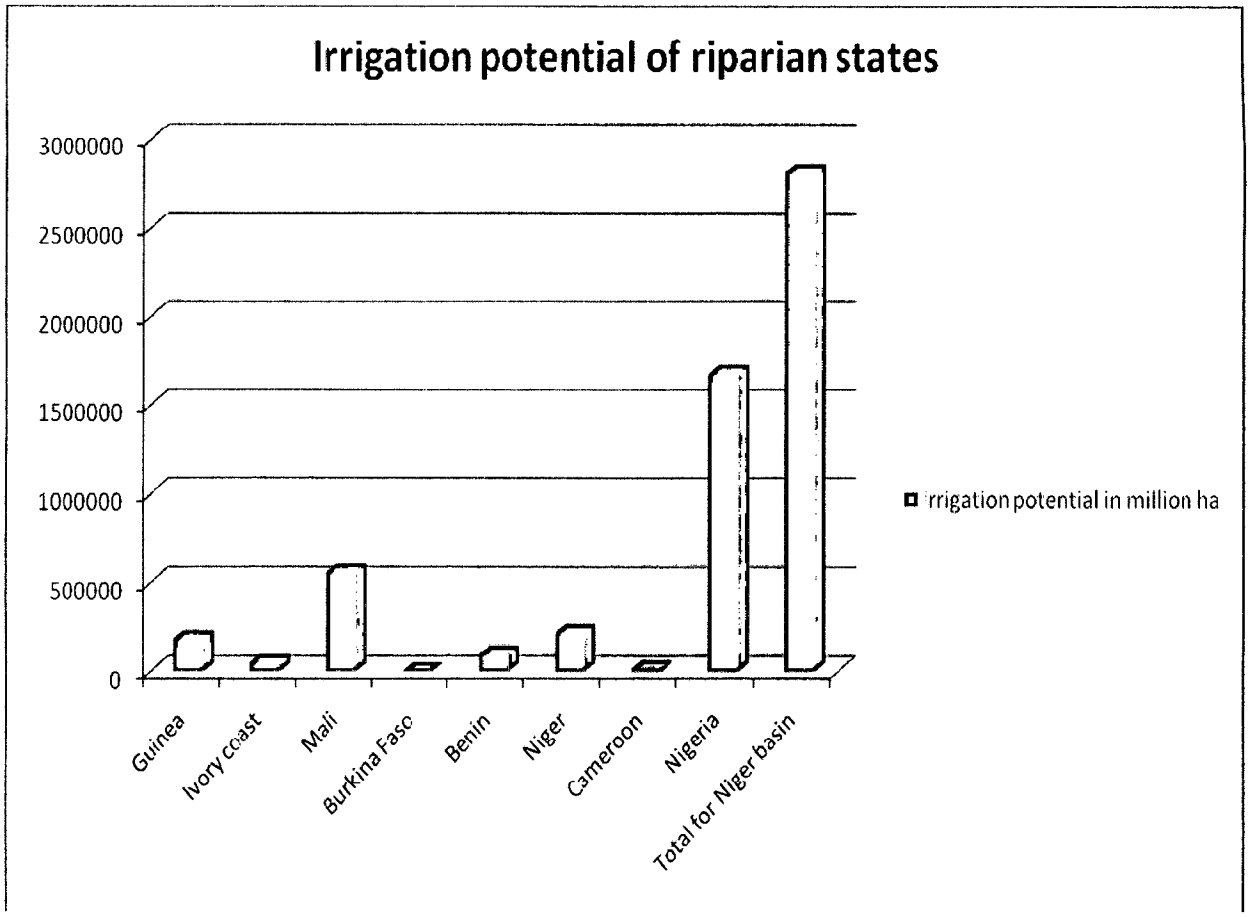
water, water lifting devices are used to lift water into the land. The existing formal fadama area has been evaluated at 79000 ha and in addition there are about 550000 ha of residual fadama cultivation in the Niger basin.' Fadamas' are sometimes considered wetland, sometimes as flood plains where flood recession cropping is practiced.

Table 3.3 Niger River basin: irrigation potential, water requirements, water availability and areas under irrigation

| **Country with an area within the Niger basin** | **Irrigation potential** | **Gross irrigation water requirement** | | **Actual flows** | | **Flowsafter deduction forirrigation and losses** | | **Area alreadyunder irrigation(ha)** |
|---|---|---|---|---|---|---|---|---|
| | (ha) | (m3/ha) | Total | Inflow km3/yr | Outflow (km3/yr | (km3/yr) | Outflow (km3/yr) | Million ha |
| Guinea | 185000 | 23500 | 4.35 | 0.00 | 40.40 | 0.00 | 36.05 | 6000 |
| Ivory coast | 50000 | 23500 | 1.18 | 0.00 | 5.00 | 0.00 | 3.83 | 0 |
| Mali | 556000 | 40000 | 22.24 | 45.40 | 29.20 | 39.88 | 6.96 | 187500 |
| Burkina Faso | 5000 | 7000 | 0.04 | 0.00 | 1. | 0. 0 | 1.37 | 85 |
| Benin | 100000 | 18500 | 1.85 | 0.00 | 3.10 | 0 | 1.25 | 740 |
| Niger | 222000 | 37000 | 8.21 | 33.70 | 36.30 | 8 | 3.96 | 67520 |
| Cameroon | 20000 | 18500 | 0.37 | 0.00 | 13.50 | 0 | 13.13 | 2000 |
| Nigeria | 1678510 | 10000 | 16.79 | 49.80 | 177.00 | 17.09 | rest tosea | 670000 |
| Sum of countries | 2816510 | | 55.02 | | | | | 924610 |
| Total for Niger basin | 2816510 | | | | | | | |

Source-FAO 2004

Diagram-3b- Irrigation potential of riparian states




Analysis of irrigation potential of the Niger River basin we see in the table 3.3, that total Niger basin potential is 2816510 ha. Whereas 924610 ha area are already under irrigation. In terms of irrigation potential, Nigeria has significant value where 1678510 ha has potential to be irrigated and 670000 ha area are already irrigated. In Nigeria, the most downstream country, of the 177 km3/year flowing to the sea, only36 km3/year enters from Niger and 25km3/year from Cameroon. The rest is produced internally. More than 1 million ha of its potential of nearly 1.7 million ha is located in the tributary Benue basin (FAO).

Guinea has 185000ha irrigation potential as water outflows from here at the rate of 40.40 cubic km, each year. Only 6000 ha, area are irrigated. Mali has Equal to the sum of the water entering from Guinea (40.40 cubic km) and Ivory Coast (5.00 cubic km), equal to the water leaving in the country (29.20) minus potential water requirement in Mali (22.24). Potential requirements in Guinea and Ivory Coast are not included, because it is supposed that is included in the 'losses' in the inner delta. In fact, also a part of the 22.24 km3 should not be included for this reason.

The countries with the largest water requirements are Mali, Niger and Nigeria. Water problems may arise in the Niger basin if the whole potential is developed. Niger indicates (36.30 cubic km) outflow, minus inflow from Mali (29.20), Burkina Faso (1.40) and Benin (3.10) is equal to 2.6 km3 and it is less than the potential water requirement (8.21). Niger has 67520 ha land already irrigated. In fact Niger needs more water than 'produced' within the country.

Ivory Coast has not any area shown as irrigated by the data of FAO. Though it has 50000 ha potential for irrigation, Benin has also a less area under irrigated in the basin which represents 740 ha. Which has out flowed of only 3.10 cubic km. it has 100000 ha area for potential irrigation. The story of Burkina Faso is not different, where inflow is not recorded but out flow is 1.40 cubic km. the already irrigated land in this basin area is only 850 ha. Cameroon shows the lesser amount of irrigation potential. It represents only 20000 ha as irrigation potential but only 2000 ha are irrigated.

In all cases, important storage works for the development of irrigation are necessary throughout the whole basin. Probable navigation and hydro power problems may arise if more water is abstracted for agricultural purposes.

**Irrigated crop areas in Niger river basin-**

The total irrigated crop area of Niger River basin is 815million squire km. among them the highest share is of rice Which denotes 385 ha (47.23%) irrigated land. vegetables is on second ranking which occupy 215 ha(26.38%) irrigated land in the basin. sugarcane64 ha

| Countries | Wheat | Rice | Sugarcane | Vegetables | Fruits | Millet | Sorghum | Groundnut | Cotton | Maize |
|---|---|---|---|---|---|---|---|---|---|---|
| Benin | | 10 | 1 | | | | | | | |
| Burkina Faso | | 21 | 4 | 6 | 2 | | | | | |
| Cameroon | | 12 | | 15 | 5 | | | | | |
| Chad | 2 | 10 | 3 | 3 | | | | | | |
| Ivory coast | | 14 | 20 | 4 | 6 | | | | | |
| Guinea | | 65 | | 20 | | | | | | |
| Mali | 4 | 213 | 4 | 3 | | 12 | 12 | 2 | | |
| Niger | 2 | 30 | 6 | 12 | | | | 32 | 3 | |
| Nigeria | 50 | 10 | 26 | 152 | | | | | | 19 |
| Total ha | 58 | 385 | 64 | 215 | 13 | 12 | 12 | 34 | 3 | 19 |
| Percentage | 7.11 | 47.23 | 7.85 | 26.38 | 1.59 | 1.47 | 1.47 | 4.17 | 0.36 | 2.33 |

(7.85%) wheat 58ha (7.11%), groundnut 34 ha(4.17%) maze 19 ha() , fruits13(1.59%), millets 12 ha(1.47%) , sorghum12ha(1.47%) and cotton 3 ha

Rice (0.36%), has comparatively low share in irrigated crops in the basin. is the primary crop in all the riparian states which needs more water for irrigation. Mali is the prime country which has 213 ha land under rice. Guinea shows 65 ha which is highly lower than Mali.

Other countries from Benin to Nigeria, rice cropping area vary from 10-15 ha. Whereas Niger represent 30 ha irrigated area under rice. Vegetables are the second important crops (215 ha) after rice, in the irrigated basin. Nigeria is most important nation in this regard to vegetables where 152 ha land is irrigated and covered by vegetables

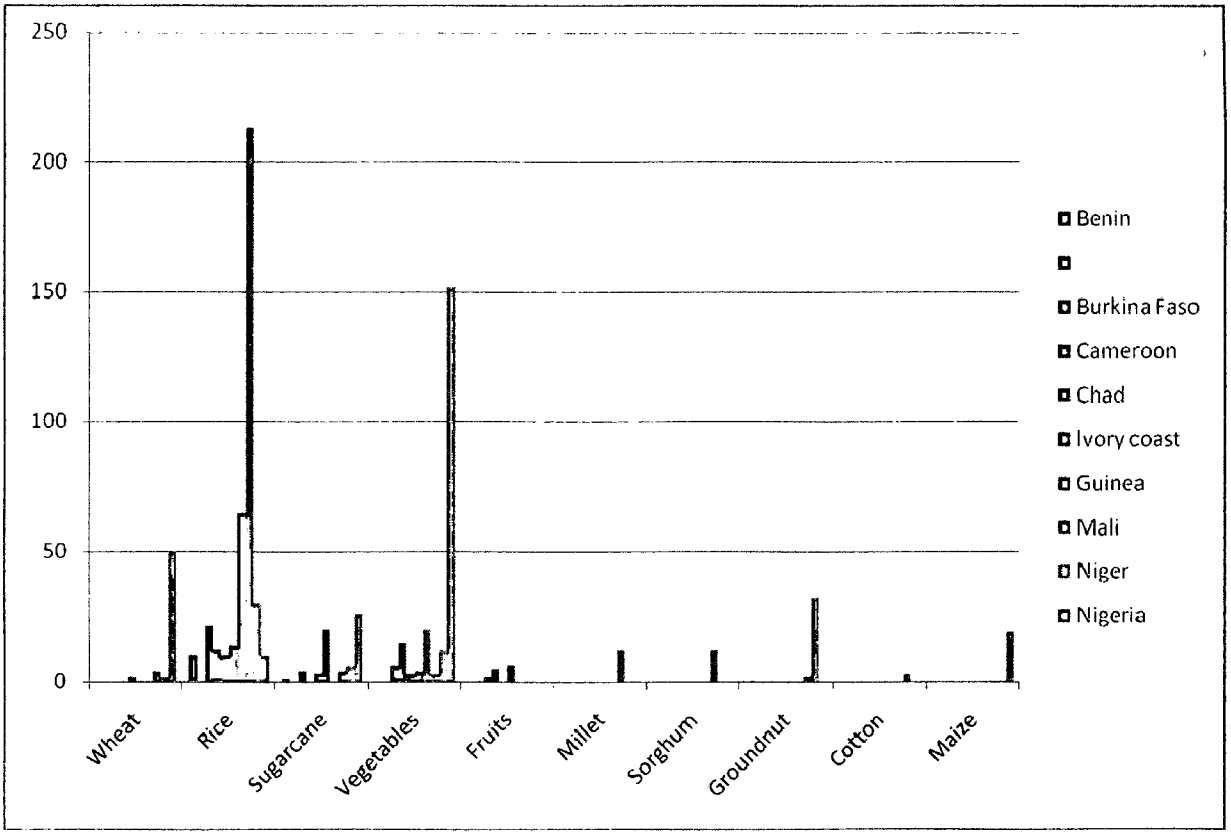
Source-WWF (2003)

On the other hand other riparian states has very low percentage share in vegetables where Guinea has 20 ha irrigated area under vegetables. Burkina Faso (6), Cameroon (15), Chad (3), Ivory Coast (4), Mali (3) and Niger (12) are less important in irrigated vegetables area.

Sugar cane has third ranks in the basin among irrigated crops. 7.85 percent total irrigated area of basin is under sugarcane. It seems to be low percentage, however sugarcane occupy the 64 ha irrigated area of Nigeria. Ivory Coast has 20ha. Other basin countries vary from 1-6 ha irrigated sugarcane crops land area. 7.11 percentages of total irrigated crops are there for wheat which is about 58 ha. Nigeria (50 ha), Niger (2 ha), Mali (4 ha) and Chad (2ha) shows the irrigated wheat lands.

Irrigated crop areas in Niger basin also experiences the fruits (1.59%), millets (1.47%), sorghum (1.47%), ground nut (4.17%), cotton (0.36%), and maze (2.33%) cultivation. but the percentage share in total irrigated cropping area in very low in the basin.

Diagram- 3c Irrigated crop area in Niger basin, area in million ha (y axis)




**Water Consumption of Selected Crops:**

Considering the fact that few crops needs more water to grow than others, we have selected a set of crops for our study. We see in table 3.5 that Rice consumes more water which is 12481million cubic m. among three countries. Nigeria accounts more than 75 percent of total rice water requirement which is 10,800 cubic m. this is due to larger area 374000hac under rice. Mali on the other hand has lesser amount of water requirement 631million cubic water. It has only 2800ha land for rice in the basin. Niger shows the middle path in rice water consumption 30,000million cubic water.

Vegetables also consume 2,114 million cubic meter water in three countries, Niger, Nigeria and Mali. Nigerian vegetables land consumes more water 1,777million cubic meter for consumption which is lower than Rice but higher than sugarcane and wheat. Mali requires lowest water 59 million cubic meters for low area 3000 ha.

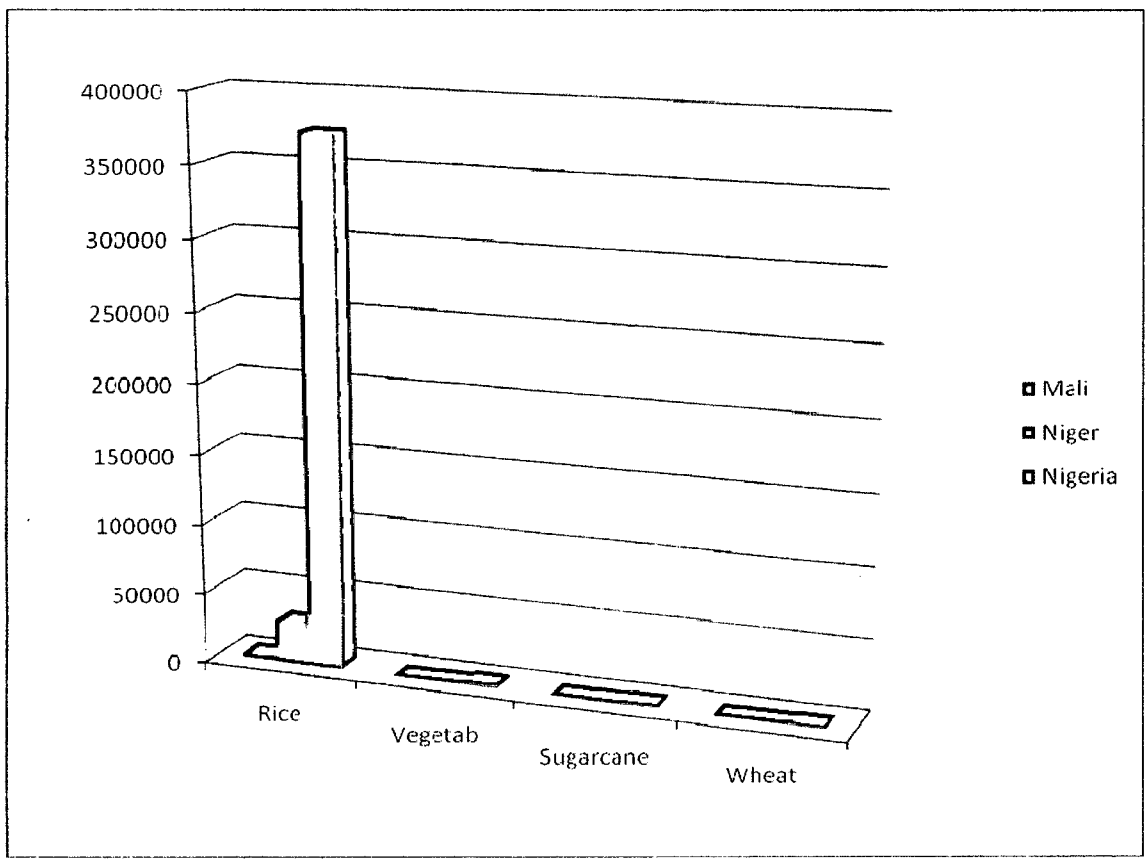
Table-3.5 - Consumption by "the thirstiest" crops of the Water basin;

| **Countries** | **Rice** | | **vegetables** | | **Sugarcane** | | **Wheat** | |
|---|---|---|---|---|---|---|---|---|
| | Ha | Million cub.m | Ha | Million cub.m | Ha | Million cub.m | Ha | Million cub.m |
| Mali | 2800 | 631 | 3000 | 59 | 4000 | 200 | 4000 | 112 |
| Niger | 30,000 | 1,050 | 12000 | 278 | 6000 | 493 | 3000 | 72 |
| Nigeria | 3,74000 | 10,800 | 100,000 | 1,777 | 26000 | 1296 | 50,000 | 1000 |
| Total | 406,800 | 12,481 | 115,000 | 2,114 | 36000 | 1989 | 57,000 | 1,184 |

Source- WWF (July 2003)

Wheat consumes comparatively less water. The total 57,000ha land of Mali, Niger and Nigeria grasp only 1,184 million cubic meter water. Consumption in Nigeria is higher 1000 cubic million meter and Niger needs lowest 72 million cubic meters. Sugarcane consumes 1989 cubic million meter of water in three selected countries. 36000 ha land is utilized for its cultivation. Mali consumes lesser water in sugarcane where 200 million cubic meter Water is taken. Niger utilized higher percentage of water as 1296 million cubic meters on 26000 ha land Though Niger needs moderate amount as 493 million cubic meters.

Diagram-3d Water requirement of selected crops in Niger River basin in million cub meter (y axis)




**Wet lands in Niger River Basin**

Wetland in Niger River basin has important role in ecosystem of region. These wetlands include various kinds of flood plains like larger inland delta and wet lands associated to Lake Habitat (Lake Chad, Niger inland delta), coastal delta environment of Niger River. It provides support to local communities of region who depend on their natural resources and the ecology of region.

Economically important wetlands in Africa include river floodplains (on all scales from 1-2kilometres across to the vast floodplains of the major rivers), freshwater swamps (sometimes occurring in conjunction with these floodplains), lakes, and coastal and estuarine environments (including)

Particularly in Sahel area, wet lands provides a vital element in the resource available to people. People utilized wetlands beyond their immediate boundaries of state.

**Floodplain Wet lands**

When the river flows is high in terms of water volume generally in rainy season then area is flooded with water. Until in the dry season some rivers can be reduced to pools of water separated by dry land.

Floodplains consist of a complex of physical features left by past deposition and erosion by river channels. As a result, topography and sedimentary characteristics are very variable, and so are flooding conditions. In many African floodplains some parts will be inundated for only a very short period, and perhaps not at all in low-flood years, while other areas flood for many months, or perhaps form permanent water bodies.

Flooding does not necessarily all come from river flow, however. Local rainfall can be important, particularly in flooding back swamp areas and pools. In some cases local run-off can cause flooding before river inundation begins, which can be important for the timing of agricultural or grazing activity. In coastal delta environments tidal movements can be important, backing up river flows and enhancing freshwater flooding. This is, for example, a significant factor in the flood related agriculture of the Basse Casamance in Niger River basin. Local run off into the floodplain also provides a vital source of water for irrigation in areas such as the Basse Casamance which are subject to brackish or salt tidal influence.[12]

In dry land Africa, the economic importance of wetlands is very great. Sometimes this fact is lost amidst concern about the development problems and needs of dry lands, and visions of huge benefits somewhere in the future if wetlands are 'developed'. However, even without such development, wetland areas have an important place in the economy of many African countries. This can include direct production of surplus food or other commodities or simply providing sound and sustainable incomes in both good and bad years for fairly large numbers of people. The Niger Inland Delta, for example, supports some 550000 people, and in the dry season provides grazing for about one million cattle and two million sheep and

[12] W. M. Adams, Indigenous use of wetlands and sustainable development in West Africa, Department of Geography, University of Cambridge The Geographical Journal, Vol. 159, No. 2, July 1993, pp. 209

goats. There are some 80000 fishermen, and the Delta supports some 17000 hectares of rice, half the total area of rice in Mali (Moorehead, 1988).

**Future Prospects of Water demand in Niger River Basin**

There is a general conclusion for Niger basin area that, by 2025, the region will face economic water scarcity — that is, primary water supply less than 60 per cent of potential utilizable water resources, with an increase in primary water supply of more than 25 per cent over current levels (WWF, 2003).

This means that Niger basin countries are expected to face primarily financial and institutional constraints in developing their water resources. It should be recognized that the predicted increases in irrigated area to meet future food needs, although substantial in terms of the percentage of the currently irrigated surface area, are in fact relatively small when compared to the total of rain fed cultivated area.

With reference to the data provided by International water management institute (IWMI), it can be said that in Mali 33 percent land in terms of irrigated area will increase where as primary water of country is expected to increase as 35 percent only. Portion of rain fed cereal area is increasing more as 57 percent. So, need of proper rainfall is needed in all the countries of basin.

Same is the case with Niger, Nigeria and Chad, where rain fed irrigation in cereal occupying land will increase in the varying rate from 67 percent in Niger to 36 percent in Chad. Nigeria will demand 58 percent rain fed cereal area.

The future water demand of Niger is predicted extremely high as 90 percent primary water supply increase, is required in the year of 2025. Nigeria is rich in potential water having 158.3 million cubic meters in 1995. This is the region only 53 percent water supply per year is needed this is due to rapid increase of population.

Chad seems to be very vulnerable which has only 25 million cubic meters water as its

potential in 1995, 54 percent primary water supply in a year in 2025. Rain fall cereal million ha area must also bee increase as 36 percent. Niger experiencing the same having 28.2 million cubic meter water in 1995 and demanding as 67 percent increase in rainfall irrigated land.

A challenge for the future in the Niger will be to devise means of increasing the area of cropland under irrigation without undermining the sustainability of freshwater ecosystems. This means improving the productivity of rain-fed agriculture, increasing the efficiency of existing irrigated areas, and expanding the use of irrigation practices appropriate to the region. Another option would be to encourage farmers to change from growing rice to wheat in the dry season, resulting in water savings of around 25—40 per cent. (WWF, 2003) Reducing water demand in this way could be significant for ecosystem health during periods of low river flows.

Table -3.6 Water demand forecasts for four West African countries

| Countries | Irrigated cereal area (million ha) | Primary water supply (cubicmeter) | Rain fed cereal area million ha | Potential utilizable resourse per cubic meter |
|---|---|---|---|---|
| **Mali** | | | | |
| 1995 | 0.12 | 1.18 | 2.75 | 76.5 |
| 2025 | 0.16 | 1.56 | 4.32 | |
| Increase (%) | 33 | 35 | 57 | |
| **Niger** | | | | |
| 1995 | 0.03 | 0.7 | 6.49 | 28.2 |
| 2025 | 0.05 | 1.3 | 10.83 | |
| Increase (%) | 66 | 90 | 67 | |
| **Nigeria** | | | | |
| 1995 | 1.06 | 5 | 16.75 | 158.3 |
| 2025 | 1.43 | 7.6 | 26.41 | |
| Increase % | 35 | 53 | 58 | |
| **Chad** | | | | |
| 1995 | 0 | 0.17 | 1.51 | 25 |
| 2025 | 0 | 0.32 | 2.37 | |
| Increase (%) | 0 | 54 | 36 | |

Source -IWMI, (2003)

**Sustainability of water resources and ecosystem**

A vision for the sustainability of natural resources and ecosystem is must in views of depletion of natural resources at a very faster rate in modern technological era. Conservation, Judicious utilization, Eco-friendly technology are the various attributes of saving the environment and natural resources.

As we observe in previous section of our study, how a region called Niger basin has been very strangely arranged with nature. Experiencing the water shortages in arid sub-Saharan climate people of the riparian states of basin try to adjust their demand and needs of water in accordance with the availability of it. Reduction in rainfall, increase in temperature, dry spells and extreme events are the features of basin in current climatic scenario. Niger basin has experienced extreme drought in the year of 1970, 1980 and 1993.

Increasing population and demand of water has accelerated the problem to manage the water resources in a sustainable fashion. It is true that projected population in the will try to jeopardizes current and future development efforts.

The Inner Delta and Niger Delta are the areas which are highly vulnerable. Agricultural withdrawals has already impact these two areas in a negative manner. Extending dry season irrigation will require additional dams and will impact heavily on wetlands and their biodiversity, notably the environmental services and the livelihoods of a million herders, fisherman and traditional rice growers in the Inner Delta. The construction of Dam in the inner delta such as Fomi dam will result in the loss of 3700-4900t of fish per yr.[13]

**Demography, water poverty and sustainability**

The basin population estimated around 95 million in 2005 is expected to double by 2050 in the lowest scenario and could be multiplied by 4 if fertility remains constant. Current fertility rates exceed 6-7 children per woman and as mortality has started decreasing, demographic increase rates now exceed 3.2% per year (Bana and Conde,

[13] Agriculture and water productivity, CPWF Project Report page no. 13 December 2009

2008, Bakiono, 2001, Guenguant, 2009). More worryingly, in countries like Mali (contrary to Ghana) fertility is not decreasing, resulting in a progressive rise in demographic increase rate. Future population trends will therefore depend on the speed of fertility decrease and the prevalence of pandemics such as HIV/AIDS. Clearly the additional demand on water and food resources to feed up to 300 million additional people added to the projected change in diets, climate change, and water demand for industry and hydro power, will lead to significant pressure on natural resources and ecosystems and increase vulnerability of rural poor communities. Population density in the basin is high compared to national averages (up to 4 to 5 times greater), as populations gather along the Niger River, their lifeline. In Mali 70% of the population is concentrated along the river. Population densities also reproduce the distribution of humans in the past centuries. Desert fringes are lowly populated, less than 1hab/km$^2$, but between the 11 and 13th parallel, there is a band of high density, a vestige of the ancient Sahelian empires which controlled the transaharian routes until the contemporary period (Fage and Tordoff, 2002). Along the Niger River the ancient cities of Bamako (Mali) and Niamey (Niger), have become modern capitals and their populations have grown from a few thousand inhabitants to several million over the past fifty years. The second highly populated band stretches between the towns of the coastal states (Port Harcourt, Lagos), important market/export towns since centuries for all central Africa. 71% of the population lives in Nigeria.

Due to combined effect of multiple factors mixing with demography, A condition of water poverty occurs as the such as increasing and competing water demand, changes in hydrological regimes due in part climate change and impediments to water access, regional conflict and corruption and changing levels of water productivity has lead to region for water scarcity. These relationships are dynamic and likely to vary spatially and temporally. Past policy responses have relied on poverty assessment that are generally not spatially explicit.

Water poverty occurs when people are either denied dependable water resources or lack the capacity to use them. Water may be insufficient for basic needs, for food production or for wider economic and environmental services. Water scarcity is

commonly thought to arise due to physical or economic constraints, though Molle and Mollinga (2003) distinguish three further causes of scarcity: managerial, institutional and political scarcity. This distinction reflects the complex nature of water poverty and points to the need to look beyond technical and financial means alone to reduce water poverty.

There exist a number of indicators designed to measure or characterize water poverty. Just like poverty indicators, these require moving from raw data towards a composite aggregated indicator and as a result often gain in simplicity what they lose in accuracy. The widely used Falkenmark "water stress index" (Falkenmark et al. 1989) defines a threshold of 1700m3 of renewable water resources per capita per year, under which a country is deemed to suffer from water scarcity. All countries except Burkina Faso exceed this threshold; however the indicator fails to capture spatio-temporal variations, crucial in a country such as Mali which spans from a sub humid to a hyper arid climate. A more comprehensive measurement of water poverty is the Water Poverty Index, which notably takes into account communities' abilities to access and use water but suffers from the use of arbitrary weights and must ideally be generated at a local rather than national or regional scale (Sullivan and Meigh 2003).

A combination of human population growth, unsustainable resource use and development, and desertification are threatening the Niger River's ability to supply crucially needed natural resources to the people of West Africa. River flows in the basin are decreasing at the same time that fishing pressure is increasing, leading to drastic declines in the productivity of the Niger's fisheries. The effects of deforestation and farming of fragile soils is leading to sedimentation of river channels. The Niger, which is the third largest river in Africa, dried up completely for several weeks in 1985 at Malanville in the Benin Republic.

Sustainable water management requires institutional and governance arrangements that can be adapted to dynamic social and biophysical systems can operate at multiple scales and respond to changing levels of river modification. Effective water policies consist of three key features: generally agreed and achievable targets; appropriate and adaptive instruments

capable of steering towards those targets; and monitoring mechanisms to provide feedback on progress towards targets (Hilborn and Walters 1976). The performance of effective water policy can be measured by the ability to sustain the functioning ecology of the water system, the potential for the efficient allocation of water resources and capacity to meet the conventional tests of equitable distribution and fairness through time.

**Conclusion**

Summarizing this chapter after a rigorous analysis of water resources and its availability in the Niger basin, we have been able to draw a general picture in our mind about water resource, rainfall, wetland and condition of irrigation in the basin area.

Topography and climate of sub Sahara are the important determinants which controls the water resource distribution and its availability and utility. Temperature increase, rainfall variation and concentration are those factors which involve in determining the water scars and water abundant areas in the basin. Region is consisted with a set of agro-climatic zones on the bases of water availability through rain fall. In northern portion of river basin, on the fringes of the Sahara desert rain fall occurrence is very low this is the region that water shortage is always reported in this arid belt. However southern Niger basin sides of river experiences high rain fall and a good water availability condition.

The increasing number of population and their demand has also a great role in water accessibility and utility condition. Population of basin is much dependent on water resources of river Niger. Farming and fishing is the main economic activities of rural population of Niger basin who utilized the water mostly in inner Niger delta as well as flood plain wetland area. We have also observed how wetlands are important in terms of natural eco-system and biodiversity.

Water shortages, poor water quality and environmental degradation is the major problems of basin. Building of larger dams although needed for irrigation, has affected the basin habitat in a negative manner. Distribution of potable water and accessibility of water to the countries has been influenced due to infrastructure building process in the zone of river Niger.

A view on sustainability of environment has also been formulated in this discussion. We see that The Inner Delta and Niger Delta are the areas which are highly vulnerable Delta. Agricultural withdrawals have impacted much in these two areas negatively. Sustainable management and sustainable agriculture in this belt is the only solution to these environmental problems.

The study of future prospects of water demand in the selected countries shows the critical result of Niger basin water resources in coming years. Therefore there is a need to be cautious to utilize the single drop of water by river basin people.

Although while dealing the topic of water resource in the basin we deliberately concentrated only on the region and its water features. Conflicts, disputes, and disagreement on utility and sharing of water among riparian states was avoided due to author's single mind focus on analysis of water resources in absolute term. However it is the next chapter which is waiting to cover the remnant portion of this study.

# CHAPTER 4

# GEOPOLITICAL ISSUES OF NIGER RIVER BASIN, CONFLICT AND COOPERATION

## Introduction

The story does not end at the juncture of explaining levels of water resource on the stage of Niger River basin but the picture of course will reach at its climax only after visualizing the levels of conflicts and cooperation among sharing countries of River Niger basin. The chapter is here with a prime motive to observe the nature of conflicts and dispute among countries sharing Niger River basin. The sources of disputes in Niger River basin vary from ecology, economics, and political psychology; finance sharing, resource utility, religion, cultural anthropology and geopolitics. Obliviously, conflicts among riparian states cover a wider range. This study specifically analyses those issues of which are geopolitical in nature. This research focused boundary and territorial problems in more detail. However water issues sharing of trans boundary resources and problems also have given space in this study. Processes of regional cooperation among countries are also the major concern of this chapter. Regional organizations and their functioning have a significant role in this process of conflict prevention and regional integration. This is the region that study has also tried to conceptualize the role of organization like Niger basin authority through this chain.

International river basins, a provider of sustenance to flourish the world's ancient civilization historically have been modified into a zone of tensions for competitive exploitation by riparian countries. No other natural resource has as many uses as a river. In view of that now it has become increasingly difficult to differentiate between water as an environmental issue and water as a national security issue, and we see the commonness of international disputes which have arisen almost everywhere among the users of the world's waterways.

Given that water is the most vital resource needed to sustain human life, it is perhaps not surprising that over forty percent of the world's population lives in river basins shared by

more than two nations.[14]Because river water is continuously in motion, issues of control, jurisdiction, and sovereignty are much more complicated than when dealing with static land resources[15].

Niger River sustains a rich livelihood of ten nations. It shapes the corridor for productivity. These nations share the resources of basin. Niger provides the sources of fresh water, hydroelectricity, fishing, farming, livestock herding, hunting and gathering of wild plants, waxing, and recreation-tourism, preservation of nature, waste disposal, flood prevention, and demarcating political or ethnic boundaries waning etc to the riparian countries.

Due to larger importance in the Western Africa this river has also become the causes for geopolitics among the basin countries. Clashes of interest are inevitable in the region where newly independent countries are struggling with acute socio-economic and political problems. Poverty in this part of Africa is important feature in shaping the geopolitical relationship among states. There is a strong correlation between several human development variables and climate in West African countries (POVERTYMAP, 2006). Trans boundary utilization of resources related to sharing of river water and area has produced a range of conflict among the countries. It is common to all river basins that all groups of riparian states have conflicting priorities and preferences. In process of geopolitical conflict emerging among nation states power asymmetries of basin states must be taken into consideration because it affects the process of negotiations. It is also important to understand how the river and its resources are used in order to avoid conflict and promote cooperation.

[14] Evan Vlachos, Anne C. Webb, and Irene L. Murphy, eds., The Management of International River Basin Conflicts (Washington, DC: Graduate Program in Science, Technology, and Public Policy, George Washington University, 1986), p.i.

[15] BonayzAdliiGodana, Africa's SharedWater Resources (London: Frances Pinter, 1985), p . 3 .

**Nature of conflict in Niger Basin**

The systematic study of nature and conduct of conflict, and cooperation between states over shared water resources in troubled areas of Niger River basin in the literature has minimal coverage. Before analyzing the issues of conflicts of Niger basin it's better to examine the meaning of conflict. The dictionary meaning of conflict is "a state of mind in which a person experiences a clash of opposing feelings or needs".[16] in other word we can say that conflict is a kind of struggle between two or more forces producing friction or opposition resulting from actual or perceived differences or incompatibilities. On the other hand conflict in river basin has another dimension where interest of individual is converted into national interests.

Drawing from the experiences of history of Africa, Latin America, and Central Europe, scholars have predicted that in Africa would lead to the outbreak of numerous conflicts. Arnold Rivkinfore fore saw in Africa's inherited colonial boundaries one of the richest sources of actual and potential controversy conflict.[17] so, historiography of region may help in understanding the nature of conflicts. However analyzing with the geopolitical issues of Niger River basin we have to be very cautious in the sense that the nature of conflicts in the region have complex identities. The central theme may be concentrated with the water resources utilization and border disputes but we cannot neglect the issues of ethnicity, race grouping, domestic factors and the personal conflicts of the actors in the study of geopolitics of basin.

In terms of systematic observation of the conflicting issues among basin countries of Niger River we have to classify the conflicts into following groups.

**Territorial and Boundary disputes**

Territorial disputes indicate a kind of dispute where a portion of land lies in the land of a state at a single point of time is very actively claimed by neighboring country. This type of

[16] Oxford Dictionary 2011

[17] Arnold Rivkin,The African Presencein World Affairs New York: The Free Press, (I963), pp. Io-II. See also C. E. Carrington, Frontiersn Africa,"( international Affairs London), October I960 (Vol. 36, No. 4);

conflict involving boundary issues is very common on the continent of Africa. The political boundary which was demarcated by the foreign powers after independence of countries seems to be not rational and identical to the physical, ethnic, and cultural land scape of the continent.

Different subcategories of territorial disputes have been suggested by scholars. Ravi kapil distinguishes of two types of territorial conflicts, Historic and ethnic.[18] Vernon Mckay discriminates between border delimitation controversies, irredentist movements, ethnic disputes and economic competitions.[19] Zatman on the other hand try to deal with individual territorial disputes rather than its subcategories. For example it might be said that he has made a distinction between present day disputes, ethnic, historical, technical and future disputes which are likely to arise "As the frontier zone shrinks to line and authority meets authority."[20] In the literature of following above authors we find useful elements but none of these are comprehensive enough.

However J. R. V. Prescott work has presented a detail study of the nature of territorial conflict. This author has differentiated about four types of boundary disputes; over territory, position, and function and resource development.[21]

Due to lack of coincidence with political boundary and the earlier and more self-conscious communities of solidarity led to a number of irredentist claims on the neighboring countries. The example in regard to this claim cam be observed from disputes between Ghana and Ivory coast, as well as between Ghana and Togo. This was the pure territorial issue but it was fused with the elements of personal and ideological nature.[22]

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[18] Kapil, World Politics, vol. no. i8, No. 3.

[19] Mckay Vernon, (ed.), African Diplomacy: Studies in the Determinants of Foreign Policy (New York ,: {Frederick .A. Praeger [for the School of Advanced International studies JohnHopkins university} 1966), p7.

[20] I. William Zartman, The Politics of Boundaries; in North and West Africa," The Journal of Modern African studies, AugustI965" (Vol. 3, No. 2), p. I63. See the same author's International Relations,in the New Africa,p. 105-119.

[21] J. R. V. Prescott, The Geography of Frontiers and Boundaries (Chicago: Aldine Publishing Co., I965), chapter 5

[22] On the Ivory Coast-Ghana dispute see Saadia Touval, "The Sources of Status Quo and Irredentist Policies,"

In other case territorial disputes has been arises from the "historic" claims which refers to both the colonial and pre-colonial past. When the colonial regime was established then territorial partition has also been occurred. Several African states has been carved out in the colonial period. This division was on the line of French and British colonies. This was the reason that some states relate them as earlier rule and demand territorial integration. This is also true that some states associate themselves from pre-colonial history. For instance, Libya also has in the past claimed a strip along their border of about 19,400km² in northern Niger.

Whilė territorial dispute has arisen from the superimposition of political boundaries on a complex cultural and physical land scape, Positional disputes occur as a result of an incomplete boundary definition. The latter therefore involves "a controversy over interpreting the delimitation or description of the boundary."[23] The issue of boundary demarcation holds a technical problem which can be easily resolved by the skilled and administrative personnel from both sides. Algeria-Tunisia border dispute is the excellent example for this regard of problems in border demarcation.[24]

We see how much struggle is there among some of the basin countries. There has been several decades spent to resolve the disputes associated with the delimitation of international boundaries in the areas of Lake Chad between Niger, Nigeria, Chad, and Cameroon. The lack of firm borders, as well as the receding of the lake in the 20th century led to border incidents between Cameroon and Chad in the past. An agreement has been completed and awaits ratification by Cameroon, Chad, Niger, and Nigeria.[25]

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in Widstrand (ed.), p. I I I; Zartman, p. I I 2- 1I3; W. Scott Thompson,Ghana's Foreign Policy, 1957-1966 (Princeton, .J: Princeton niversity ress, I969), pp. 87-89, 244-245, 315, 334.

[23] Prescott, . p. IO9. For data on African boundaries see Edward Hertslet, The Map of Africa by Treaty (3 vols; London: Harrisonand Sons, I909); Anthony . S Reyner, Lengthand Statusof International Boundaries in Africa,"African Studies Bulletin,September 967 (Vol. 10, No. 2); and 27 different International Boundary Studies,issued by the U.S. Department of State,Office of the Geographer.

[24] U.S. Department of State, Office of the Geographer, International boundary Study,April 28, I96I, P I); and Zartman, p. 113-II4.

[25] Central Intelligence Agency, (CIA), https://www.cia.gov/library/publications/the-world-factbook/

In Burkina Faso there are two villages which are in center of dispute located along the border with Benin. Benin accuses Burkina Faso of moving boundary pillars; Burkina Faso border regions have become a clashing space for Liberia and Ivory coast rebels and an a asylum for refugees caught in regional fighting the Ivoirian Government accuses Burkina Faso of supporting Ivoirian rebels. The boundary demarcation between Mali and Burkina Faso is underway currently.

Niger has ongoing processes delimiting sections of their borders with Burkina Faso and Mali, disputes which date back to the colonial period. These entities, along with Benin and other nations which do not border Niger were semi independent elements of French West Africa. Within the colonial administration, borders were frequently changed, with Niger colony once possessing large portions of what is now Burkina Faso and Mali, as well as much of northern Chad, later associated with French Equatorial Africa. Disputes between these post-independence nations have been minor and peaceful. Sometime this technical problem in boundary demarcation leads to the extreme political differences.
We can see this situation on the issue of ownership of "Lete" island between Niger and Benin.

Lete Island is an island in the Niger River having the length of 16 kilometers and it is 4 kilometers wide. There is a conflict between Niger and Benin over this island. Together with the other smaller island in the Niger River, it was the island was the main object of territorial conflict between Benin and Niger.
The island and seasonally flooded land around it is valuable to semi-nomadic Puel cattle herders as dry season pasturage. The two countries had almost gone to war over their border in 1963 but finally chose to settle by peaceful means. In the early 90s a joint delimitation commission was tasked with solving the issue but could not reach an agreement. In 2001 the two parties chose to have the ICJ decide on the matter once and for all. On 3 July 2005, the ICJ ruled in Niger's favor.

The International Court of Justice (ICJ) – the United Nations' principal judicial organ for settling disputes between States – has awarded Niger 15 islands at the center of a four-

decade border dispute with Benin. It awarded Benin ownership of the remaining nine, and delineated the boundaries between the two countries in the River Niger and the River Mekrou.[26]

Entire Cameroon-Nigeria land and maritime boundary are in conflict. International court of justice (ICJ) ruled in 2002, but the parties formed a Joint Border Commission to resolve differences bilaterally and have commenced with demarcation in less-contested sections of the boundary, starting in Lake Chad in the north; the ICJ ruled on an equidistant settlement of Cameroon-Equatorial Guinea-Nigeria maritime boundary in the Gulf of Guinea, however, implementation of the decision is delayed due to imprecisely defined coordinates, the unresolved Bakasi allocation, and a sovereignty dispute between Equatorial Guinea and Cameroon over an island at the mouth of the Ntem River; Nigeria initially rejected cession of the Bakasi Peninsula; Lake Chad Commission continues to urge signatories Cameroon, Chad, Niger, and Nigeria to ratify delimitation treaty over the lake region, which remains the site of armed clashes among local populations and militias.[27]

Another subcategory in the study of boundary disputes emerged in the sense of (application or non application of border) of states on the function at the border. Independent states seem to be no longer willing to the policies towards in the tune with their colonial rulers. These newly independent sovereign has passed immigration laws, imposed export and custom duties. Before this situation mobile communities (nomadic tribes and migrant laborer) and traders did not feel any hamper in their free movement. There is no any doubt that this state of affairs is little evidence that either trade barriers or other border restrictions resulted in interstate tensions.

In the limiting case of semi-skilled, urban labor, tensions did arise between the Ivory Coast and Benin Gabon and Congo (Brazzaville), and Niger and Benin when the former states expelled or repatriated the latter's nationals. the greatest portion of migrant labor in Africa, however, has gone into unskilled occupations, working in the mines or farms, looked upon

[26] Fabio Spadi (2005), the ICJ judgement in the Benin-Niger border dispute; the interplay of titles and 'effectiveness' under the uti possessideitis juris principle.leiden journal of international law p. no. 777-794
[27] www.globalsecurity.org

by local workers as low prestige occupations, competition between foreigners and citizens n this area has not been fierce.[28] Therefore functional conflicts occasionally comes out in response to very stringent control of administration of African borders which for the most part do not constitute a significant barrier in the movement of nomadic tribes and local traders.

In discussion with the territorial conflicts among Niger basin countries, we can also apply the Prescott's final subcategory of boundary disputes focuses on tensions that arise from exploitation of a resource held in common such as river water which form or cross any international boundary. Niger River also comes in that list in Africa. Problems generally arise over the issue of water supply, fishing rights, navigation and transportation etc.

**Conflict related to River and Water bodies in Niger Basin**

Water related disputes have a long historical back ground where issues of conflicts vary from accessibility to adequate water supply. Water bodies and water-supply systems have been the roots and instruments of war. An intentional attack on water supply system during war is also recorded on world platform of geopolitics. Inequality in water utilization has been the causes of regional and international frictions and tensions. These conflicts are always running and in some places growing more intense as growing populations demand more water for agricultural, industrial, and economic development. While various regional and international legal mechanisms exist for reducing water related tensions, these mechanisms have never received the international support or attention necessary to resolve many conflicts over water. Indeed, there is growing evidence that existing international water law may be unable to handle the strains of ongoing and future problems. In addition to improving international law in this area, efforts by UN and international aid agencies to ensure access to clean drinking water and adequate sanitation.

[28] Eliot J. Berg, "Economics of Migrant Labor Systems," in Hilda Kuper (ed.), Urbanization and Miigration in West Africa (Berkeley: University of California press, I965).

Interstate conflicts are caused by many factors, including religious animosities, ideological disputes, and arguments over borders, and economic competition. Although we can argue here that resource and environmental factors are playing an increasing role in such disputes, it is difficult to disentangle them any intertwined causes of conflict. In regions with shared water supplies, third-party participation in resolving water disputes, either through UN agencies or regional commissions, can also effectively end conflicts.[29]

Turning to environmental imbalance, scarcity is at the core of the problem. On the supply side, the contamination of river water may be growing and thus the amount of usable water contracting due to exposure to increasing amounts of both human/animal (organic) waste and industrial (largely inorganic) waste; and decreasing ecological diversity in the water system as a consequence of the waste and over-exploitation. On the demand side, the use of river water may be growing due to increasing human population, generated internally or externally through migration; and increasing urbanization, Indus-trialization (including the use of hydroelectric power), and agriculture (especially through irrigation efforts). While the bottlenecks engendered by this supply/demand squeeze seem quite real and heavily influenced by long term ecological trends, the potential certainly exists for riparian nations to exaggerate the level of scarcity and to indulge in finger-pointing about blame for the pressured predicament.

The total estimated volume of freshwater resources of Africa is proportional to its share of global population. However, less than 5% of these potentially available water resources are exploited, developed and utilized even though an increasing number of African countries experience water stress and water scarcity routinely and some of the countries especially in the south and south eastern parts of the continent are subjected to frequent floods and inundation.[30]

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[29] Peter H. Gleick, Water and Conflict: Fresh Water Resources and International Security,international Security, Vol. 18MIT press, No. 1 (Summer, 1993), pp. 79-112

[30] Mr. Azm Fazlul Hoque, Transboundary River/Lake Basin Water Development in Africa:Prospects, Problems, and Achievements, United Nations Economic Commission for AfricaAddis Ababa, Ethiopia December 2000

**Dam Construction and Displacement**

West African countries have built over 150 large dams on the region's rivers, increasing water storage capacity and regulation of water courses to support the economic development of the countries of the region. Over the next 30 years, many more will be built, not least as a response to increasingly fluctuating rainfall. However, the construction of these dams has often led to the complexity in the relationship among sharing states. It also resulted into displacement of larger number of population from their places and the problem of relocation of populations is being added often affecting thousands of people: 80,000 people in the case of Ghana's Lake Volta created by the dam at Akosombo; 75,000 people with the dam at Kossou in Ivory Coast.

Table-4.1 No. of displaced Population from dams in Niger basin

| **Name of dam** | **country** | **No.pf displaced persons** | **Date of displacement** |
|---|---|---|---|
| Akossombo | Ghana | 80,000 | 1963 |
| Kossou | Ivory coast | 75000 | 1970 |
| Kandji | Nigeria | 44000 | 1967-1968 |
| Sélingué | Mali | 15000 | 1980 |
| Nangbéto | Togo/Benin | 10,600 | 1987 |
| Manantali | Mali | 10,000 | 1986-1987 |
| Garafiri | Guinea | 21,040 | 1999 |

Source : De Wet Chris, 1999; et M. Niasse& Y. Ficatier , 2008

The construction of dams often brings about complex and difficult operations of displacement and relocation of thousands of people. One case in point in Africa is the Akossombo in Ghana (80 000 displaced and the Kossou in Coast of Ivory (75 000 displaced) brought about by the construction of the dams.

The displacements of people have been carried out in compliance with the environmental

and social concerns of the bilateral or multilateral agencies of development. For the displacements undertaken before the first handbook of the World Bank was issued in 1980, the criteria used were inspired by national laws that favoured state interests rather than those of the displaced. Thus, in Akossombo, Ghanaian land laws (Land Act of 1962 and later modifications) upheld the national interest in land acquisition, and the Volta River Development Act of 1961 gives to The Volta River Authority the power to manage the land affected by, and close to the dam (World Bank, 1993:12)

In other words, after 50 years of experience in population resettlement, dam promoters, operators and regulators must commit themselves to supporting, during the whole lifespan of the project (50-100Years), the development and the well-being of the local and regional communities impacted by the dam. This consensus also recognizes that the conflicts and the complaints are minimized if the displaced populations become genuine stakeholders in the development process any feeling of marginalization; that they will actually be "better off" when those policies are carried out, and feel joint ownership of the project.[31]

[31] Mrs Mame Dagou DIOP, PhD and Cheikh Mamina DIEDHIOU, Environmental consultants in Senegal; Water Management and Environment

Diagram-4 a : No. of displaced population due to dam construction

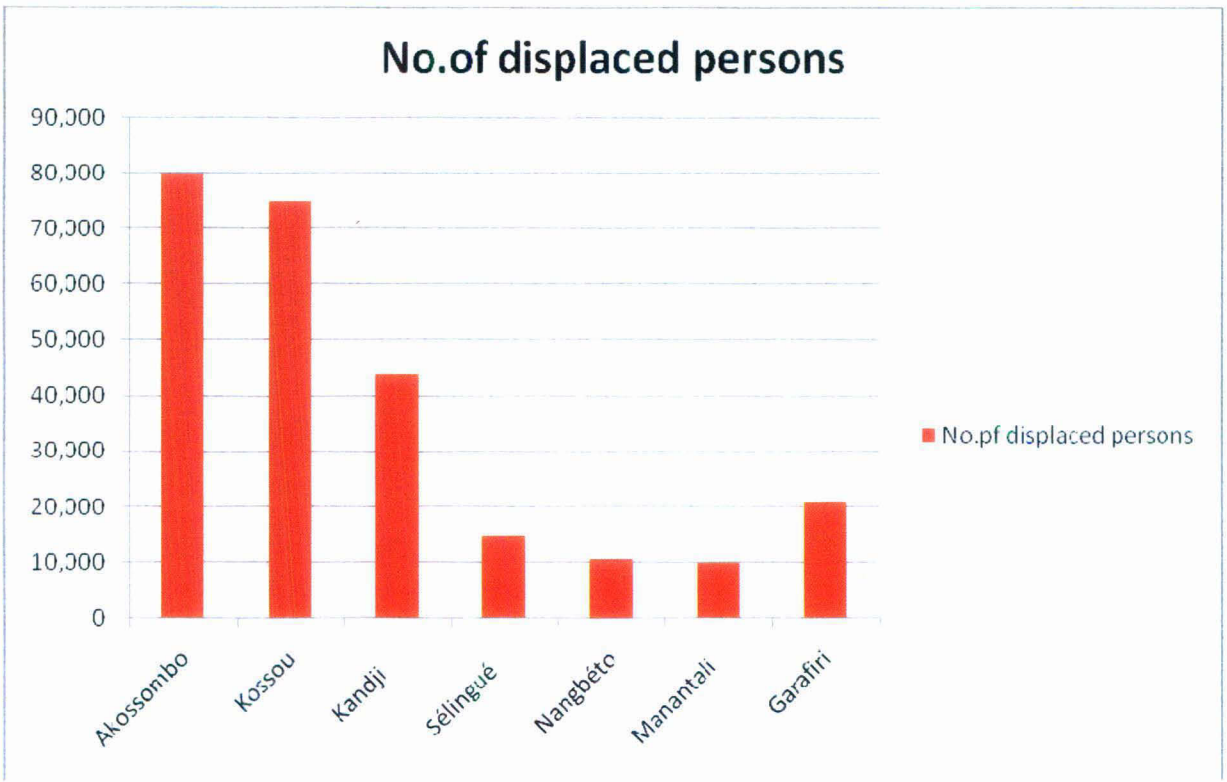
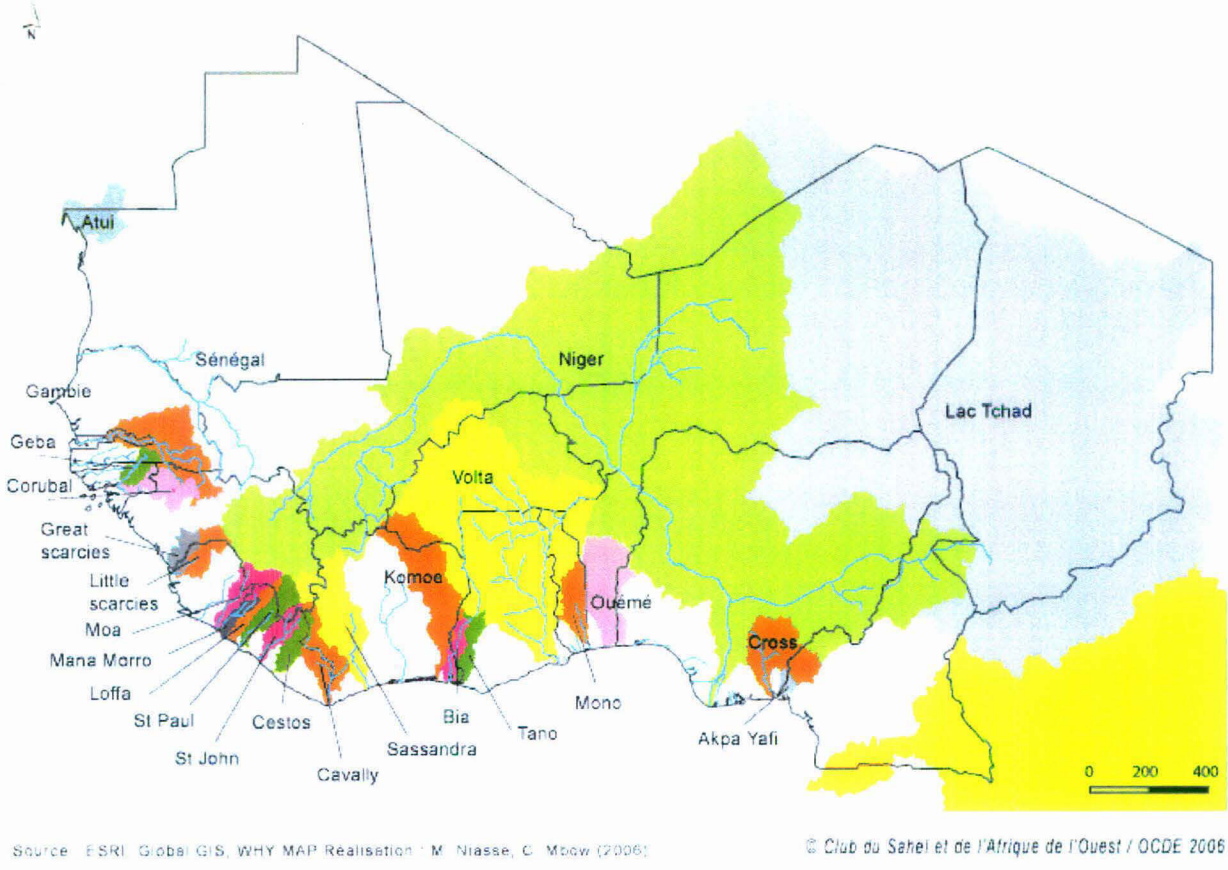
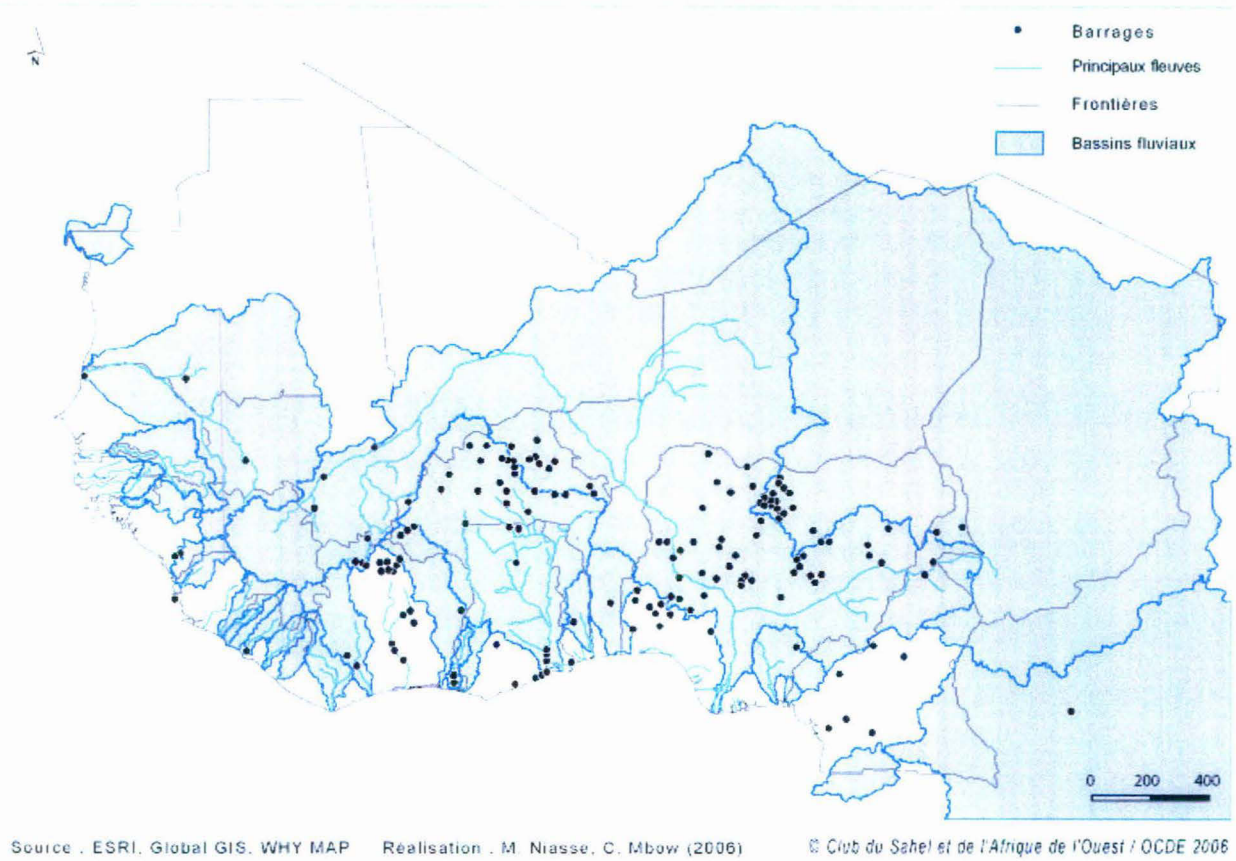


Figure 4(i): Water resources of Niger basin and surrounding




(Source: CEDEAO-CSAO/OCDE, 2006)

Figure 4(ii): Map of West Africa's and Niger basin dams




(Source: CEDEAO-CSAO/OCDE, 2006)

Conflict outbreaks also constitute major unforeseen hurdles stalling the realization of dams. The multiplication of big dam projects and other water-related amenities, the high degree of interdependence of the West-African countries concerning water, and the considerable reduction of surface water availability may often strain relations between neighbours. Whenever conflicts break out, they disrupt the process of financing these works both at the national and the international levels. And when the conflict is internal or opposes countries involved in the realization of the dam directly, the project is frozen pending a settlement, which may take a long time. During that period, the process of managing the local people affected by the dam project is put on hold. To illustrate, the 15 year-gap between the end of the construction of the Manantali dam (1988) and the beginning of energy production (2003) was due in large part to the strained relations between Mauritania and Senegal, following the 1989 crisis.

**A study of Regional cooperation in Niger River basin**

During the time of Second World War a scholar named David Mitrany writes in 1943 that "the problem of our time is not how to keep nations peacefully apart but how to bring them actively together.[32] It is proved today that Mitrany underestimated the success of bringing states together in regional and international organizations. The problem we face today is not how to bring them together, but how to handle disputes and maintain good relations once cooperation has been initiated. Bringing the states together at an international and regional platform needs a level of cooperative feelings which aims for regional and international integration.

Regional cooperation may be conceptualized as a process in which states enter into an environment of living with regional peace and co-existence. It can also be observed in integrative mechanism of regional setting. in order to enhance regional cooperation through regional institutions and rules, states try to build regional institution and rules through agreement. The objectives of the agreement could range from economic to political, although it has generally become a political economy initiative where commercial purposes are the means to achieve broader socio-political and security objectives. It could be

[32] David Mitrany, A Working Peace (Chicago: Quadragle Books, 1966), 28.

organized either on a supranational or an intergovernmental decision-making institutional order, or a combination of both. Philippe De Lombaerde and Luk Van Langenhove define regional integration as a worldwide phenomenon of territorial systems that increase the interactions between their components and create new forms of organization, co-existing with traditional forms of state-led organization at the national level.[33] In short, regional integration is the joining of individual states within a region into a larger whole. The degree of integration depends upon the willingness and commitment of independent sovereign states to share their sovereignty. Deep integration that focuses on regulating the business environment in a more general sense is faced with many difficulties.[34]

However conflict prevention is another objective hidden in the concept of regional cooperation and integration. There is a great link between the process of conflict resolution and regional integration. Regional organizations may have also a constructive role in conflict resolution and prevention.

In this above context we can easily visualize the environment of cooperation and integration in Niger River basin. In the case of the Niger River basin, cooperation could be seen as increased water, food, power, transport, and so on. Optimized management of any river is difficult, primarily caused by the need to recognize so many different interests. Management of an international river is particularly difficult, but much can still be done to move toward optimized management. A better understanding of the Niger River Basin will assist decision makers in basin management. It is a premise of river basin management that managing the river as a system yields optimal benefits.

The countries of Niger River Basin are among the poorest countries in the world, and they are ready to adapt those entire paths which are intended to be done to improve the lives of the peoples of the Basin. Four of the nine Basin countries are among the bottom 20 countries on the WDI scale, while on the UNDP HDI, seven countries are among the bottom 20.[35] The need for development and investment in the region is evident, and the Niger River

[33] De Lombaerde, P. and Van Langenhove, L: "Regional Integration, Poverty and Social Policy." Global Social Policy 7 (3): 377-383, 2007
[34] Claar, Simone and Noelke Andreas (2010), Deep Integration. In: D+C, 2010/03, 114-117
[35] UNDP, HDI Report, 2010

holds tremendous potential; this is the reason for cooperation.

Development opportunities in the Niger Basin are wide ranging. Some of these opportunities such as in power, irrigation, and navigation, are directly linked to the river. Once cooperative investments have been made in the development of the water resources, trust and cooperation will grow between the countries, and many other benefits will accrue, include those "beyond the river," such as communication investments, increased trade, enhanced flows of labor and ideas—that is, an enhanced regional integration of the countries of the Basin.

Regional cooperation follows a significant path of development from unilateral initiative to shared multilateral cooperation. Generally, at first hand most countries countries take step to larger investments at the national domestic level. When dealing with a shared river basin, and in the absence of an effective basin organization, most countries will plan on a unilateral basis. In some river basins, riparian states have rushed to "get facts on the ground" through infrastructure projects, seeking to acquire rights ahead of any neighboring states doing the same. In the absence of a cooperative agenda to which countries have committed and which clearly assigns benefits to each member state, the pursuit of unilateral development will most likely lead to lose outcomes, the potential consequences of which include increased tension and insecurity between member states, and lost opportunities for regional cooperation and integration. For many years, the trend in each of the Niger Basin countries has been toward unilateral development of the river's resources. From the position of each nation state, this makes perfect sense, particularly given the lack of a strong regional river basin institution through which cooperative developments could be leveraged, promoted, and instituted.

However regional cooperation is the only way for common growth and development in a sustainable fashion in the Niger River basin. To secure the sustainability regional integration is the key. In the Niger River Basin, where water scarcity and flow variability are always causes for concern, the only option for sustainability of the water resources, optimal utilization, and good member relationships is to pursue the path of coordinated, cooperative

water resources development. The challenge facing the countries of the Basin is to find ways in which the river's development potential can be realized. With an empowered, enabled, and relevant river basin organization in place, attuned to its constituencies and respected as an institution that can broker major development investments, the nine countries have an opportunity to move a significant, common development agenda forward, to reduce poverty, promote regional cooperation and integration, and enhance the lives of the 100 million people who live in the Niger River Basin.

A common agenda and approach is required to a river basin to develop a master plan for river basin. A comprehensive plan may help in making a broad struggle for holistic development which facilitate in bringing interests united. Though such an approach needs more time and it may be costly, Involving many studies and considerable time to complete.

However in the sense of Niger River basin, this approach is of limited real value, because it takes little account of the political and economic reality. Investments will inevitably be driven by a variety of factors, including local and national priorities, diplomacy, political compromise, availability of and access to investment finance, and, perhaps most important, the extent of broad ownership of, and commitment to, defined development priorities.

A more dynamic approach for a larger river basin development is required which would be both more pragmatic and attainable. Although a detailed master plans are helpful which has been made by analysis and design potential but they do not contribute directly to building the community of interest and political constituency among and within the member states that is the key to moving cooperative developments forward on Africa's large shared river systems. In several river basins in Africa (and beyond), concerned countries have embarked on the definition of a Shared Vision that encompasses their views of how shared water resources can help in the struggle against poverty, against environmental degradation, for peace, and for regional cooperation and integration.

The countries of the Niger Basin have recently endorsed development of a Shared Vision process that lays out cooperative actions through which needs and priorities will be defined

and through which management, development, and investment actions will be identified.[36]

**Niger River basin Authority**

For better cooperation among each other and for a common goal of regional development countries of River Niger basin has formed an organization in 1964, named as River Niger Commission. On 21 November 1980, it was re founded as the Niger Basin Authority. It is based in Niamey and works in both French and English. The inspirational source of this formation was no doubt the Tennessee Valley Authority. it is an intergovernmental organization aiming to accelerate co-operation in managing and developing the resources of the basin of the River Niger.

The Niger Basin Authority defines its purpose as the promotion of cooperation among member countries to ensure integrated development of resources. The organization originally defined its mission as the cooperative management of water resources, most notably, but not limited to, the Niger River. While centering of water and hydroelectric resources, the NBA nations use the organization to harmonies development of energy, agriculture, forestry, transport, communications, and industrial resources of the member nations. The NBA has worked to create an "Integrated Development Plan of the Basin", especially focusing on cross boundary projects. The NBA itself has been ceded no sovereign power over resources or management, and therefore all regulation must be imposed by individual sovereign governments. While not the original focus of the NBA, environmental protection from the threats of desertification, deforestation and pollution of the rivers by agriculture and industry have become a major theme of their work.[37]

In 1980 Niger Basin Convention, Niger basin authority has defined the basic scope and mandate of the NBA. This legal framework was established to promote cooperation between the member states and to ensure integrated development in all areas as part of development

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[36] Inger Andersen, Ousmane Dione Martha, The Niger River Basin A Vision for Sustainable Management, world bank publications, page no. 60, 2005

[37] R. Lycklama a Nijeholt, S. de Bie, C. Geerling, M. Magha, J. Kambou, J. Koudenoukpo. Beyond Boundaries:Transboundary Natural Resource Management in West Africa.Biodiversity Support Program (BSP) Transboundary Project, page-108 (2001)

of its resources, particularly in the areas of energy, water, agriculture, forestry, transportation and communication, and industry. The Convention provides a powerful platform for the NBA to promote, facilitate, and coordinate river basin development among the Basin countries, empowering the institution to play a strong, substantive, and important role in them in their development of the Basin.

However, the NBA underwent a crisis during the early 1990s, engaging in a variety of projects activities that may have allowed for institutional survival but that distanced the institution from its core mandate to manage and develop the Basin. During the 1990s, the NBA lost its basic legitimacy, relevance, and constituency, the three key requirements for the viability of the institution. In2002 NBA Summit of Heads of State met in Abuja and reviewed the performance of the NBA, agreeing to set the organization on a renewed path toward identifying relevant and strategic priorities, through a Shared Vision process supported by a Sustainable Development Action Program (SDAP), to serve the member countries. The Summit of heads of State expressed clear expectations of the institution.

In Abuja in February 2002, the Niger Basin heads of state agreed to develop a management framework for the Basin through preparation of a Shared Vision and SDAP. The Shared Vision is an expression of the countries' commitment to promote a framework for enhancing cooperation and sharing benefits deriving from the Niger Basin's resources. The Shared Vision process encompasses several objectives. The first objective is political, to formulate a statement on sustainable development of the Niger Basin to be adopted by the Niger Basin heads of state. Such a statement must include commitments to, and goals for, cooperation that will lead to joint developments in the Basin. The second objective is operational, to prepare the SDAP for the Niger Basin. The SDAP is seen as an appropriate instrument to realize countries' commitment to address the challenges of the Basin. It will include an innovative planning and priority-setting approach to define the development opportunities in which the member countries can jointly participate. The Shared Vision's third objective is financial, to mobilize resources from both member countries and international donor partners to implement the SDAP.[38]

[38] Katherin George Golitzen, The Niger River Basin:A Vision for Sustainable Management, The International

Observing the cooperative phenomenon it can be said that the Niger basin has significantly more cooperative instinct than conflict, but cooperation with minimal financial resources goes only so far towards real development. So, financial sharing is the acute problems in the regional development. Despite spreading over two regions with asserted regional economic community development norms and practices somewhat (ECOWAS in West Africa and ECCAS in Central Africa), the Niger Basin Authority had to struggle, largely aided by donor support and benevolence.[39]

However, from few years a new trends has witnessed of the reversal of this poor situation, riparian states has began to share their responsibility in maximizing the support from donors. One most significant mark impressed upon the Basin in what could be considered a new beginning has been the restructuring of the organization, with a focus on capacity development of its executive secretariat, establishment of enabling national mechanisms and strengthening the collaboration with the civil society to effectively and efficiently manage the abundant resources of the basin for economic and social development of the communities and population in member countries.

In short, we can say that the NBA adopted a strategic plan up to 2027. What a far projection into the future! Between 2008 -2027, a total of 639 projects are earmarked for member states worth CFA 3.645 trillion, geared for "the development of infrastructure for water storage, conservation and utilization for agriculture, hydropower, fisheries, as well as agro-forestry, silting, erosion control, poverty eradication and socio-economic development of the populations of the basin", said the then Executive Secretary, O. Ogunmola.[40] In order to mitigate the incapacity, rather the failure of the past, a Fund Mobilization Unit is now established at the Secretariat in charge of fund raising for autonomous and sustainable financing of the projects and programmes of the Basin primarily from member-states who called upon themselves to paying their dues promptly and who have seen to the enhancement of conditions of work and life at the Secretariat.

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Bank for Reconstruction and Development / The World Bank 1818 H Street, NW, 2005, Page no 60.

[39] Paul Yao Ahiave, New Dawn for Niger Basin Authority? West Africa Insight, page-2, Water, March 2011

[40] Executive secretary of NBA, 2007

Besides the institutional arrangement there is a legal framework referred to as the Water Charter of the Niger Basin adopted by the 8th Summit of Head of States and Government in April 2008. Essentially the Charter will help to foster concerted and cooperative use of the basin, prevent possible conflicts around the shared resource and serve as reference document for national scheme development in member –countries.

In terms of the future of NBA and its member countries, it appears promising, regional economic organizations and the civil society supported by relevant UN bodies must continue to forge stabilization initiatives by guaranteeing democratic elections and transitions in member countries.

**Conclusion**

In concrete, this chapter can be summarizes in words of hope and optimism about the countries of Niger River basin. We have gone through the various issues of conflict while our discussion. Basin has dominated the conflicting interests of nations. Causes for conflict seem to be rooted in the socio-economic environment and geographical setting of basin. Colonial past and asymmetrical geographical boundaries, irrational territorial demarcation of border and trust deficit among nations has caused the tensions among states. Issue of sovereignty claim over conflicting area is also an important factor in this regard.

Natural resources and their sharing are other dimensions of disputes. Climatic hazards like droughts and scarcity of some resources has modify the states behavior to think with the tune of Hobessian state of nature where security and survival is the prime issue for state. Among these resources water resources are in the center. Due to location of major area of basin in the sub-Saharan climate known as Sahel climate, every member states has prime objectives on control of larger area of water resources. Water quality, sharing water amount, building dams, hydro electric project and multipurpose projects are the features which come out in analysis of factors in regional conflicts.

However it would be very injustice if we neglect the cooperative environment of Niger River basin on which this chapter has worked as a second section of research. A value of

regional cooperation has always been observed in the conflicting cloud of disputes as lightening. Somehow regional similarities of the states of basin in terms of geography, culture, society and levels of development provoked countries to work for regional integration through the means of cooperative emotions and multilateral steps. With these motives of making region developed and flourished, countries of Niger basin has formed the Niger basin authority in the very beginning of their independence.

Function of this organization has been analyzed in this study. Financial problem is only a factor where this organization feels trouble. However the recent objectives of Niger basin authority and changes in the nature and behavior of basin countries has rejuvenated the feelings of common goals and common development objectives among the countries of Niger River basin.

## Conclusion

A travel to the journey of Niger River basin has passed and distinctiveness of the study of Niger River basin has been so fascinating and attractive to expand the horizon of knowledge of this scholar. This study has helped us to formulate a vision to the region of West Africa. A long term focus on study area makes mind in love with the people, environment and places of the study region. Crossing through this whole journey of Niger River basins there have been important stations which have is covered through the chapters of this work. While writing the chapter first of this work, we have been exposed to the conceptual frame work of geopolitics and river basin which helped us to make a systematic back ground of research. In any study first basic thing is the clarification of concepts which is going to be further inquired. Therefore it was needed to define and conceptualize these concepts in beginning.

River basin has been defined as the area of land drained by a river and its branches, or tributaries, which traced back to its usage in English from the last quarter of the 19th Century. This river basin is taken into consideration as a unit for holistic development of region. The main aim while constructing this river basin as an aerial unit seems to be a geographical area for the purpose of regional development. The genesis of this concept comes from the French literature. A French scholar P. Buache, has utilized the concept of "river basin" to divide the whole Earth with reference to water bodies.

The theory building process adapted an accelerated path with contribution of geographers and it became the essential unit for geographers in the way regional subdivision was apprehended. Branches of geography like Geomorphology especially River Geomorphology has enhanced the learning. W. M. Davies, R. E. Horton and later R. J. Chorley has diffused their thought in the literature what then came to be referred to in scientific literature the "drainage basin". In modern time the field of water resource management has contributed much in the growth of river basin concepts.

The other concept which has been utilized in this work is geopolitics. This concept has also

positioned into the first chapter. The development of the concept "geopolitics" has been studied from its evolution in Germany to the recent development of critical geopolitics. Founding Scholars like Rudolf Kjellen and extended by K. Haushofer from 1924 as an "applied science" is counted. Ratzel's view on state as living body has also been observed in this study.

The major findings of this chapter are research on relationship between river basins and geopolitics. It also searches out the various elements in river basin geopolitics. There is a great value of water bodies in geopolitics. From ancient civilization to modern ages, history has always told us the socio-economic value of water. Water acquires a geopolitical importance when river basins are arbitrarily and unequally distributed among the territories of several States, in regional contexts characterized by increasing water scarcity due to demographic, environmental, and economic causes.

The technology in geopolitical game of river basin has also acquired the definite space which involves the adoption of measures by riparian states to improve the management and expand the available water potential. Differences in the levels of development in terms of technology and economy, countries has faces the problems in determination of sharing of resources and its utility for socio-economic purposes. Regional conflicts and dispute on issues like boundaries demarcation, resource distribution racial and ethnic problems have impacted the region into the form of a zone of conflict and cooperation. Climatic change and global warming is another determinant in this regard to impact on region which comes in geopolitical purview.

The elements in geopolitics of river basin vary from water availability issues due to asymmetric distribution of water resources among basin countries to the condition of agriculture in the basin. Increasing number of population and high demand of water resources are other elements in this concept. The mental images about development and management of river basin and its implication on environment have the role in geopolitics of River basin. The last section of first chapter deals with the issues of conflict and cooperation related to major African river basins. It was studied in a case study manner.

After the foundation research on concepts, this study continued its travel for second station means second chapter to analyze the study area in detail. This was the time when we have to exposed to our region, and it was really enthusiastic to work upon that. In search of geopolitics of basin it was necessary to examine the physiography of the basin as well as countries located in it. Niger River is an important river of West Africa and ranks third in terms of length of rivers in African continent after Nile and Congo River. It basin covers 7.5% area of the continent and spread over ten countries. The Niger River basin seems to be a great asset for 10 million population of the western and central African region.

This region has been explained in detail. All the ten countries of basin which occupy the space in its lap is also described with their physical, demographic and socio-economic characteristics. Where the share of Nigeria in the basin is more then Mali and Niger comes into the scene in sharing the basin. Ivory Coast, Benin, and Chad has lower share in the basin. On the other hand Cameroon and Algeria has the moderate share in this context.

The study told about physiography of Niger basin. Larger portion of basin is located in Sahel, a semi arid area between the Sahara desert and Sudanian Savanna. This zone is located in the northern portion of Niger basin. Having mostly flat topography Sahel lies between 200 and 400 meters altitude. There are several isolated plateaus and mountain ranges in the Sahel. The flora and fauna has important characteristics as thorny vegetation different to the surrounding areas.

The other physiographic units of river Niger basin are as inner delta, middle Niger basin and delta of Niger River. The swampy and sandy Inner Delta is also known as Macina. This physiographic area is dominated with lakes and flood plain in Sahel area of central Mali. The delta consists of the middle course of the Niger River, between the bifurcated Niger and its tributary.

The Middle Niger Basin is known as the Nupe or Bida Basin. Generally this area is plain in the Lokoja region; the basin occupies a gently down warped trough. It stretches from the confluence of Niger and Benue Rivers to the dam lake of Kainji, where basement rocks separate it from the Sokoto Basin.

Niger delta is a vast low lying region through which the waters of the Niger River drain into the Gulf of Guinea. Characteristic landforms in this region include oxbow lakes, river meander belts (see meander), and prominent levees. Large freshwater swamps give way to brackish mangrove thickets near the sea coast.\

Basin encompasses a range of forest community. In its south, tropical rain forest is the important category where rainfall occurrence is high. Moisture laded wind has become the causes for rain forest of this zone. Grassland and savanna has covered most of the portion of Sahel. Species of Acacia are the dominant trees in this belt.

There are three types of major soil in the Niger River Basin, which are Ferralitic soils, tropical Ferruginous soils, and Hydromorphic soils. The basin also faces the problem of environmental degradation. This degradation can be observed in each sphere of ecosystem. Drought, soil erosion, desertification, and deforestation are prominent problems in West Africa. Particularly area of Sahel and inner Delta suffer much with this problem.
The first two chapters have provided a significant insight to look the region in a form of subject matter for analysis in minute scale to view an area in its features and the geographical location of concerning states. Geopolitics of basin is still waiting to determine. In this aspect studies go ahead in to a form of resource availability and its distribution among the basin countries. Among all the natural resources of river basin water seem contain major attraction due to its importance and common sharing. The value of this resource increased if the region is in arid and harsh climate. The scarcity of water and increase in demand has make it so valuable for analysis. Third chapter of this work very much centered on water resources'.

Physical environment of Sahara, especially topography and climate controls the water resource distribution, its availability and utility. Increase in temperature, rainfall variation and concentration are those factors which involve in determining the water scars and water abundant areas in the basin. Rainfall distribution is not even in the region. In northern portion of river basin, on the fringes of the Sahara desert, rain fall occurrence is very low this is the region that water shortage is always reported in this arid belt. However southern Niger basin sides of river experiences high rain fall and a good water availability condition. The surface flow and runoff of Niger River and it tributary Benue river indicate the variation

in river flow at various stations.

Irrigation system of Niger River basin, irrigated area and cropping pattern also show the interesting result where Nigeria superseded to other countries. And Mali, Chad, Niger and Burkina Faso are there in struggle zone.

The building of dams on river Niger has also negatively influenced which become the cause for people's movement and ground water depletion. The most influenced area in this context is the inner delta of Mali and Niger delta. Extending dry season irrigation will require additional dams and will impact heavily on wetlands and their biodiversity, notably the environmental services and the livelihoods of a million herders,

In the ecology of Niger basin, wetlands have their own unique importance. These wetlands are mostly flood plain wet land. Larger inland delta and wet lands associated to Lake Habitat (Lake Chad, Niger inland delta), coastal delta is the example of this lands. It provides support to local communities of region who depend on their natural resources and the ecology of region.

Region is consisted with a set of agro-climatic zones on the bases of water availability through rain fall. In northern portion of river basin, on the fringes of the Sahara desert, rain fall occurrence is very low this is the region that water shortage is always reported in this arid belt. However southern Niger basin sides of river experiences high rain fall and a good water availability condition.

While discussing with the water resources an issue comes in to the mind which is related with the sustainability of natural system. Demographic pressure and carrying capacity linkages indicate the vulnerable situation of river basin where depletion of natural resources has going to dominate at a very faster rate in modern technological era.

In terms of Water poverty, Burkina Faso is the country where condition is hazardous. Future prospects of water availability and utility in the region also shows the negative result in few

countries. Data shows the Niger and Chad will face the acute problems in 2025.

There is a need of sustainable water management in the basin. However sustainable water management needs the systematic coordination between government institutions, policy formations and executive machinery. That can be adapted in tune with dynamic social and biophysical systems. This arrangement can be executed at multi scale. The performance of effective water policy can be measured by the ability to sustain the functioning ecology of the water system, the potential for the efficient allocation of water resources and capacity to meet the conventional tests of equitable distribution and fairness through time.

Now the time has come to reach at final destination of our journey. The picture of Niger basin has clear in perspective of its location, area distribution, countries, physico-demographic environment. We have also seen the water resource characteristics and irrigation arrangement in the basin but the adjustment and the geopolitical behavior are still in darkness. This is the last chapter of this journey which tells us the issues of conflict and process of reconciliation and cooperation of Niger River basin. It seems to be very common among riparian states involvement in conflicts and disputes. The power structure and uses of natural resources was in the mind while discussing with this chapter.

Chapter tried to cover the nature of geopolitical conflicts and its types in the basin. In this context territorial and boundary disputes comes first. The further subcategory of territorial disputes includes the boundary demarcation problems, delimitations problems, and position of land water and places, resource sharing historical and ethnicity etc. study also concentrates about states own domestic issue affecting the region at whole. These conflicts are cited with the case study in the region. Struggle between Burkina Faso and Benin for sovereignty over two villages is given as example.. Benin accuses Burkina Faso of moving boundary pillars; Burkina Faso border regions have become a clashing space for Liberia. The boundary demarcation between Mali and Burkina Faso is underway currently. Niger has ongoing processes delimiting sections of their borders with Burkina Faso and Mali, disputes which date back to the colonial period. The issue of Lete Island is another example in this study. There is a conflict between Niger and Benin over this island. Together with the other smaller island in the Niger River, it was the main object of territorial conflict between Benin and Niger.

Conflict over the water resources and water sharing is another dimension of this study. Few African countries experience water stress and water scarcity routinely and some of the countries especially in the south and south eastern parts of the continent are subjected to frequent floods and inundation. Building dams and displacement in response to it has produced social problems besides environmental impact.

Regional cooperation among countries is the second segment of this final study. Regional cooperation is a process of integration in order to enhance regional cooperation through regional institutions and rules, states try to build regional institution and rules through agreement. Analyzing to this issue, we have tried to complement the regional picture in total. The role of regional organization in this regard is important.

Niger basin authority, is working hard to co-ordinate the developmental programmes of basin and to secure the sustainability of regional physical and socio-economic environment. It was necessary in context of resource characteristics of Niger basin where water scarcity and flow variability are always causes for concern; the only option for sustainability of the water resources, optimal utilization, and good member relationships is to pursue the path of coordinated, cooperative water resources development. The challenge facing the countries of the Basin is to find ways in which the river's development potential can be realized only with empowered, enabled, and relevant river basin organization in place, attuned to its constituencies and respected as an institution that can broker major development.

Niger basin authority has followed a zigzag path in its way to achieve regional integration and development. This agency has faced some difficulties in 1980s, but soon it returned back on its smooth path.

The contemporary situation of this organization and its function is very optimistic and future oriented. Sharing countries are co-operating much for the fulfillment of common goals. Financial incapability and poverty is the main hurdle in the way of development. However countries and organization try to manage these huge resources from donations and cooperation with world agencies.

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