

**THE IMPACT OF DADIN-KOWA DAM ON THE SOCIO-ECONOMIC  
DEVELOPMENT OF YAMALTU-DEBA LOCAL GOVERNMENT AREA OF  
GOMBE STATE  
(1982-2012)**

**BY**

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**AUGUST, 2021**

## **DECLARATION**

I hereby declare that this study in its original form has been carried out by me, BELLO MUHAMMAD BOSE of the Department of Political Sciences Ahmadu Bello University Zaria.

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## CERTIFICATION

This study entitled “The Impact of Dadin Kowa Dam on the Socio-Economic Development of Yamaltu Deba Local Government Area of Gombe State 1982-2012 by Bello Muhammad Bosemet the regulations governing the award of the degree of Masters of Science of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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## **DEDICATION**

I dedicate this research work to the Almighty Allah for his immeasurable mercy and guidance he gave me throughout the conduct of this study. And to my late father Alhaji Muhammad Bose, my Late wife Izzatu Tijjani Aminu as well as my beloved mother Hajiya Aishatu Muhammad Bose

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## **ABSTRACT**

The centrality of water to both global population and its expanding economic activities is enormous. The need for water without correspondingly expanding its source has led to the depletion of water resources; causing severe scarcity while compelling people to look for alternative sources. Dams are constructed as alternative source of water to the entire population. While it provides water and other resources to the population, it also holds possibilities of considerable harm for human living. On this basis, the study examines the relevance of Dadin Kowa Dam in fostering socio-economic benefits and environmental sustainability at Yamaltu Deba Local Government Area in Gombe state. Predicated on the popular Ecological modernization theory, the data was generated from the administration of questionnaires and in-depth-Interview which were corroborated with data from secondary sources. The study reveals that Dadin Kowa Dam has in no doubt helps in improving the socio economic activities of the area by providing the people living in the area increased job opportunities to cater for their immediate needs, though the dam like other dams in the country has also brought forward difficulties due to constant flood some communities faced during heavy downpour and displacement/resettlement issues during its construction. The study recommends that government should complete the building of canals and hydroelectric generation for the benefits of the people. Also the dam authority must provide essential services to the people in the area (i.e. pipe bone water, schools roods and hospitals).

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## ACRONYMS AND MEANINGS

DFRRI	Directorate of Food Roads and Rural Infrastructure
EIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
EPA	Environmental Protection Agency
FWL	Full Water Level
FMWRRD	Federal Ministry of Water Resources and Rural Development
FIWD	Federal Inland Water Department
FMWR	Federal Ministry of Water Resources
GHG	Green House Gases
HEP	Hydro-Electric Power Generation
HIV Aids, STD	Human Immune Virus/Sexual Transmission Diseases
ICLD	International Commission on Large Dams
IDAM	Integrative Dam Assessment Modeling
ITCZ	Inter-Tropical Convergence Zone
MW	Mega Watts
MDGs	Millennium Development Goals
NESAP	Nigerian Environmental Study/Action Plan
RBDA	River Basin Development Authority
RPF, FMWR	Resettlement Policy Framework
RPF, UBRBDA,	Resettlement Planning Framework
TRIMING	Transforming Irrigation Management
UBRBDA	Upper Benue River Basin Development Authority
WCD	World Commission on Dams
WB	World Bank



## **CHAPTER ONE**

### **GENERAL INTRODUCTION**

#### **1.1 Background to the Study**

Water is one of the most important natural resources and a key element in socio-economic development of any civilization. Most of the economic activities like agriculture, industry, transportation among others are largely dependent on this vital resource. Its ready and sustained availability is one of the basic building blocks of the society. But the increasing world population and expanding economic activities are depleting water resources, causing scarcity and fostering immense competition; thus compelling people to look for alternative sources. This is the motive that has led to the need for the vigorous construction of dams in order to curtail the problem of water scarcity which is an impediment to overall human progress (Hussein, 2014).

The last century saw the rapid increase in the construction of dams. By 1949, about 5000 large dams were built worldwide, three quarters of them in industrialised countries. By the end of the 20<sup>th</sup> century, there were over 45000 large dams in over 140 countries (Michael et'al, 2008:1-2). Dams conventionally have been promoted as an important means of meeting perceived needs of the people. Hence regional development, job creation and fostering an industrial base with export capability are most often cited as additional consideration for building dams.

However, while dams can contribute to economic growth and development, this often comes at great costs to humanity. Apart from the benefits that come from dams as highlighted above, dams around the world choke about two thirds of the world's largest rivers and the consequences of this massive engineering program have been devastating.

Nigeria has witnessed an upsurge in dam construction in the past three decades. Over 323 dams have been constructed in the country and many more are under construction in different

parts of the country. Between 1970 and 1995, 246 dams were constructed in Nigeria. The effect of Sahelian drought of 1972-1975 aggravated the food shortage in the country; prompting various levels of government to embark on rigorous policy to rescue the situation. River basins impoundments were therefore, seen as a remedy to the situation. It was the severe drought that forced most of the rural population to abandon farming and move to urban areas in search of better life. As a result, insecurity and poverty became rampant within the cities with less or no measures to curtail the menace (Mato, 1999).

Good agriculture production which is a means towards curtailing or managing rural migration to urban centres is major socio-economic activity of the Nigerian societies. From the pre-colonial, colonial to post colonial periods of Nigeria and more specifically Northern Nigerian history, data on demographic and occupational distribution studies, most often display a preponderance of rural dwelling for the vast majority of the people with farming as their major preoccupation (Mato, 1999).

Moreover, during the plan period of 1962 -1968, agricultural productivity was considered synonymous with rural development and therefore, high expectation was placed on returns from agriculture as pivot of development; even though the legacies of colonial agriculture that informed the thinking of the policy makers ended up making the policies and practices to reinforce dependency and the neo-colonial position of Nigerian state in relation to international capital. The long term resultant outcome of this development added to the beginning of long term famine and hunger as the peasants were forced ironically to produce what they cannot consume and consumed what they cannot produce (Abbas, 2014), thereby necessitating short and or long term remedial measures like the construction of dams.

Urbanisation is no doubt a reality part of this history, as a result of certain colonial and post-colonial factors: yet the imperative of rural population in the production of food for subsistence as well as cash crops cannot be overemphasised. The construction of Dadin Kowa dam was among other things come as a result of rural development projects in Nigeria so as to reduce rural urban migration, due to the shortage of food in the country. The essence of the dam was to make possible a year round farming through irrigation. Before then farmers in Dadin Kowa area like their counterparts all over the state or region rely on subsistence farming and other forms of farming like shifting cultivation and crop rotation.

With the construction of the Dadin Kowa dam, fishing, irrigation farming and animal husbandry gain popularity among the farmers in the area. Daily and weekly markets thrives, trade and exchange in agro allied product bloom. However, with the discovery of oil after independence and accompanying effects of its boom and gluts has continued to drastically alter the equation of hinging Nigeria's socio-economic fortunes on agriculture. Huge revenues from crude oil gradually displaced agriculture from its first place as the mainstay of Nigeria's economy. Mono-economy further breeds rentier mentality and over dependence on oil proceeds (Ibrahim, 1992).

Less attention was then focused by people on agriculture, industrialisation and solid minerals exploration. Although policies such as Green Revolution, Operation Feed the Nation, etc, were proposed by the state during the seventies and eighties, they all failed to succeed in attaining the goals which they were set up to achieve as the result of corruption, poor policy setting or policy inconsistency, poor human capital, poor infrastructural provision, among others, marred such efforts (Ibrahim, 1992).

Thus, the River Basin Development, Agricultural Development Programme and Rural Water Projects were introduced as key components of the World Bank designed for Nigeria on agriculture, upon which adjustments and new commitments were required. This was what led to the formation of River Basin Development Authority, and Agricultural Development Programme (Beer, 1963).

These institutions were fabricated as inputs to augment agricultural development in the country. River Basin Development Authorities (RBDAs) were expected to facilitate irrigation farming in the country yards through provision of needed rural infrastructures, dams, water ways and canals, and the needed professional advice and training for all year irrigation farming. The Agricultural Development Projects (ADPs) have as part of their terms of reference to provide needed rural extension services to farmers, feeder roads construction, agricultural mechanisation service, as well as pesticides and insecticide control (Abdullahi and Imam, 1984).

The Dadin-Kowa Dam in Yamaltu-Deba L. G. A. of Gombe State was conceived and executed in order to hold back water and achieve many other objectives. Notable among the objectives is to promote irrigation and fishing as well rural electrification, so as to empower its surrounding communities. Before its construction, the nature of the valley of Dadin-Kowa area was mountainous and handful of flat land that was mostly occupied by the inhabitants that were more often than not, affected by natural rhyme of flooding; particularly during the period of heavy downpour (UBRBDA Report, 2014):1-3

Dadin-Kowa dam therefore, has the potentials of making hydroelectric generation, coupled with irrigation activities and fishery possible to its surrounding communities. Agriculture, industrialisation, poultry, grazing, and tourism will also receive a boost in the area. In addition to, the surrounding communities residing at the Dadin-Kowa dam area, particularly

people from the following electoral wards of (Hinna Dadin-Kowa ward, Gwani Shinga, Wade ward and Difa, Lubo, Kinafa ward) are farmers.

The area is one of the major sources of seasonal farm produce in the north eastern part of country. With the produce ranging from tomatoes, pepper, sweet melon, onions, cabbage, carrot, and grains like maize, rice, sorghum, millet and wheat. The area is the largest market for vegetables and gracious that attracted people and business men from all over Nigeria. Fishing is another major preoccupation of the people surrounding Dadin-Kowa dam. Most of this is made possible by irrigation farming which requires annual water supply for continuous production. This therefore, brings out the necessity and imperative of source of consistent water supply that will ensure continuous farming and irrigation in the area for socio-economic and ecological balance of the area.

Though, the benefits of constructing Dadin-Kowa dams outweigh the cost, however, the development of this project resulted to negative biophysical, socio-economic, and geopolitical impacts. Often through the loss of ecosystem services provided by fully functioning aquatic systems, the dam has wiped out different aquatic species, flooded huge wetlands, forests and farm lands; and displaced villages living both up and down stream. For instance people of Gwani east and west were separated completely apart by the activities of the dam while Kinafa village was completely submerged by the growing body of water. Though, Dadin Kowa dam project was designed to promote human centered development and to meet humanitarian needs and expectations of the term of sustainable development became imperative in achieving the aforementioned. Constructing dams for irrigation, energy production, and flood control generally requires big scale usage of technology and engineering design. However, dam projects were not

solely depending on technology and engineering structure alone, but also in addition to these is to solve soils, water's and people's problems if not both.

## **1.2 Research Problem**

Water scarcity is critical constraints to farming in many parts of the world. This call for building of water reservoirs/dams; to meet the growing demand for drinking and increase supply of water for irrigation and further increase certain aspects of the environment (Blench, 2014). However, adverse socio-environmental impacts have been identified during and after dam construction, whether dams are beneficial or detrimental to either environments or human surrounding population have been debated. Hazards such as ecosystem fragmentation, blockade of downstream sedimentation, riverside and coastal erosion, diseases outbreak, resettlement issues, flooding and other climatic disorders/problems have been identified with the dam construction in many places.

This study therefore, attempts to unravel the impact of Dadin-Kowa dam on the socio-economic development of Yamaltu-Deba local Government area, of Gombe State (1982-2012). In other words, since dams, along side their duly acknowledged positive benefits also come with deleterious effects, this study examines the contribution of Dadin Kowa Dam to the Socio-Economic Development and Environmental Sustainability of Yamaltu-Deba local Government area. In specific terms the study therefore attempts to answer the following questions:

## **1.3 Research Questions**

1. What are the factors responsible for the construction of the Dadin-Kowa dam in Yamaltu-Deba local government area of Gombe state?
2. To what extent has the Dadin-Kowa dam contributed to the socioeconomic development and environmental sustainability in Yamaltu-Deba from 1982-2012?

3. What are the negative impacts of the Dadin Kowa dam on the ecology of Yamaltu-Deba Area?
4. What can be proposed to tackle the challenges posed by the establishment of the Dadin-Kowa Dam to socio-economic development and environmental sustainability?

#### **1.4 Research Objectives**

This research intends to achieve the following objectives;

1. To identify the rationale behind the construction of Dadin-Kowa dam.
2. To examine the socio-economic benefits derivable to the people of the area as a result of the construction of the Dadin-Kowa dam between 1982-2012
3. To assess the negative impact of the dam on the ecology of the area.
4. To identify possible challenges posed by the dam establishment in the area and proffer possible solutions.

#### **1.5 Research Assumptions**

1. The rationale behind the construction of Dadin Kowa dam is to generate electricity, provides modern irrigation farming, fishing and agricultural extension services .
2. Dadin kowa dam has created opportunities for fishing and irrigation farming as well navigation and hydroelectric generation.
3. The presence of Dadin kowa dam led a huge human cost of restlement of persons, diseases outbreak, flooding.
4. The challenges caused by the dam can be solved through the review of compensation of the displaced inhabitants as a result of the dam construction, provision of modern

health centres adequate management of the dam to prevent flooding and timely government intervention during flooding.

## **1.6 Justification of the Study**

This research work is justified by believing that gaps exist in this study on “the impact of Dadin-Kowa dam on the socio-economic development of Yamaltu-Deba local Government area, of Gombe State (1982-2012). Most of the available literature on the topic under study examined the cost implication of the dam as well as the benefits derivable as a result of the construction of the dam (i.e. irrigation farming and fishery), leaving behind other important factors. This study provides an empirical work on the dam. Others factors includes; socio economic sustainance of the dam to the people, and its consequences, and also finding out from the inhabitants weather the intended benefits derivable from the dam became a reality or otherwise.

To this end therefore, this work examines “weather in the long run the advantages of having the Dam will far outweigh the economic and environmental damages caused by it, by doing so a well structured assessment was administered to the (inhabitants) to unraveled the possibility of the above preposition by proving it or otherwise in relation to the dam construction in the area.

This empirical research work dig deep in the socioeconomic development and environmental sustainability of Dadin Kowa dam in Gombe State and was able to unraveled the relevance as well as challenges it caused residents of Dadin kowa area of Gombe State, which hopefully is a modest contribution to the existing body of literature on the impact of dams to the people it meant to serve. Moreover, the essence of this research work is to shed light on how to intervene by the authorities concerned towards the challenges poses by the Dam construction in the area.

In the same vein, this research work is important in various ways, it will increase the existing body of knowledge and scholarship; the study would immensely help people especially those in the policy making circle to understand better, on how to manage public infrastructures like dams, and how to tackle problems that might occur during the construction or after.

### **1.7 Scope and Limitations of the Study**

The topic under study “the impact of Dadin-Kowa dam on the socio-economic development and environmental sustainability of Yamaltu-Deba Local Government Area, of Gombe State (1982-2012)” focuses on the area affected particularly the villages within the Dam bank and those within the following electoral wards (Hinna Dadin-Kowa Ward, Gwani Shinga, Wade Ward and Difa, Lubo, Kinafa Ward).

The only limitation experienced during the field work was access to data during the research particularly base line data showing the income of the inhabitants before the construction of Dadin Kowa dam which was not available, as well as the nature of dispersed settlement particularly those divided by the dam during field work exercise with some financial constraint.

### **1.8 Conceptual Clarification**

**Development:-** simply means application of new ideas to practical problems of research, it can also be define as a planned and comprehensive economic, social, cultural and political process in a defined geographic area, that is right based on ecologically oriented and aims to continually improve well-being of the entire population and all individuals. This at the process individuals will be actively involved in open meaningful participation in development and in fair distribution of benefits (fritz, 2012)

**Socio-economic Development:-** refers to professional intervention with intend of improving socio-economic condition on seven levels according to Fritz, they are;- individual and group

empowerment; conflict resolution; institution building; community building; nation building; regional building; world building. It also be refer to as a process of economic and social transformation based on cultural and environmental factors (Contemporary India issues report, 2000).

**Sustainability:** Deals with anything that ensures the need of todays population are met without jeopardising the ability of the future generation meet their needs.

**Environmental Sustainability:** Could be define as a condition of balance, resilience and interconnectedness that allows human society to satisfy its needs while supporting ecosystem to continue to generate the services necessary to meet those needs not by our actions diminishing biological diversity.

**Ecology:** Is a branch of science which study how people or organisms relates to each other within the living environment or a branch of biology that is dealing with relationship and interactions of existence between organisms and their physical surrounding or generally a political movement that seeks to project the environment especially from pollution.

**Dam:** However, defines as a barrier constructed to hold back water and raise its level, which the resulting reservoir being used in the generation of electricity or water supply. In other words it can be simply means the barrier that obstruct the flow of water especially one of earth masonry e.g. built across a stream or a river.

## **1.9 Organisation of Chapters**

The study is organised in five different chapters. Chapter one covers the background of the study, the research problem, research questions, objectives of the study, research propositions, justification of the study, scope and limitations, conceptual clarifications, as well as chapters review. Chapter two contains literature review, theoretical framework and the environmental

features of the area under study, the history of water supply in Nigeria, the nature and activities of dam and Dadin-Kowa in particular, its capacity, its access to the community, socio-economic activities of the area with relevance of the study/contribution to knowledge. Chapter three dwells on the Research methodology. Chapter four is data presentation and analysis on the socio-economic development of the dam and its environmental effects on the ecology of people of Yamaltu-Deba LGA of Gombe state, while Chapter five is the summary, conclusion and recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

#### **2.0 INTRODUCTION**

This chapter reviews the existing literature on the subject under study. The review is undertaken thematically. It also provides theoretical framework and highlights the relevant and limitation of the existing body of knowledge on the subject of study.

#### **2.1 LITERATURE REVIEW**

##### **2.1.1 Conceptual Clarification**

###### **i. Development**

There is a consensus between academics, Non Governmental Organisations as well as policy makers on the belief that development is a state in which things are improving but in different ways and in various contexts, social, political, biological, scientific and technological, language and literature. (Evandro, 1993) In the social and economic context, it implies transformation of people life styles through improved education, income, skills development and employment. It is the process of economic and social transformation based on cultural and environmental factors (Boeninger, 1992).

Development is a planned and comprehensive economic, social and political process that is ecologically oriented and aims to continually improve the well being of the entire population. Here the individual will be actively involved in open meaningful participation in development and in the fair distribution. This definition has three components social development, economic development and environmental protection.

The conventional definition of development theorists focus on a north–south dichotomy or the development and under development writings. These narrowly defined approaches were

adopted in Asia and so the idea such as full employment, universal social service and social safety net were not part of the development initiative.

Smith (1976) maintains that development is concerned with the achievement of a better life; that the focus of development analysis has to include the nature of life of the people, the length of the life itself, life expectancy and the living standard of the people. In a similar vein, Singer (1952) noted that in a development discuss, People value their ability to do certain things and to achieve certain types of beings (such as been well nourished, been free from avoidable morbidity, been able to move about as desired, and so on). These "doings" and "beings" may be generically called "functioning" of a person.

While, Jonathan (1995) underscores that development is a powerful language which has historically been used as a tool to reorder space, imagine and transform societies, rewrite socio-economic and political landscapes and replace one reality with another. Also Adams (1995) associated development with how Europe, after undergoing industrial revolution and the bourgeois liberal revolutions, glorified itself as a dominant civilisation and producer of modernity ahead of other parts of the globe. As affirmed by Loanna Kucuradi, when he stated that;

Development can be seen from two senses; one from an active denotation- where it is seen as a human activity i.e. to frame, plan or work out a project. Second from a passive or reflective use a critical sense. Here, it is a process undergone by a given bearer, which possesses or is expected to possess certain potentialities that are expected to be actualised up to a certain limit; after which decay sets in. This applies to living beings including human beings”.

From the foregoing, one will inferred that development has no specific definition or yardstick of measurement but can be understood from relationship that have long been existed between Africa and Europe

## **ii. Debates on Development (North-South Divide)**

These debates were characterised by numerous clashing perspectives with theories and deep differences of opinion. The results of empirical studies are often contradictory or ambiguous. At times, it even seems that empirical research leads to more than less uncertainty.

Jonathan (1995) opines that developing countries are trapped in a vicious circle of stagnation; they are condemned to stagnation and poverty. He believes that it was generally due to the manner of which they pilot their affairs in their states.

In similar vein, Rostow, cited in Abbas (2014) maintains that for society to develop, they must follow the composition of investment and growth in certain leading economic sectors. He further argues that the following stages must be followed for development to thrive in any society-the precondition for take off, take off stage, and drive to maturity and state of mass consumption. If these stages were followed it will eventually push development to fall into place. He added that Marx Weber's, development analysis was base on the relationship between Protestantism and the development of capitalism. He however opines that for capitalism to develop in Western Europe not only appropriate economic conditions were crucially put in place, but there must be capitalist spirit, orientation and values.

In another development, David McClelland, opines that for a society to develop it must fall within the dimension of values and attitudes of a man towards attaining modernity, he places emphasis on the "modern man" whom he describes as efficient, adaptable, confident, in bringing about change and believes that traditional man is lacking in ambition, suspicion, fatalistic, conservative, anxious and cling to well established norms.

Almond's structural functionalism maintains that political modernity is prerequisite for development by taking functional specialisation, for him for societies to prosper five main

capabilities of the political system must take place thus; extractive, regulative, distributive, symbolic and responsive will fall in place to achieve a desired development.

This stereotypical view of developed countries scholars is generally untrue. As some developing countries exhibit strong economic growth and dynamics, while other countries stagnate. One should also always remember that every economically advanced country was once a developing country.

From a perspective of the developing writers like Gatung in Weede (1993) suggest the idea of structural theory of imperialism to support the foregoing argument by exposing the imbalance in trade relations between the Developed and Less Development Countries (LDC). For him, developing countries suffer from vertical trade and feudal interaction patterns. Vertical trade refers to the fact that most rich industrialised and powerful countries tend to export processed and finished goods while, developing countries export raw materials to the developed world. Both have different effects on the economy and society.

He further argues that for developing countries, it is often negative like resource exploitation leaving a “hole in the ground” while the same process in developed countries leads to the production of sophisticated goods which contribute to capital formation.

He however maintains that, western writers on developing countries whom alleged that given the pace of the population growth, food scarcity in developing countries will always be a problem. This statement is often associated with horrible images of starvation and malnutrition on the African continent, the statement is generally untrue. For him, in the long term, world food production is increasing more rapidly than world population; this is the case in most developing countries. However, this does not mean that hunger and malnutrition can be eliminated in the foreseeable future.

Ogunduwale (2007) posits that Agricultural production, mining and exports cannot contribute to the economic development of a country. This unfavorable image of agricultural and mining exports originates from the late nineteenth century when tropical developing countries exported agricultural products and industrial countries exported industrial products. Nevertheless, there are few countries where agriculture and mining exports have been the foundation of later economic prosperity. They can also make a positive contribution today.

Bagmisaye (1986) advanced his argument by admitting that dependence of developing countries on the advanced economies leads to a net out flow of capital. This proposition originates from the first half of the twentieth century, when there was an outflow of resources from colonies to their colonisers. However, during most of the second half of the twentieth century, developing countries have profited from net inflows of capital

Rodney (2005) asserted that development in human society is a many sided process. And that was what implies at level of individual differs from what it implies at level of social groups. According to him, development at level of individual implies increased skill and capacity, greater freedom, creativity, self-discipline, responsibility and material well-being. While development at the level of social groups, implies an increasing capacity to regulate both internal and external relationships. He added that development in the past, it always meant increase in the ability to guard the independence of the social group and indeed to infringe upon the freedom of others something that often came about irrespective of the will of the persons within the societies involved. The tools with which men work and the manner, in which they organise their labour, are important indices of social development.

Consequently, however, development' is often used in an exclusive economic sense. In this sense, he maintains that a society develops economically as its members increase jointly

their capacity for dealing with the environment. This capacity for dealing with the environment is dependent on the extent to which they understand the laws of nature (science), on the extent to which they put their understanding into practice by devising tools (technology), as well as the manner in which work is organised.

He equally observes that there has been constant economic development within human society since the origins of man, because man has multiplied enormously in his capacity to win a living from nature. Rodney (2005) goes on to argue that:

the magnitude of man's achievement best understood by reflecting on the early history of human society and noting firstly, the progress from crude stone tools to the use of metals; secondly, the changeover from hunting and gathering wild fruit to the domestication of animals and the growing of food crops; and thirdly, the improvement in the character of work from being an individualistic activity towards an activity which assumes a social character through the participation of many"(Rodney, 2005).

However, Rodney did not fail to point out that " all societies have experienced development; it is equally true that the rate of development differs from continent to continent and within each continent different parts increased their command over nature at different rates".

Rodney rounded off his explanation on development by saying that the way and manner in which the bourgeoisie scholars talk about development is deceptive. This is because these scholars concentrate their attention narrowly on economic development. This explains why average bourgeoisie scholars often define development as simply a matter of the combination of given factors of production: namely land, population, capital, technology, specialisation and large-scale production.

The deception in the bourgeoisie's definition of development, according to Rodney, is in the omission of some fundamental issues which are not supposed to be found wanting. For instance, he says

No mention is made of the exploitation of the majority which underlay all development prior to Socialism. No mention is made of the social relations of production or of classes. No mention is made of the way that the factors and relations of production combine to form a distinctive system or mode of production, varying from one historical epoch to another. No mention is made of imperialism as a logical phase of capitalism

As such, Rodney insists that development cannot be seen purely as an economic affair, but rather as an overall social process which is dependent upon the outcome of man's efforts to deal with his natural environment.

### **iii. The Concept of Environment**

The term Environment is derived from the French word "Environia; meaning the surrounding. It refers to both a biotic (physical and non living) and biotic (living) environment. The word environment means surroundings, in which organism lives. Literally Environment according to Bäckstrand, and Lövbrand (2007), means all that surrounds man and everything that affect an organism during its life time. It is the sum total of conditions that surrounds us at a given point in time and space. It is comprised of the interacting system of physical, biological and cultural elements which are interlinked both individually and collectively. Environment is the sum total of conditions in which an organism has to survive or maintain its life process, its influences the growth and development of living forms and consist of atmosphere, hydrosphere, lithosphere and biosphere. Its chief components are soil, water, air, organisms and solar energy.

Aluko (2006), affirms that environment "is the physical space and the surrounding in which Man lives or resides. To Baryn and Chorley; environment is:

What we see and find as land, water and air. It is an embodiment of the entire stock of plants, animal and human beings and indeed the complex ecosystem and life forms between and among them, the environment is the earth and all its fullness-physical features, its structures, and crust space and time of the living earth-the only place where life is known to be found and sustained. It is where the humans exert extensive influence and control over the forces of

nature. The living environment is the embodiment of solid, liquid and gas, sound, vibration, radiation, heat and combination of varying degrees that influence the growth and development of organisms; the mineral in the bowels of the earth and the mountains, hills, valleys, rocks, forest and the woodlands and the fluffy and scenery vegetation cover, it is in fact, an all embracing life support system (Baryn and Chorley; 1976).

From the above the definition one may argue that everything surrounds man is collectively termed as environment. It is through environment that man gets food to eat, water to drink, air to breath and all basic necessities required for a day to day living. Schaefer and Lamm (1995), addthe environment serves three basic functions of environment for man:

First, the environment 'house' man and all other living species – it is what constitutes the home, the living space, the place where human beings reside and work. Man has no other place to go or reside other than in an environment. Man cannot and does not live or reside in a vacuum. Second, the environment provides the resources essential for life. These include: land, water, air, and the raw materials used to build houses and create shelter, transportation, food and other essentials needed for living. If man exhausts these resources, the consequence can be very devastating. Third, the environment serves as a waste repository. Man more than any other living things produces a large quantity and variety of waste products. These include body wastes, garbage, and sewage. The environment is becoming more and more polluted because man is generating more waste than the environment can safely absorb.

But even with the above extraction benefits that man drives from environment he (man), continually consciously or sub-consciously harm the environment that sheltered him.

Backstrand and Lovbrand (2007), note that the misuse, abuse and degradation of the environment by man have brought disruptions on the environment everywhere due to man economic activities and livelihood practices that are changing and changing the environment the consequence of the realisation that when people have power to extract resources around them for a more fulfilling life, such power is sometimes unleashed with a sense of desperation in order to solve the increasing and mounting problems of survival and progressive improvement. ThisAccording to Intergovernmental Panel on Climate Change, (2007) led to environmental

declining and degradation and a threat for the future on one hand and long life preservation of human life and natural resources on mother earth on the other hand.

From the foregoing, one understands that man's activity in the environment was harmful and it later goes back to him. For instance the haudrallic head of Dadin-Kowa completely submerge a near by settlement forcing them to relocates to another area. Kinafa village was completely destroyed due to the dam construction, they were therefore given a potion of land to resettle by their neighbors Gwani west and eventually crisis erupt between the two settlements on the ownership of a potion of grazing land that the settled (Kinafa). While, the host (Gwani west) contended and the issue led to an open battle between the two villages. In the process the village head of Kinafa was once attacked by youth from Gwani west and he was rushed to the hospital as a result. The case is presently on trial in court at the time of writing this thesis.

#### **iv. The Concept of Dam**

A dam is a barrier constructed across a water way to control the flow or raise the level of water. To Uyigue (2006) It is an impediment or boundary constructed across a stream or river to impound water and raise its level for various purposes such as generating electricity; direct water from rivers into canals for irrigation and water supply systems, ground water recharge; increase river depths for navigational purposes; to control water flow during times of flood and droughts; create artificial lakes for fisheries and for recreational use. Many dams are multipurpose and fulfill several of these reasons.

Although, dams are designed to meet many different human needs, the two basic functions of dams are; to store water and raise its levels (McCully 1996).The storage ability of dams allows runoff to be retained for subsequent controlled release, whereas the ability to raise upstream water levels permits water diversion, increases hydraulic head for hydropower generation, creates impoundments for recreation, and so on. The most common classification of operational

characteristics divides dams into two groups, Storage and Run-off River, these was based in large part on their functional differences (FMWRRD, 1993). For example, a storage dam typically has a large hydraulic head and storage volume, long hydraulic residence time, and control over the rate at which water is released from the impoundment. By contrast, a run-of-river dam usually has a small hydraulic head and storage volume, short residence time, and little or no control over the water-release rate.

Shamseldin, (1997) submitted that the dichotomous classification has several limitations. First, different criteria are sometimes used to place dams in an operational class. Second, membership in a single class can conceal large and important variation. For instance, storage dams can include flood-control dams that dramatically alter seasonal flow patterns, as well as hydropower dams that impact flow regimes primarily on a time scale of hours to days, in response to fluctuating electrical demand. Likewise, run-of-river dams can have whole-reservoir turnover times ranging from a few hours to many weeks, and impoundment depths ranging from 1m to more than 30m.

Finally, many “multipurpose dams” are used for flood control, irrigation, navigation, power generation and recreation and do not fit neatly in either operational class. Despite the challenges involved in creating a simple classification system that effectively describes variation in the size and operational characteristics of dams, such variation can have markedly different ecological effects (Gujja and Perrin, 1999).

#### **v. Dams in Nigeria**

Dams refer to as reservoirs of water hold back by barriers. They are series of public infrastructure projects aimed at economic development of a river basin, a region or a nation. Several dams were constructed in Nigeria for the purposes of irrigation, power generation, water

supply as well as flood control and of course reversing rural urban migration epidemic due to famine as a result of increase incidence of drought particularly in Sudan savannah zone among other notable functions. These dams are sources of hydro-electric power to Nigeria and some other West African countries (FMAWRRD, 1993).

Rosa (1994) reveals that a number of dams in Nigeria have achieved the main goals for which they were constructed such as the provision of hydro-electricity, water supply or irrigation; constructions of some dams have also been instrumental in causing severe socio-economic hardships for those people who had to move to make way for the dams. Unlike other dams across the country Dadin Kowa dam is still yet to achieve some of the needed activities it was set to achieve since its inception e.g hydroelectric generation. An earlier report by Nigerian Environmental Study/Action Plan (NESAP, 1991) the construction of dams requires not only feasibility studies, but also impact assessment studies of the communities that are likely to be affected with displacement and resettlement, thereby pushing residents out from their original homes which as a result others migrate to towns to settle with their families.

However, various programmes financed by the Nigerian government were put in place to ameliorate rural urban migration as we stated earlier aside building dams. Hence less or no impact was felt by the masses due to high level of corruption, policy inconsistency, poor planning and execution among others. Programmes such as Structural adjustment program (SAP) of the eighties came as a socio-economic policy measure aimed at liberalising Nigeria's economic frontiers through import substitution and trade liberalisation. Nigeria's vast economic potentials were assumed to be best exploited by incorporating its economy into the mainstream capitalist economy. This heralded, though not the beginning, but an unprecedented period of

Nigeria's faithfulness to the dictates of the West through international finance agencies such as the World Bank (Mato, 1999).

Similarly, Abbas (2014) argues that the policy framework of the World Bank which is aimed at rescuing the rural population from the shackles of poverty as a result of lost of lands or valuables to government projects which is aimed at reversing rural urban drift has often manifested into even more disaster to the state. This usually happens when the agricultural project introduced in the country e.g river basin development which Dadin-Kowa dam was carved out that was aimed at developing the sector become uncoordinated thereby turning into an extension of state bureaucracies used to siphon material resources in the name of rural development.

The process was by applying for and accepting financial loans and assistance from these Western programmed financial institutions, Nigeria and other nations of same predisposition will graciously come out of the shackles of poverty, diseases wretchedness through professionally designed programme and adjustments. Programmes offered by these agencies ranged from the areas of infrastructural development, mining, education and agriculture. A relationship which some scholars argued is of a predator and prey (Mato, 1999:95).

Nigeria has witnessed an upsurge in dam construction as an answer towards tackling rural urban migration in the past three decades. Over 323 dams have been constructed in Nigeria and many more are under construction in different parts of the country (Salami and Sule 2010). Between 1970 and 1995, 246 dams were constructed in Nigeria. The effect of the Sahelian drought of 1972 –1975 that aggravated food shortage in the country prompted various levels of government to embark on a rigorous policy to increase food production. To achieve this,

impoundment of river basins was seen as inevitable to provide sufficient water for a year-round irrigation which led to the construction of over 246 dams (Ihonvbere et al, 1986).

In another vein, Oyebande, (1995) states that about 162 large, medium and small dams have been constructed and are being operated in Nigeria. These dams have a total storage capacity of more than 30109 m<sup>3</sup>, i.e. less than 10% of the country's total potential surface water resources. While (85%) of the larger dams are located in the Sudano-Sahelian zone of the country. A sample of 52 dams indicates that 79% have domestic industrial water supply components, while the effects of reservoir operation on the hydrological regime in Nigeria stands at 27%, 33% for irrigation, and the stored water is put at 4% are also for hydro-electric power generation (HEP); 29% for fisheries and 16% for recreation (Salami and Sule 2010). All these dams contribute to flood mitigation and affect the area of wetlands (floodplain) in their downstream areas.

However, dams in Nigeria are generally associated with large reservoir areas, because of slight topographical differences that prevail the available storage at the full water level at the end of the wet season is often drastically reduced by large evaporation losses during the dry season (May-November in the northern Nigeria). The losses reach 10-30% of the active reservoir capacity and even when the reservoir is filled to the full water level (FWL) at the end of the wet season only 70-90% of it is available for the dry season (Rosa, 1994).

#### **vi. Argument for and Against Dams Construction.**

Dams have been used for thousands of years to regulate river flows and ensure adequate supply of water during dry periods. In the future, as population's increase and water consumption rises many people believe there will be a need for more dams (ICLD, 1998). However, in recent years proposals for new dams have, in many places, aroused intense opposition. There are many social and economic arguments used for or against dams, but underpinning many of these arguments is the fact that dams, particularly large dams apart from being beneficial to human

economic wellbeing, produce major ecological changes in river ecosystems and the environment at large (Jobbin, 1999).

Koch (2002) opines that, the new international framework, Integrative Dam Assessment Modeling (IDAM) tool is one example of a new process that seeks to fulfill the WCD's recommendations. Of the other strategic priorities for the equitable and sustainable development of water resources promoted by the WCD, the IDAM tool contributes most directly to facilitating comprehensive options assessments that equally consider the environmental, technical, social, economic and financial components of alternative development scenarios (Koch, 2002).

As proposed in the year 1992, at Rio Declaration on Environment and Development (UN Committee on Economic Development, 1993), IDAM was established to promote the full and equal consideration of the three pillars in dam decision making. IDAM is distinct in its ability to simultaneously consider costs and benefits across the three pillars, as opposed to the discrete analyses (e.g. in social impact assessments, environmental impact assessments, and benefit cost analyses) often used to appraise dam decisions (McCully, 2001).

Oyabande and Balogun (1992) opine that Construction of dams both big and small has been a controversial issue in recent years. While the proponents of dams claim that they deliver many benefits, among which is increased water availability as well as ground water recharge, thus, for domestic and industrial purposes; increased agricultural production because of the availability of reliable water for irrigation; protection from floods and droughts; generation of hydro-electric power; navigation; and overall regional economic development which improves the quality of the peoples including women. They argue further, that like any other large infrastructural development or national policy, dams have both benefits and cost. However, the

overall benefits of dams outweigh their total cost, and thus society as a whole is far better off with dams than never (Roggeri, 1985).

Another issue is that dams are often the largest energy development in many poor countries, which can lead to an unbalanced energy supply. While countries generally get richer as they increase their use of modern energy, the trend goes the other way round for dependency on hydroelectricity (Koch, 2002). Of the world's 40 richest countries, only one is more than 90% hydro-dependent; and of the world's 40 poorest, 15 are more than 90% hydro-dependent. Numerous hydro-dependent countries have suffered drought-induced blackouts and energy rationing in recent years. Energy security means these countries should diversify power generation away from large hydropower, rather than deepening their dependency. Changes in rainfall patterns due to climate change make this especially critical (WCD, 2010).

Dam's construction also has impacts on both upstream and downstream ecosystems, which among other things constitute obstacles for longitudinal exchange along rivers and disrupt many natural environmental processes. Floods that took place in the up-stream of dam' results in the permanent destruction of terrestrial ecosystems through inundation. All terrestrial plants and animals disappear from the submerged area. Reservoirs trap waterborne materials including sediment and obstruct migration pathways for some aquatic species. Downstream there are changes in flow regime, sediment transport, and water temperature and quality. Many of these changes are immediate and obvious (Whyte, 1975).

However, Whyte (1975), adds that others are gradual subtle and more difficult to predict. For example, changes in thermal regime, water quality and land-water interactions result in changes in primary production, which in turn has long-term implications for fish and other fauna higher up the food chain. Dams may cause changes in ecosystems at great distances from the

dam. For example, changes in sediment transport result in changes in river floodplain and even coastal delta morphology sometimes many hundreds of kilometers from the site of the dam. The response of river ecosystems to dams are multiple, varied and complex. There is a need for fundamental research linking changes in abiotic processes caused by dam construction to changes in ecology, particularly in tropical climates where much of the remaining potential for new dams resides, but where very little research has been conducted to date.

Guy and Lund, (2006) opine that the complex inter-relationship between dams and their environment make them extremely difficult to predict all the consequences that dam construction will have for any particular river ecosystem. The impact of each dam is unique and dependent not only on the dam structure, but also for local sediment supplies, geomorphic constraints, climate and the key attributes of the local biota. However, climate exerts a general and pronounced influence over the basic pattern of catchments processes and in this report a preliminary appraisal of possible variation in impacts under different climatic regime is attempted. However, they re-affirm that the approach provides a very broad indication of likely response; current understanding is too imperfect to provide a basis for precise predictions. The problem faced by those responsible for power and water management concern the ways that dams impact on the environment, and how these impacts can be measured and taken into account by decision makers.

Ecosystem impacts are effectively costs to society, and need to be included into accounting structures and applied at the project appraisal stage of dam planning. If this does not happen, the dam development may have spatial and temporal impacts which create a situation of both intergenerational and intra-generational inequity (Guy and Lund, 2006)

Conversely however, dam proponents argue that large dams have played a vital role in human development throughout the world and significantly improved the well-being of humankind. They argue that many of the adverse environmental impacts can be mitigated through appropriate dam siting and operation. Land and water resources are linked so it is essential they are managed in an integrated manner. They further agreed that successful management practice must be based on knowledge of ecosystem processes and an understanding of the manner in which human intervention alters those processes. To this end, an understanding of the impact of large dams on ecosystems is a pre-requisite to better management of water and other natural resources.

#### **vii. Ecology**

Ecology is a branch of science which deals with the study of interrelationship between biotic and abiotic components of nature as well as relationship among the individuals of the biotic components. The term Ecology was first used by a German scientist called Ernest Haeckel, in 1869 and it is derived from the Greek word “*oikos*” meaning “*house or place to live*” combined with “*logos*” meaning “*study of*” (Maganga; 1999). Similarly, Radford (2002) identifies five (5) basic concepts ecology has the following basic concepts:

1. Diversity of living things: Plants and animals exist in a great variety of forms. They can be observed and classified by their structure and (for animals) behavior. This diversity is the result of each type of plant or animal adapting to its environment in its own way.
2. Interdependency of living things: All living things rely on and are affected by other living organisms and by non living features of their environments.

3. Resource and energy cycles: The interactions among the members of an ecological community involve the exchange of energy and resources in continual cycles. Cycles are all driven by a constant flow of solar energy.
4. Nested Systems: Networks of interdependent organisms exist within other larger networks (community to biosphere). Each network can be examined as a whole or as a part of a larger whole.
5. Dynamic Balance: Each ecological network regulates and organizes itself by maintaining a state of dynamic balance characterised by continual fluctuations.

King (1997) describes ecology as the domestic side of organic life and the knowledge of the sum of the relations of some of the organism to the surrounding outer world. He also defines it as a scientific study of the relationship between living organisms and their environment. Ewusie (1980) maintains that; Ecology is a branch of Biological science that deals with the distribution, abundance and productivity of living organisms and their interactions with each other and with their physical environment. The environment includes the physical living or non living (a biotic) world and biological living (biotic) conditions surrounding under which organisms live.

Ernest (1869), a German biologist, for the first time defined ecology as “the body of knowledge that is concerning the economy of the nature the investigation of the total relation of animal to its inorganic and organic environment including above all its friendly and animal relations, with those animals and plants with which it comes directly or indirectly into contact.

However, in 1985, Charles Krebs proposed the most accepted definition of ecology which may be defined as follows: “Ecology is the scientific study of the interactions that

determine the distribution and abundance of organisms”. Thus, modern ecologists have broadened the definition of ecology considering all the fundamental aspects in the subject. It is clear that ecology is primarily a biological science in as much as it deals with the inter-relationships of organisms with their environment.

Ecology plays a significant role in our day to day life. It is concerned with agriculture, horticulture, conservation of soil, wildlife, forest, water resources, etc. Its domain is so vast that it cannot be confined with limited discussion. However the study of ecological principles provides background knowledge for understanding the problems of forests, soil, and surface water (Christ, 1995)

### **2.1.1 Socio-Economic Development:**

Socio-economic development is the process of social and economic development in a society. And according to Edozien (1980) Socio-economic development is measured with indicators such as GDP, life expectancy, literacy and levels of employment. Also less- tangible factors are also considered, such as personal dignity, freedom of association, personal safety and freedom from fear of physical harm and the extent of participation in civil society. The causes of socio-economic development are basically changes in technology and in laws which is one of responsibilities of the state in the process of governance.

Scholars like Ali (2013) opines that socio-economic development as an idea embodies all attempts to improve the conditions of human existence in all ramifications. It implies improvement in material wellbeing of all citizens, not the most powerful and rich alone, but a sustainable way such that today’s consumption does not imperil the future.

Socio-economic development emphasizes progress in terms of economic and social factor within a geographical unit. In economic terms it is the process of raising the level of prosperity through increase production distribution and consumption of goods and services (Ayida, 1987).

Ake (2001) holds that social and economic development embraces changes that take place in the social sphere mostly of an economic nature. This socio economic development is made up of process cause by exogenous and endogenous factor which determined coursed and direction of the development.

Looking at the perspective of socio-economic development, the central issues are improvement in the conditions of human existence in all ramifications. And, this improvement can be generated through strong partnership between all sectors, cooperate bodies and other groups in the society. Socio economic development there fore is the combination of social and economic developments which includes or encompasses the advancement or improvement in the standard of living and the increase in economic life and condition of the people.

### **2.1.2 Measuring Socio Economic development**

Although, there is no strong consensus on the conceptual meaning of socio economic development and how to measure it on certain people, sociologists typically use this term to refer to the relative position of an individual or a family within a hierarchical social structure, based on their access to or control over wealth/income, employment, standard of living welfare and power (Edozien, 1980). This concept is traditionally operational through measures characterising parental educational levels, parental occupations or employments, and family income over time. This is to find out how does it address poverty? How does it increase the level of income to certain set of people in the area? And how does it enhance the life of certain set of people in the area?

Dadin Kowa dam in Yamaltu Deba local government has recorded noticeable number of achievements in spite of shortcomings associated with its existence. On this note, the research use the aforementioned terms to measure the impact of Dadin Kowa dam on the people of Dadin Kowa and environs.

- **Income**

Family income is frequently used as an indicator of family wealth and is seen as an important measure of family background. Children from high-income families are able to provide their children with learning resources, such as books and other educational materials, a place and a time to study. This opportunity also to applies people living in Dadin Kowa town and environs. The presence of Dadin Kowa dam had greatly increased the level of income of many families, and this in turn help them in catering for the immediate needs of their children particularly securing good education and improved health care services.

- **Occupation/Employment**

Another often-used indicator of socio economic development of an area is family background in relation to gainfully employment or occupation. A stable employment opportunity shows a certain position in the hierarchy of a society. Nevertheless, occupational status still remains one of the most stable indicators of family stability. Occupation has huge potential as a measure of family background. It could be operationalise as an indicator of family wealth or prestige. It could also relate to social capital, given that some occupations imply a higher level of connectedness with other people or societal institutions.

- Dadin Kowa dam as an institution is a project executed by federal government to provide employment opportunities for the people in the area. And considering the fact

that many people were employed as a result of the dam is seen as a milestone in addressing the menace of unemployment bedeviling the state

- **Standard of Living or Welfare of the People**

The measurement category of standard of living of an area is focused on socio-economic development. Social well-being of certain people is calculated on quantitative indicators, where the main objective is to show the degree of needs and satisfaction. For this purpose, on the basis of measurements of particular needs, aggregates of groups of needs are formed. Food, housing, health, education, social protection and material standard are termed as indicators for measuring welfare status of the people.

### **2.1.3 Sustainability and Sustainable Development.**

Sustainability or sustainable development means that the needs of the present generation should be met without compromising the ability of future generation to meet their own needs. The World Commission on Environment and Development (1987) defines sustainability as a system which can be considered sustainable if it ensures that today's economic development is not at the expense of tomorrow's development prospects. The term sustainability to the commission is not a fixed term what is sustainable today might not be sustainable tomorrow and vice versa. RIO+20 officially defines sustainable development as composed of the three dimensions that must be pursued simultaneously; economic, social and environmental.

It is in line with this, Mert (2009), opines that sustainable development is a logical extension effort to reproduce development in a form more palatable to both the people being developed and the international level and national level institutions attempting to reconcile semantically economic growth and ecological transformation as part of their development

mission. As further defined by Redcliff (1991) as meeting human needs and maintaining economic growth or conserving natural capital or is about all the three.

Sustainable development in general connotes the effort of mankind to build a durable society that meets the basic needs of man and at the same time observe the serenity of the national environment that helps and support him.

#### **2.1.4 Environmental Sustainability;**

While, the concept of sustainability is increasingly discredited as a useful concept by itself, it appears to be serving some purpose when preceded by a delineating modifier like “ecological” or “agricultural” or “economic.” Efforts have been made by members of various professions to give meaning to the term within the context of those respective and professions (Mitcam, 1995).

Callicott and Mumford, (1997) affirm that “ecological or environmental sustainability” as a useful concept for conservation biologists; In “Ecological Sustainability is a Conservation Concept,” they advance an ecological definition of sustainability that connects human needs and ecosystem services: “that meeting human needs without compromising the health of ecosystems.” They propose this concept as a guiding principle for areas where human activities take place.

While Foy, (1990) states that from an economic standpoint, sustainability requires that current economic activities is not disproportionately burden future generations. That an economy will allocate environmental assets as only part of the value of natural and manmade capital, and their preservation becomes a function of an overall financial analysis. This view is in contrast to the ecologist who will seek to preserve minimum levels of environmental assets in physical terms.

He added that since an ecological approach will better characterise the present situation, it should serve to limit conventional economic reasoning to ensure sustainability. For him economic sustainability should involve analysis to minimise the social costs of meeting standards for protecting environmental assets but not for determining what those standards should be.

On the other hand, McKenzie, (2004) attempts to define social sustainability and concludes that, “a positive condition within communities, and a process within communities, and he identify the following principles to be basic in defining environmental sustainability

- Equity of access to key services
- Equity between generations
- A system of relations valuing disparate cultures
- Political participation of citizens, particularly at a local level
- A sense of community ownership
- A system for transmitting awareness of social sustainability from one
- Mechanisms for a community to fulfill its own needs where possible
- Political advocacy to meet needs that cannot be met by community action.

Redcliff (1991), maintains that poverty reduction is the primary goal of sustainable development, even before environmental quality can be fully addressed. To him “poverty is increasing in the world in spite of global and national economic growth” poverty reduction has to come from qualitative development, from redistribution and sharing from population stability and from community solidarity, rather than from though put growth. When social sustainability has been clarified, possibly it will be linked with environmental sustainability, the whole will contribute into a sustainable development.

Based on the various view points given by scholars above, one will conclude with Butler (2009) who asserts that a common professional goal for environmental managers does exist separate from, though related to, that of the industries that employ them, and that goal is “ecological balance.”

In relation to Butler’s contribution, Malik and Groham (2002) affirms that current actions of interaction with the environment are pursued with the idea of keeping the environment as pristine as naturally possible based on ideal seeking behavior. It is also seen as a responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for a long-term environmental quality.

To this end, environmental sustainability could be defined as a condition of balance, resilience and interconnectedness that allows human society to satisfy its needs while supporting ecosystem to continue to generate the services necessary to meet those needs not by our actions diminishing biological diversity. It is apparent that without a sustainable productive environment to provide resource foundation, it would be difficult or impossible to imagine having sustainable society. Similarly, a sustainable economy depends upon a sustainable flow of material, energy and environmental resources, without it economic system will fail.

### **2.1.5 Importance of Environmental Sustainability**

Since early ages men have been consumers rather than replenishers environmental resources, from hunter-gatherer, societies moved into an area to use up its resources in a season before setting up a camp that gave way to settlements, then eventually villages, towns and cities which would put pressure on the environment (Toman 1992). Sometimes this environmental pressures forced people to make changes by moving somewhere new where the environment

could better sustain them and their practices. The early people of the distant past therefore understand that soil had a maximum fertility that could be exhausted and replenished as well.

It is widely acknowledged that many societies due to inability to adapt to the conditions brought on by these unsustainable practices. Activities such as cutting down trees at once, or even failure to adapt to natural fluctuations in the climate change. Today the world is in the about the potential damage caused by human action and there is urgent need to redress it (Robert, 2007).

By the late 20<sup>th</sup> century, the science of climate change as firmly established, and by 1980s we know about the problem of green house gasses effect and the destruction of the ozone layer and coming very late in the century awareness on fossil fuels and this issues forced experts to make efforts towards renewable methods of power, it was then that we saw the social, economic and scientific birth of environmental movements on sustainable development from state level to international stage (Robert, 2007).

#### **2.1.6 River Basin Development**

The concept of Integrated River Basin Management has its roots in a collective effort to make water use economically productive, socially equitable and environmentally sustainable for all users within the basin (William, 1998). The idea of integrated management of land and water resources or the use of the river basin as the most appropriate management unit is not new but it is only in recent times that it has become an internationally accepted principle.

Akanmu (2006) opines that the concept of River Basin originally referred to as drainage basin, represents an interconnected system of water tributaries that flow towards a single outlet. It combines the natural processes of precipitation, evapotranspiration, surface and ground water runoff with man-made features such as dams and reservoirs and hydro-power projects, diversions

and irrigation schemes, industrial and residential water and environmental and cultural protection services

He adds that in the early part of the last century, the focus was primarily on exploiting and controlling water. By the middle of that century, growing needs and modern technology increased the need for efficient use of water resources. By sixties, questions concerning the impact of hydro-engineering projects on social well-being and environmental protection started to emerge. Along this line, the idea of coordinating water resources development with land and environment in the basin took root (Patrick, 1996).

Herbert, (2008) maintains that with increasing pressure on water resources, the limits of river basins were extended to include surface and sub-surface. In addition, concerns about the potential adverse impact of global warming and the need to restore and protect the ecosystem introduced a new element into defining the river basin concept as integrated water resources management as articulated by the Dublin Principles of 1992. The call for integrated management of water resources was further endorsed in Agenda 21 at the United Nations Conference on Environment and Development at Rio de Janeiro later that year. Also, from the Dublin statement of 1992, the River Basin was affirmed to be the most appropriate geographical unit for planning and management of water resources (Rio +20summit, 1992).

Apart from the aforementioned, there are some other agreements, treaties and policy declarations that give legal recognition to the concept of River Basin as a unit for planning and management of water and environmental resources. Under the new approach to River Basin Management, Integrated River Basin Management thus entails dealing with water management in a more integrated way, moving away from the sector-by-sector approach; looking for sustainable use of water, satisfying the needs of both man and environment and moving

progressively away from the centralized management models in order to adopt increased stakeholder participation. According to Zackster et al (1998) many countries have introduced the concept of River Basin Management because they recognise that this is the best way to effectively and economically protect and restore water quality and quantity.

### **2.1.7 River Basin Development in Nigeria**

Nigeria is situated entirely in the tropics where its climate is semi-arid in the north gradually becoming humid in the south. Annual rainfall varies from over 4,000mm in the south-east to below 250mm in the extreme north-east. It is also highly seasonal with the wet season of July to September (Esho, 1987).

Esho, further maintains that Nigeria is divided into six main Hydrological basins. Geographically, in the far south are low-lying Swamp forests, followed in a northerly direction by generally flat dense rain forests, hilly shrub lands in the middle belt, relatively flat savannah grass-lands, and semi-arid areas in the far north. The central part of the country is marked by crystalline rock outcroppings and gently rolling hills. The average rainfall is about 500 mm/year in the north (occurring April, through September), increasingly to about 3,000 mm/year in the south (occurring March through October).

The country is noted for its two major river systems: the Niger entering from the Northwest, and the Benue entering from the Northeast which together with their many tributaries drains half the land area of the country. The two rivers meet at Lokoja, and then move in a southerly direction into an extensive delta before discharging into the Atlantic Ocean. Other rivers flow directly into the ocean or into Lake Chad.

Many rivers in the north are intermittents, having water in them only in the rainy season, but the majority of the rivers in the south are perennial, flowing all year round, and are important sources of drinking, irrigation and hydroelectric generation purposes (Esho 1987).

The provision of sustainable access to safe and sufficient water sources to meet the cultural, social and economic needs of all Nigerians in a way that will enhance public health, food security, poverty eradication while maintaining the integrity of freshwater ecosystems of the nation is a major objective and goal of water resource management in the Country (ORBRDA, 1981). The vehicle of the nation's integrated water resources management is identified as the River Basin Development Authority (RBDA) contributing optimally to the socio-economic activities of the nation by comprehensively planning, facilitating and creating the enabling environment for integrated conservation, development and management of various water-uses for the preservation of the quality and quantity of freshwater ecosystems.

The organisation of River Basin Development Authority is shouldered with so many activities this includes irrigation, flood control, watershed management, pollution control, fisheries and navigation as well as activities remote from water resources, such as seed multiplication, livestock breeding and food processing. Their remit also covered a number of activities to be shared by state agencies, such as the provision of agricultural extension services and rural electrification. In practice, three bodies are involved in the management of water in Nigeria. (i.e Federal, State water Boards and Local Government water corporations) (RBDA Decree, 87, 1979).

In 1975 when the defunct Federal Ministry of Water Resources was initially created, the responsibility of nationwide river management administration has not been attached to it, but rather fall under the Federal Inland Water Department for Inland Navigation is still responsible

for the management of the Niger and the Benue. Prior to August 1993 when the water Resources Decree 101 was promulgated, there was virtually no single agency that is responsibly for an integrated river management on use and conservation of the water resources and river systems. (FMI, 1982). Currently, in Nigeria we have the following River Basin Development Authorities (RBDAs)

1. Anambra-Imo River Basin Development Authority
2. Benin Owena River Basin Development Authority
3. Chad River Basin Development Authority
4. Cross River Basin Development Authority
5. Hadejia-Jama'are River Basin Development Authority
6. Lower Benue River Basin Development Authority
7. Lower Niger River Basin Development Authority
8. Niger Delta Basin Authority
9. Ogun-Osun River Basin Development Authority
10. Upper Benue River Basin Development Authority
11. Upper Niger River Basin Development Authority
12. Sokoto-Rima River Basin Development Authority

River Basins Development Authorities Act 1979 that establish the River Basins Development Authorities listed under the First Schedule to the Act. 1987 No. 35 1<sup>st</sup> October, 1986. Commencement (FMI, 1982).

### **2.1.8 Functions of the Nigerian River Basin Authorities**

The followings are the functions contain in Decree no 25, of 16<sup>th</sup>, June. 1976. for the purpose of undertaking by the management of River Basin Development Authorities throughout the nation.

- (a) To undertake comprehensive development of both surface and underground water resources for multi-purpose use;
- (b) To provide water from reservoirs and lakes under the control of the Authority for irrigation purposes to farmers and recognised association as well as for urban water supply Authority concerned;
- (c) The control of pollution in rivers, lakes, lagoons, and creeks in Authority's area in accordance with nationally laid standards;
- (d) To resettle persons affected by the works and schemes specified under special resettlement schemes;
- (e) To develop fisheries and improve navigation on the rivers, lakes, reservoirs, lagoons and creeks in the authority's area;
- (f) To undertake the mechanical clearing and cultivation of land for the production of crops and livestock etc.
- (g) To undertake large-scale multiplication of improved seeds, livestock and tree seedlings for distribution to farmers and for a forestation schemes;
- (h) To process crops, livestock products and fish produced by farmers in the authority's area in partnership with state agencies and any other person;
- (i) To assist the state and local governments in the implementation of rural development works (construction of small dams, provision of power for rural electrification schemes,

establishment of grazing reserves, training of staff) in the Authority's areas (FRN official gazette, 1976).

### **2.1.9 The Upper Benue River Basin Development Authority and Dadin-Kowa Dam**

The Upper Benue River Basin and its sister organisation the lower Benue River Basins and Rural Development Authorities, just like other River Basins in the nation were established by the Federal Government of Nigeria to bring development to their host communities through the creation of employment opportunities, augmenting income of rural dwellers and the provision of social amenities through which Dadin-Kowa dam was carved out (FGN, 1976).

The organisations thus, embarked on programs and projects to boost agricultural production through mechanization and the development of water resources potentials to the nation. These functions entail direct agricultural production, construction of dams, dykes, polders, drilling of boreholes for potable water supply and construction of rural roads, bridges as well a means of generating hydro-electric power to the immediate communities towards overcoming the shortage of power in boosting developmental needs of the people around the country. The Dadin-Kowa dam presently through River Basin Development activities had been the source of water supply to the Dadin-Kowa town, its environs and Gombe metropolis in general

### **2.2.0 Background to the Study Area**

#### **2.2.1 Brief History of Yamaltu-Deba LGA**

Yamaltu-Deba local government is located in the south-eastern part of Gombe State. It shares boundaries with Waja and Kaltungo chiefdoms to the south, Akko emirates to the southwest, Malam Sidi emirates to the north in kwami Local Government, and Gombe emirates to the west. The local Government headquarters is Deba, lies within latitude 11.13°, and

longitudes 11.24°, of the equator. The local government has the approximate population as of 2014 census figures to 328,398 while adult population stands at 255,248 thousand people with 1,981 km<sup>2</sup> land mass.

Yamaltu/Deba consists of (11) wards as follows; Deba, Difa-Lubo-Kinafa, Gwani-Shinga, Wade; Hinna; Jagali north; Jagali south; Kanawa, Wajari. Kwadan, Liji, Kurba; Lubo, Kanawa, Wuro birdaka; Kuri, Lano, Lambam; and Zambuk Kwali wards respectively.

### **2.2.2 Geography**

Yamaltu-Deba local government Area has a land area of about 1,981 km<sup>2</sup> square kilometers and situated in the Savannah region of Nigeria. The local Government headquarters is popularly known as Deba.

The climatic conditions of the Local Government like every settlement in the Sudan Savannah belt could be categorised into two seasons namely; the dry and wet seasons. It is important to note that the variations of weather enable people of the area to develop the idea of time that is “*kaka and damina*”, and these successive seasons greatly influenced the socio economic activities of the people of the area (Mohammed, 2002)

These seasons allow Yamaltu-Deba people to engage in wide range of economic activities such as farming, hunting, fishing and animal rearing. As earlier mentioned, Yamaltu-Deba falls under the Sudan Savannah, thus the rainy season in the area varies from place to place, but generally, it lasts for three to four months of July and August as peak rainfall period characterized by continuous rains and thunderstorms while in the dry season, temperature varies as its very high during the days while the relative humidity is low in the months of November to march. The cold season which feature harmattan begins in November and terminates in March (Mohammed, 2002).

### **2.2.3 People**

Yamaltu-Deba Local Government Area consists of different ethnic groups with diverse cultural and religious backgrounds. These are Tera, Bolewa, Waja, Kanuri, Kare-Kare, Fulani e.t.c. The people of the area speak diverse languages which belong to the family of afro-Asiatic and Niger Congo family of languages (Abba, 2000). Tera is the dominant ethnic group at Yamaltu-Deba area and are popularly known as “*Nyimatli*” who according to the tradition the first to settle in the area (Tafida, 1991).

Tera were accorded with the founding of Yamaltu-Deba and Yamaltu emirates. They were also found in Akko, Kwami, and Gombe local government areas of Gombe State and also found in some parts of kwaya kusar in Borno State. The tradition maintains that when they arrived and when asked about their identity they respond “*chem Nyimatli*” which means “we came from Yemen”. At later part the word *Nyimatli* disappeared and replaced by Tera (Tafida, 1991).

### **2.2.4 Economy**

Yamaltu-Deba Local Government is among the richly endowed centers among the local governments in Gombe State. Being one of the biggest in terms of land mass, one of the best fertile soils for agriculture in the state. The type of soil of the local government is black clay suitable for the production of cotton and other agricultural crops (Tiffen, 1976).

Apart from the rich in agriculture, the local government has flat arable land; there are few streams, which are seasonal in nature. Most of these streams dry up during the dry season. Geographically, the area is also traversed by River Gongola which is the largest tributary of the Benue River.

But agriculture remains the prominent occupation for the people of the area. The area is one of the greatest sources of seasonal farm produce in the north eastern Nigeria. Yamaltu-Deba Local Government due to its economic viability particularly on seasonal farm produces; serves as commercial centre in North East Geo-political Zone (Tiffen, 1976)..

### **2.3 Water Supply in Nigeria**

The history of Water supply schemes in Nigerian major cities started in Abeokuta (1911) by the colonial administration with a key role to improved water supply eliminate or control common diseases raising the health level and general welfare of people (Ekpo and Akanmu, 2006). “By 1970, there were 261 urban water supply undertakings. Since then Governments have invested heavily in urban water supply schemes including the reservoir construction and borehole sinking for State capitals.

Akanmu, Eluwa and Ekpo (2006) opine that virtually all the States gave a relatively low priority on water in their rural development efforts, and in many areas, the rural people regards water more in terms of convenience than the health benefits. Many tube wells were sunk in the Northern Region between 1940s and early 1960s without active involvement of the local people; thus, the people were not made to accept to take care of them after the construction. With the establishment of RBDAs in 1976 and DFRRRI in 1986, a new era was opened in the provision of rural water supply, and a great number of boreholes were sunks in various parts of the country. Because of inadequate supply, technical problems and peoples’ ignorance, many of the rural communities served did not derived the maximum benefits.

In 1975 when the defunct Federal Ministry of Water Resources was initially created, the responsibility of nationwide river management administration has not been attached to the said Ministry, while the Federal Inland Water Department for inland navigation (FIWD) is still

responsible for the management of the Niger and the Benue. The said Department was there fore shouldering management of water supply activities in the country prior to 1975 (Ekpo & Akanmu, 2006).

Prior to the construction of Dadin Kowa Dam in Yamaltu Deba, water supply in the area was source through wells like other parts of north-eastern part of the country where by deep wells were used for domestic activities. Although, there exist a slight difference due to the nature of the area that even before the dam was constructed a run off river that flow seasonally aided in boasting agricultural activities in the area for a given period of time. The fertile land of the area coupled with the readiness of the people towards fishing and irrigation added up the productiveness of the land in the local government and the state in general.

### **2.3.1 The Dadin-Kowa Dam**

The Dadin-Kowa Dam is in Yamaltu-Deba Local Government Area of Gombe State in north eastern of Nigeria. The town, of Dadin Kowa which host the dam is located between latitudes 10 to 10° 20' N and longitudes 11 01'E and 11°, 19'E. While the dam is located about 35 kilometers to the east of Gombe town; it provides drinking water for the town. Its construction was completed by the Federal Government in 1984, with the goal of providing irrigation and electricity for the planned Gongola Sugar Plantation Project. The water supply project was built at a cost of about N8.2billion by CGC Nigeria, a Chinese company (Ibeje1, Agunwamba and Okoro, 2013).

In 2010, it was provided about 30,000 cubic meters of treated water to the neighboring villages/towns and Gombe metropolis. In August 2001 the federal government announced that it would spend \$32 million to complete the Dadin-Kowa Dam power generation facilities (Nwezeh, 2001).

Timawus (2010) noted that in March 2009, N7 billion was allocated to complete the hydro-electrical generation component of the dam and another N500 million to complete the canal, which would irrigate 6,600 hectares of farmland. The canal was since then not functional as earmarked as only 100 out of 6,600 hectares was put to use for improved system of dry season farming and fishing in the area.

The climate of Dadin-Kowa is characterised by a dry season of eight months, alternating with a four months rainy season. As in other part of Nigerian Savanna, the precipitation distribution is mainly triggered by a seasonal shift of the Inter-Tropical Convergence Zone (ITCZ). For the years 1977 to 1995, the mean annual precipitation is 835mm and the mean annual temperature is about 26°C, whereas relative humidity for the area has same pattern 94% in August and dropping to less than 10% during the harmattan period (Yamaltu-Deba L.G.A., 1999). The relief of the town ranges between 650m in the western part to 370m in the eastern parts.

### **2.3.2 Storage Capacity of Dadin-Kowa**

The Dam has a reservoir capacity of 2.855 cubic meters\*10<sup>9</sup>m<sup>3</sup>, live storage 1.770\*10<sup>9</sup>m<sup>3</sup> cubic meters, maximum flood level is EL 249 meters (asl) meters, full supply level is EL 247 (asl), minimum supply level is 239 (asl) meters, surface area is 300 square kilometers, made of earth rock-fill embankment, crest length about 520m, maximum height 47m, Ogee Crested Spillway equipped with radial gates and Power house. The H.E.P has a design installed capacity of 34MW, electricity generation output 224.74GWh/annum that can generate revenue about N2.25 billion gross, at N10.00/kwh (Abubakar 2011).

A report by UBRBDA (2011) confirms that the Dam has a potential to irrigate about 25,000 hacters net downstream which can produce about 200,000 tons of grains equivalent twice

a year that can generate about N6 billion gross. Through mechanized fish farming, about 20,000 tons of fish can be harvested annually from the reservoir that can generate about N10b at N500.00 per kg. Presently only 100 hectares is under irrigation, by abstraction of water from the river, due to non completion of the canal for irrigation purpose. Under the Trimming project the contract for the continuation of work on main canal (1.3km) is in appreciable progress

### **2.3.3 Socio-Economic Activities of the Area**

Dam construction is an important engineering measure in dealing with the relationship between water and human being. In the traditional hydraulic engineering, a great deal of dams and dikes were built for the purpose of “harm exception and benefit enrichment” (Qi & Ruan, 2005). Dams have huge economic benefits and social benefits, such as preventing flood and reducing the disaster, adjusting the water quantity, irrigating and generating electricity (Friedle and Wuest, 2002)). However, in dam construction, some disadvantages may be caused to the river basin.

Until the 1970s, large dams were promoted as important means of meeting human needs for water and energy. The World Commission on Dams report (2000) an independent assessment based on case studies from all over the world, has shown that many dams under-performed with respect to intended benefits and delivery of services. Dadin-Kowa dam for instance was constructed to fulfill large socio-economic investments as domestic and industrial water supply, energy production, irrigation and flood control. But unfortunately the reverse is still the case, as the intended irrigated fields by the dam did not even cover 10% completion

Also, the negative environmental and social impacts of large dams were largely unanticipated or under-estimated. Adams (1996) notes that water resources projects such as dams represent large-scale engineering works or activities that can cause significant impacts on socio-

economic components of the environment. The Positive and negative socio-economic impacts of dam construction are very selective both spatially and socially.

The Federal Ministry of Water Resources (FMWR) through, Transforming Irrigation Management (TRIMING Project, 2013) World Bank Assisted project, noted that Dadin Kowa Dam provides constant Supply of Water for Domestic and Industrial or Energy Production and Irrigation Purposes. The dam also should also have to provide a balanced supply of water for all seasons and conditions. Notwithstanding the dam was to some extent of great significance in providing water in the parts of North eastern Nigeria where there is relatively undeveloped surface water, while most of the population lacks access to improved water supply. Lack of access to clean water increases the incidences of diseases making it difficult to achieve the Millennium Development Goals (MDGs).

Dams also provide a constant supply of water for irrigation purposes. Dadin-Kowa dam and other dams in Gombe State such as Cham and Balanga in other part of the State were mainly built to provide irrigation water to the surrounding local Governments within the state. Although Balanga and Cham dams were build purposely for irrigation. Dadin Kowa dam was put in place for many other benefits some of which includes rural electrification, navigation, modern irrigation and fishing to mention but a few.

So also the benefit of irrigation in stable yields, Dadin Kowa dam since its construction ensures a long growing season that permits several crops per year and make irrigation economically feasible. The area that was known to suffer shortage of rainfall and drought was completely changed due to improved agricultural activities recorded after Dadin Kowa dam was constructed. This was done possible by supplementing dry season cropping to provide food security in grain deficient areas. Irrigation development is of great significance in the face of

climate change and the associated increased frequencies of extreme climatic events. Droughts have over time exerted a heavy toll on the inhabitants and the economy of North Eastern Nigeria which are largely depended on agricultural production.

A report by FMWRRD (1993), affirms that Dadin-Kowa dam also provide a constant supply of water for livestock which is important in the face of increased incidences of droughts, lack of access to this vital resource in north eastern Nigeria and the country at large led to the constant clash in the country between Fulani herdsmen and farmers during herders migration in search of water and grazing fields for their animals and eventually lives and properties lost during these frequent clashes. In addition droughts result in the death of livestock thereby devastating the fragile economy of the country.

To Abubakar, (2011) Creation of employment and other income generating activities to people living in the area is another important factor provided by the dam. Dadin-Kowa dam construction results in employment generation. People of the area employed during the construction of the dam some as laborers that handle menial jobs while others as management staff. Furthermore, labor needs during dam construction can lead to a population influx resulting in local villagers having an expanded market for their agricultural products.

Other sources of employment within the dam area are irrigated agriculture. Dadin-Kowa area is one of the greatest sources of seasonal farm produce in the north eastern Nigeria. The area remain till date the largest market for vegetables and gracious that attracted people and business men from all over Nigeria (UBRBDA, 2014) Fishing, recreation and tourism had also been enhanced by dam construction thereby creating employment and income.

While the environmental impacts of dams can be classified according to different criterions as long term and short term impacts, as well as social factors due to the mixed up of

foreigners with the locals may be harmful to them .These may be classified as an intensive and complicated manner like climatic, hydraulic, biological, social, cultural, archaeological etc.

Dadin-Kowa dam construction result in the destruction of natural habitats. Crane, (2009), maintains that the shift from river to Lake Environment can result in the reduction of species diversity. The dam activities in the area lead to the loss of rare flora and fauna species. Impoundments of this dam lead to decreased woodland thereby adversely affecting wildlife communities. This leads to decreased hunting and associated uses as well as attractiveness of an area to recreationists. According reports due to the influx of people after the construction of the dam huge forest reserve that was initially left as forest reserve was sold by local officials and greedy politicians. The land area from *Baure* village down to *Dutsen Kura* in Dadin-Kowa town that covers about 8-10 kilometers was now used as farmlands and the result is increase incidence of flood every year to the area and other unpleasant catastrophes.

Resettlement Planning Framework (2013) ensures that resettlement of the population displaced by Dadin Kowa dam in Yamaltu Deba during its construction has been an issue for long as many people find themselves in a serious problem leaving their own land to relocate in another. A report by these bodies Resettlement Policy Framework, and Resettlement Planning Framework of (RPF, UBRBDA, 1982) further, noted that Dadin-Kowa dam in the Yamaltu-Deba displaced close to 27,500 people from 82 settlements in the area. This led huge economic and human costs. The financial costs of resettlement include surveying people and property, compensation or rebuilding of settlements and infrastructure and the actual translocation. There is also the human cost of the stress caused by uprooting of inhabitants from their land (RPF, UBRBDA, 1982).

Spread of Diseases, Large dam projects often lead to the spread of schistosomiasis and other communicable diseases devastating water-borne diseases are introduced by reservoirs and their associated irrigation works. Furthermore, scholars argue that dams have reduced the quality of drinking water for hundreds of millions of people. Crane, (2009) states that when large new volumes of water are created, the risk of disease in tropical areas rises sharply.

In Dadin Kowa dam for instance there exist many cases of black flies that cause night blindness, mosquitoes and other deadly vectors of diseases; this was as a result of dam construction. The final report on Environmental and Social Management Framework (ESMF, 2013) on Dadin-Kowa dam stated that disease transmission such as (HIV Aids, STDs) to communities along the route from construction workers became the order of the day. So also diseases associated with dams such as schistosomiasis, yellow fever, malaria, river blindness and liver fluke infections etc become common in the area. The report further reveals that although water-borne diseases are widespread in African floodplains, dam construction can increase its prevalence.

Adams (1999), submitted that water resource development projects create additional habitats for disease vectors beyond those already present. Water-borne diseases lead to debilitation and vulnerability to other diseases. This results in working hours being lost due to illness and medical costs increasing. He added that various kinds of unpleasant pollutants came along during the construction activities. From noise to visual pollution coming out from the construction side and have harmful effects to immediate surroundings. All this negative outcomes will cause serious environmental damage to man.

Noise is generated at the impoundment construction site of Dadin-Kowa and environs during the construction phase. Environmental Impact Assessment (EIA, 2010) gave noise level

measurement in the Dadin-Kowa dam area which varies between 41.0dB and 42.3dB for wet season and 41.0 dB and 53.2 dB for dry season. Noise can be defined as objectionable or unwanted sound. Complaints of noise nuisance generally arise when a noise interferes with work, communication, recreation or sleep.

Damming can also adversely affect the visual quality of an area. Furthermore, it can result in the water resource producing a bad odor. This reduces the attractiveness of the area to recreationists (EIA, 2010). Preservationists argue that free-flowing rivers should be left intact in order to avoid spoiling the beauty of the landscape.

The report of (EIA, 2010) on Dadin-Kowa Hydroelectric generation noted that during the dam construction phase there were social conflict between the local villagers and some dam construction workers that maybe foreign. Foreign construction workers constantly disregard and disrespect local culture and authority of inhabitants and this result into constant chaos between the two set of people. So also people displaced by Dadin-Kowa dam construction that were moved to land claimed by others. Friction had often occurred in the process, arising from the resentment felt by the original owners of the land towards the newcomers who have been foisted on them. The resettled people are also angry over having had to leave their old lands.

Friedl and Wuest, (2002), maintain that a dam can be a barrier leading to the disruption of transport and communication. This results from the replacement of a relatively narrow river by a wide dam. Occurrence of drowning the occurrence of drowning may increase due to dam construction. People may drown while fishing or swimming. According to reports by the locals, there had been cases of fishers and farmers drowning during fishing in the Dadin Kowa Dam this was due to the increase body of water after the construction that they were not used to before.

In conclusion, although Dadin-Kowa dam and other dams in Gombe State and beyond serve as a remedy to problems of water shortages in Northeastern Nigeria and Gombe State in particular. It is important to note that other issues in the discuss are also very vital to the environment and people who are directly affected by the dam activities from the beginning, one of which is resettlement policies by referring to above mentioned explanation which partially includes the problems of these policies. Especially in developing countries like Nigeria that may be in dire need of hydroelectric power and big irrigation projects, and great dams are many times seen as an answer to these needs.

However, resettlement had been an inescapable phenomenon during the process of development. The main problem at this point is to find out the ways by which, the resettlement planned reduced the problems caused by the project towards decreasing it to minimum and the meets of the peopled who are dislocated met at a maximum level. As a result, all the problems that are caused by the project had the possible solutions which most of them should be clarified in the planning phase of the project but some neglected, with the participation of the local communities that had been affected.

Consequently, the result of the executed plans should be frequently revisited as new issues arose day after day that might need urgent attention, and when identified there are need to be revised and managed by institutions concern with the effected communities on regular basis. This is because of the effects as well as benefits referred above. The discussions on the dams' functionality are raised, and many people are advocating for the dams while a considerable numbers are opposed to some the construction of any more great dams, in the 21st century.

The main point of these discussions is one question: "Are great dams sustainable?" That's the crucial question because, despite the invested billions of naira to dam projects, (i.e.

like Dadin-Kowa dam) cost of these dams has been even bigger. Especially the costs that are paid because of the environmental effects of dams (increasing humidity, the destruction of flora and fauna diversity etc.) and the need to resettle the local communities put the sustainability issue into question and forced people to find what to be done to make them sustainable.

On the contrary, it is essential to consider their benefits too. National and international institutional mechanisms must appreciate the potential effects of new technology before they start to be used generally; it must be guaranteed that production, usage and recommendation of these won't destroy the environmental resources. The same necessities are true for the interventions to natural systems." Dams in general big or small are given as examples to the possible types of interventions to natural systems and the rise on the responsibility awareness is defended, about the damages caused by unwanted results of projects for development.

Finally, while many have benefited from the services which the Dadin-Kowa Dam provides, its construction and operation have also had adverse societal and environmental consequences. The adverse effects on populations include displacement of families, host communities where families are resettled, especially those downstream of the dam, whose livelihood and access to resources are affected in varying degrees by altered river flows and ecosystem fragmentation, and even those in the upstream due to growing body of water that causes serious floods in their area.

Practically, Dadin Kowa town was known to been hit by series floods due the overflow of the dam every year. For instance this year 2017, alone this catastrophe succeeded in destroying more than 250 houses in addition many lives were lost inside Dadin Kowa town alone in this raining season. Other important things lost to the flood include farm animals' crops and livestock etc.

To manage reoccurrence of such catastrophe it does not just mean simply consulting the tables and making comparisons, or applying mathematical formulae towards overcoming the adverse socio environmental problems. The risky zones are defined at the course of our discussion, and then must be explicitly treated in terms of activities, which include obtaining opinions of the populations, and recording infrastructures in the major river bed. This is to contribute in order to develop the ways and means for the protection of this zone against flooding and other unpleasant consequences of socio economic sustainance. While the results will allow the population to better organize their activities in terms of seasonal agricultural work for better outcome. It will also help decision-makers and different actors, to manage the future of this highly important valley for the development of the area and the country at large. But till today nothing concrete was done apart from the normal routine by politicians of giving empty pledges on doing something to ease the tension but nothing is on place yet to show.

#### **2.4 Empirical Literature Review**

Mudzengi (2012) conducted a research on the "Assessment of the Socio-Economic Impacts of the Construction of Siya Dam in the Mazungunye Area: Bikita District of Zimbabwe". He drew his data from administering questionnaire to 350 respondents living within the dam area as well interviews to the dam officials and traditional leaders of the clans in the area. The findings revealed that the Dam can be useful for irrigation viable in the face of climate change. Fish resources from the dam can also be used to augment dietary protein requirements thereby improving community health and contributing to the achievement of Millennium Development Goals.

Salami and Sule (2010) studied "The Reservoir Operational Impact of Kainji, Jebba and Shiroro Dams on the Environment" using survey method. They administered 440

questionnaires to the locals while oral interviews were conducted on the major stakeholders in the area to solicit answers on the environmental damages caused by the dams in the area as a result of flooding. The findings revealed that year round floods have caused damages and untold hardships to lives and property of the people in the area. The occurrence of flood has great effect on communities and farming activities downstream. For instance flooding experienced at the sugarcane, rice plantations and communities downstream of the dams is caused when the reservoirs of both Kainji and Jebba dams were full due to excessive runoff from the catchment areas of the river. The only alternative left to protect the dams from collapse is to discharge more water to the downstream areas.

Other empirical studies conducted particularly on the Dadin Kowa Dam includes Ishiyaku (2014) who conducted research on "The Assessment of Potential Values on Dadin Kowa Dam as a Tourist Site in Yamaltu Deba Local Government Area, Gombe State". Using survey method an oral interview was carried out on the major stakeholders in both the Local Government Area and State levels as well as the officials of Upper Benue River Basin Development Authorities. The findings revealed that, Tourism in Dadin Kowa Dam will boost income for the authority.

Shehu (2015) studied "The Role of Upper Benue River Basin Development Authority in Irrigation Farming in Dadin Kowa Dam, Yamaltu Deba Local Government Area, Gombe State". Data were generated using structured and unstructured questionnaires administered to 430 respondents in Dadin Kowa, Hinna and the environs who are the direct beneficiaries of the dam. Interviews were also conducted on the major stakeholders to solicit valuable information on the activities of the dam particularly in respect to irrigation or dry season farming. The findings revealed that Dadin-Kowa Dam provides a constant water supply for irrigation purposes.

The empirical studies here helped us to understand some of the various literature available on dam studies as it relates to the impacts of Dadin kowa Dam on the people of the area and Yamaltu Deba Local Government in general.

## 2.5 Gap in the Literature

Successive research works on dams particularly on sub saharan Africa (Dadin Kowa dam inclusive) virtually dwells on the impact assessment of dam towards modern irrigation with agricultural extension services ( ie, Mudzengi (2012) conducted a research on the "Assessment of the Socio-Economic Impacts of the Construction of Siya Dam in the Mazungunye Area: Bikita District of Zimbabwe". and Shehu (2015) studied "The Role of Upper Benue River Basin Development Authority in Irrigation Farming in Dadin Kowa Dam, Yamaltu Deba Local Government Area, Gombe State". and Ishiyaku (2014) who conducted research on "The Assessment of Potential Values on Dadin Kowa Dam as a Tourist Site in Yamaltu Deba Local Government Area, Gombe State". )

Other writings look into the way through which the dams solve the problem of hydroelectric generation and portable water for domestic use, ( ie, Salami and Sule (2010) studied "The Reservoir Operational Impact of Kainji, Jebba and Shiroro Dams on the Environment") leaving behind other important areas untouched. However, there was no attempt on the socio economic sustenance of Dadin Kowa Dam. Hence this study filled this gap.

## 2.6 THEORETICAL FRAMEWORK

For the purpose of this research Ecological Modernisation appears to be a fundamental theory as postulated by Joseph Huber (1982) and Martin Janicke (1985) to come up with valid and acceptable data under study.

The perspective of Ecological Modernisation was said to offer a constructive approach to deal with environmental and developmental problems, with a central role assigned to science and technology (Mol and Spaargaren, 1993). The concept was developed in the 1980s through the work of the German social scientists Joseph Huber (1982) and Martin Janicke (1985). The basic argument is that the central institutions of modern society can be transformed in order to avoid ecological crisis. Huber (1982), for example, has argued the need for an “ecological switchover” a transition of industrial society towards an ecologically rational organisation of production, based upon the theory of a changed relationship between the economy and ecology.

Ecological modernisation has a vital relation with “strong” versions of sustainability with envisages a process of the progressive development of the institutions of modern society, as opposed to their destruction or dismantlement (Mol and Spaargaren, 1993). Ecological modernisation proposes that structural change must occur at the macro-economic level through broad sectoral shifts in the economy and at the micro-economic level, through the use of new and clean technologies by individual firms Gouldson and Murphy (1997). Both Hajer (1995) and Harvey (1996) link ecological modernisation and sustainable development together such that the latter is the “central story line” of the policy discourse of ecological modernisation. However, Ecological Modernisation has much more analytical rigors than sustainable development and ‘has a much sharper focus than does sustainable development on exactly what needs to be done with the capitalist political economy, especially within the confines of the developed nation state’ (Dryzek, 1997:143).

As a framework, the concept of Ecological Modernisation can be used at two levels. First, it can be used as a theoretical concept to analyse those changes to the central institutions in modern society deemed necessary to solve the ecological crisis. Second, Ecological

Modernisation is used to describe a more pragmatic political programme to redirect environmental policymaking. In the sense of the first meaning, ecological modernisation stands for a socio-economic transformation, or “ecological switch”, of the industrialisation process into a direction that takes account of the need to maintain the sustenance base. As with sustainable development, Ecological Modernisation indicates the possibility of overcoming environmental crises without leaving the path of development (Mol and Spaargaren, 1993). The processes of production and consumption can be restructured on ecological terms through the institutionalisation of ecological aims (Mol, 1994).

### **2.6.1 Relevance of the Theory to the Study**

In analysing the data for this study, ecological theory provides for improving the quality of life of a people in full respect of the life and prosperity of such environment that house man. It advocates rationality to ecological factors Vis a vie scientific and technological development. River Basin Development and Dam construction are components of modernisation. Dams are sources of portable water as well as for agricultural production. They provides source of livelihood to the people they serve.

Dams are science and technology based projects that require impact assessment measures to prevent a circumventing effect on environment. Capital infrastructural projects such as Dams, constructed on lands for the benefit of people may have a corresponding catastrophic result on such land and its ecology. Apart from ecological problems that may result from Dams and River Basins, long term negative, psychological and environmental problems such as flooding, contamination, chemicalisation and acidity can occur.

Dadin Kowa Dam however, was constructed for the purpose of solving problems of portable water for domestic purposes, modern irrigation farming, agricultural extension services

and to address ground water shortage to the people of the area as well hydro-electricity generation to the state and its immediate neighbours . Ecological Modernisation theory, therefore, presupposes the construction of Dadin-Kowa dam for the soul purpose of which it is meant in consideration of all possible dangers that may result on the environment.

The theory, while in support of the modernisation drive for the construction of the dam, it correspondingly advocated for rational concern to the environment on which the dam is constructed. The dam should be design in such a way that it will effectively improve the socio-economic life of the people at the same time sustain the environment for future generation. Irrigation agriculture benefits should be achieve in retention of soil content and fertility, fish farming should flourish without fish extinct, hydro-electric generation should flourish without pollution and portable water without spill.

### **2.6.2 Limitations of the Theory**

Despite its strengths, Ecological Modernisation posses' different number of shortcomings and weakness with scholars provide a constructive criticism on it. The theory gave little or no attempt to address issues of equity or democratic participation, which are central to sustainable development. It is also weak on the potential for policy integration. Thus ecological modernisation has little to say about the form of institutional adaptation or change required to inaugurate sustainable development. Work on ecological modernisation also has relatively little to say about barriers to implementing ecological modernisation, other than seeing it s “state failure”, whereby ‘policy becomes “locked-in” to a reactive and standardised approach even though more proactive policies are available and might offer economic and environmental advantages (Gouldson and Murphy, 1997, 80).

Ecological Modernisation is too mechanical in nature and also falls short of sublimating the “enabling state” as the institutional response that will secure the efficient functioning of the market economy within a framework of state regulation (Blowers, 1997). This enabling state will deliver ecological modernisation through corporatist relationships between government and industry, although co-opting environmental movements where necessary, thus ignoring issues of participation and reducing the rest of society to passive consumers to be provided with enough information to make informed (but market-based) choices.

Indeed, ecological modernisation largely ignores the major institutional changes needed, despite being based on the notion that the necessary changes to institutions can be made (Christoff, 1996). Another important criticism of ecological modernisation from a theoretical approach is therefore that it fails to take account of the social processes at work, such that it relies upon a narrow technocratic and instrumental approach rather than being integrative and communicative. This approach will not lead to the type of embedded cultural transformations that will sustain factors such as environmental improvements, reduced consumption and greater equity.

In other words, the technocratic and instrumental components of the transformation process may spawn new beneficial changes, the neglect of the cultural dimensions that can sustain this transformation means that the long term sustainability of the transformation may not be certain.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.0 Introduction**

This chapter contains the Methodology of the study

#### **3.1 Research Methodology**

Data used for this study were obtained from two broad sources. That is the primary and secondary sources. The secondary data was collected from academic books, annual reports of the upper Benue river basin development authority, reports from ministry of Water Resources, and of course Ministry of Environment, Federal Governments Reports on water supply in Nigeria, journals, magazines, news papers periodicals and articles/undergraduate studies on dams from Department of Water Resources ABU Zaria, Kashim Ibrahim Library (KIL) and of course postgraduate library, others includes unpublished thesis and dissertations, the reviews of internet sources and office of Gombe state Beureau of Statistics and independent electoral commission (INEC) .

The primary sources collected through the following survey instruments;

- (a) Structured and unstructured questionnaire,
- (b) In-depth interviews (IDI) and
- (c) Personal observation.

#### **3.2 Research Design**

Descriptive Survey Method is employed. Survey research involves collecting information from a selected part of a larger population in order to draw inferences about the larger population due to the impossibility of studying the entire population. Survey research here, enable us generate information about the opinions, attitudes, and actions of people that are residing within

the area under study particularly farmers, fishermen and the dam officials. This made us to understand the nature of activities of farmers, the fishermen and the interconnectedness with the dam officials in the activities of the dam.

The choice of survey research is due to its suitability in unraveling events in descriptive research. Furthermore, it will bring the researcher into close contact with the observable phenomenon. Survey research also allows thorough and deep study of a situation studied which may eventually leads to uncovering loopholes buried within and may prompt applied research towards overcoming the menace if identified. Surveys enable reliability and validity due to the thoroughness of the process and provides avenue for quantification and measurement.

### **3.3 Sources and instruments of Data collection**

A total of 391 questionnaires were administered within three selected wards. Since the wards differ in size and population, each ward got share of questionnaires based on its population. Ward one (1) (Hinna Dadin Kowa ward) with the estimated population of 22445 got 180 questionnaires, then ward two (2) (Gwani, Shinga, Wade ward) with total estimated population of 16596 got 133 questionnaires, the last ward three (3) (Difa, Lubo, Kinafa ward) with estimated population of 9724 got 78 questionnaires respectively.

An in-depth interview was also conducted to the three set of stakeholders in order to have valid and accurate information from them. Among the dam officials three important officers were selected and interviewed separately, they were the Area manager in charge of Dadin Kowa dam who is also responsible for the day to day activities of the dam and also answerable to the head office of Upper Benue River Basin Development Authority at Yola Adamawa State. The second person interviewed was the Engineering officer who is head of all operations of the Dadin-Kowa dam in the hierarchy of the dam officials. The third person interviewed was a

sectional head of Irrigation who is responsible of overseeing issues concerning canal building, its maintenance and development and anything that has to do with irrigation or dry season farming.

The second category of the interviewees interviewed were the traditional rulers among them The Emir of Yamaltu Deba who was interviewed in Dadin-Kowa town, the second person interviewed was the District Head of Kinafa which was among the hard hit areas during resettlement process as the whole village was submerged by body of water during the dam construction. The third person interviewed was of the representatives of Gwani District head in Gwani west whom his village was forcefully divided as a result of construction of the dam into two distinct villages presently known as Gwani east and Gwani west.

The last set of stakeholders interviewed during the exercise was the Director of Environment, Ministry of Environment and forestry development who is overseeing the Environmental Impact Assessment (EIA) of Dadin-Kowa electrification, the issue of resettlement policy framework (RPF) issues and many other important functions of the Dadin Kowa dam operation dam. Finally, the Director of Water Resources of the Ministry of Water Resources, who is in charge of overseeing all dams in Gombe State.

Personal observations (Non participant observation) this covers generally incidence happened during the field work e.g the reactions of the locals about the activities of the dam and of course the traditional rulers whose villages were submerged by the dam building and are expecting compensation from government but nothing was on ground apart from frustration and constant clashes between them and their neighbors. Another important thing observed was the nature of increase productiveness or otherwise as a result of utilising the dam by the locals.

### **3.4 Target Population**

The target population includes all adult male and female inhabitants within the three electoral ward which constitutes the general public (ie farmers and fisher men) in Yamaltu Deba local Government area of Gombe State living nearby bank of the Dadin-Kowa dam Yamaltu-Deba Local Government Area, Gombe State, which formed the first category of the respondents while the second category of respondents was the administrative staffs of the dam as well as officials from ministries of water resources and environment in charge of irrigation farming, fishery and environment. Among the administrative staff of the dam are the Area manager and two others were interviewed. While Directors in charge dam activities from ministry of water resources and of environment were also part of respondents. In addition to three traditional rulers were selected in all the wards during the exercise to complete the respondents in this category (i.e. one traditional ruler from each of the three wards).

### **3.5 Area of Study**

The sample area under study is Yamaltu-Deba Local Government Area, Gombe State with particular reference to the chosen electoral wards and villages thus; Hinna Dadin-Kowa ward, Gwani Shinga, Wade ward and Difa, Lubo, Kinafa ward. Yamaltu-Deba has eleven electoral wards in all, using quota sampling technique; which specify that for a respondent to be included in a given research he must first of all posses a needed characteristics which are (ie age, gender, occupation, class, or more importantly residence within the area) and how many of them may likely know about or have an insight and experience of the issue discussed.

These three wards were selected considering their proximity to the Dam under study as they possess needed characteristics for the study as mentioned above. This was for instance Kinafa Village was completely submerged by the dam whereas Gwani village was divided as

presently known as Gwani west and Gwani east while Dadin Kowa town experienced reoccurrence of flood each year as the result of the overflow of the dam.

### **3.6 Population and Sampling Size of the Study**

Population sampling techniques is a kind of statistical processes of selecting a subset known as a “Sample” of a given population of interest for the purpose of making observations and statistical inference about that population (Bhattacharje, 2012).

Dadin-Kowa dam and environs being the study area and which located 35 kilometers from Gombe town and 5 kilometers northern part of the village where the main reservoir is located as well as the communities affected along the line which are the three electoral wards of (Hinna Dadin-Kowa ward, Gwani Shinga, Wade ward and Difa, Lubo, Kinafa ward) with the approximate adult population according to Gombe state bureau of statistics (GSBS) and independent electoral commission (INEC) figures to 328,398 with adult population of 255,248 thousand people in 2014 population projection with 1,981 km<sup>2</sup> land mass as well as 48765 inhabitants within the three electoral wards.

The sample size of this study is 391, which is considered to be a representative sampling of the adult population of this study. This sample is considered to be representatives of the total population in the three selected electoral wards. The sample was derived using Morgan and Krejcie formula of determining proportional representation of sample size, with margin error of 5.0% and 95% confidence level (sample size table, 2006). This was in conformity to the Krejcie and Morgan in their 1970 article “Determining Sample Size for Research Activities” which stated that the sample of 381, can represent the total population of 45,000 to 50,000 (Krejcie and Morgan, 1970)

For the purpose of this study therefore, the sample size of “391” were selected representing total of “48765” thousand people from which the combination of the inhabitants both farmers/fishermen and those living within the dam bank (ie general public) was randomly selected and interviewed during the exercise to enrich the work. Other important stake holders interviewed were from Ministry of Water Resources and Ministry of Environment and Forestry, Upper Benue River Basin Development Authority Dadin Kowa and Senior Traditional Rulers from the area were interviewed. This activity was conducted by the researcher and it has contain various questions with regards to their post in relation to the topic under study, in all the a total of 391+8 questionnaires as well as the interview papers were distributed to the respondents during the exercise (ie 391 questionnaires and 8 interview questions).

Below is the distribution of of three (3) selected wards and their number of responded selected as according to their population

Ward 1 (Hinna Dadin-Kowa ward) = 22445 people

Ward 2 (Gwani Shinga, Wade ward) = 16596 people

Ward 3 (Difa, Lubo, Kinafa ward) = 9724 people

Total population of the three wards = 48765

**Ward Sample Population** =  $\frac{\text{Ward Population} \times \text{Sample Size}}{\text{Total Population}}$

Ward 1 =  $\frac{22445 \times 391}{48765} = 180$  (Respondents for ward 1)

Ward 2 =  $\frac{16596 \times 391}{48765} = 133$  (Respondents for ward 2)

Ward 3 =  $\frac{9724 \times 391}{48765} = 78$  (Respondents for ward 3)

### **3.7 Method of Data Presentation and Analysis**

Data were presented and analysed through tabular form using statistical packages for social sciences research (SPSS) which was inform of transferring data from the instrument of data collection so as to arrange in tabular form. It was further analysed through the use of qualitative and quantitative means of analysis to summarise the result of the responses given at the period of study. Thus, through quantitative method of simple percentage and frequency distribution table summary of the information generated from the field was analysed as well as the interview.

## CHAPTER FOUR

### DATA PRESENTATION AND ANALYSIS

#### 4.1 Introduction

This chapter presents the statistical analysis of the findings on the impact of Dadin-Kowa on the socio-economic development and environmental sustainability of Yamaltu-Deba Local Government Area, Gombe State (1982-2012). Assessments were presented along the research questions. Each of the item and variables in the respective sections are analyzed with percentage and mean scores. Decisions on each of the items and variables were based on agreement signified by the magnitude of the score. The discussions of findings from the analysed data were presented in the last two sections of the chapter. Summary of major findings was also included.

**Table4.1 Gender**

Respondent	Frequency	Percent	Valid Percent	Cumulative Percent
Male	304	79.8	79.8	79.8
female	77	20.2	20.2	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

The table shows that 304 respondents, representing (79.8%) of the respondents are males while 77 respondents, representing (20.2%) of the respondents are females. This implies that majority of the respondents to this research work are males. The reason why males dominated the responded was due to culture and religious restrictions on participation of women in reach of this nature.

**Table 4.2 Occupation of the Respondents**

Respondent	Frequency	Percent	Valid Percent	Cumulative Percent
Farmer	240	63.0	63.0	63.0
Fisherman	130	34.1	34.1	97.1
Civil servant	11	2.9	2.9	100.0
Total	381	100.0	100.0	

**Source: Field work, 2017**

Table 2 shows that 240 respondents, representing (63.0%) of the respondent are farmers and 130 with make a total of (34.1%) of the respondent are fishermen while 11 respondents, representing (2.9%) of the respondent are civil servants. This implies that majority of the respondents occupation are farmers in the study area. This is due to the nature of people that were directly affected by the activities of the dam are farmers.

**Table 4.3 Level of Education of Respondents**

	Frequency	Percent	Valid Percent	Cumulative Percent
No formal Education	165	43.3	43.3	46.2
Only Primary school	139	36.5	36.5	82.7
up to Secondary school only	66	17.3	17.3	97.1
tertiary education	11	2.9	2.9	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

From the table above 165 respondents, representing (43.3%) of the respondents believed that, they do not have formal education and 139 respondents, representing (36.5%) of the respondent said they attended primary school education while 66 respondents, representing (17.3%) of the respondent attended secondary school and above education. This implies that majority of the respondent's level of education lack formal education.

**Table 4.4 The length of time respondent have been farming and fishing or farming in Dadin-Kowa dam**

Respondent	Frequency	Percent	Valid Percent	Cumulative Percent
1-10years	164	43.0	43.0	43.0
10-20years	107	28.1	28.1	71.1
20years and above	110	28.9	28.9	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

The table shows that 164 respondents, representing (43.0%) of the respondents said 1-10years and 107 respondents, representing (28.1%) of the respondents said 10-20years while 110 respondents, representing (28.9%) of the respondents said 20years and above. This implies that majority of respondents have been fishing or farming in Dadin-Kowa dam between 1-10years.

**Table 4.5 Responses on various ways respondents benefited from the construction of Dadin-Kowa dam**

Respondent	Frequency	Percent	Valid Percent	Cumulative Percent
Farming	154	40.4	40.4	63.0
Fishing	141	37.0	37.0	40.4
Drinking water	86	22.6	22.6	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

Table 5 shows that 154 respondents, representing (40.4%) of the respondents said they benefited from dry season farming, and 141 respondents, representing (37.0%) of the respondents said they benefited from fishing activities, while 86 respondents, representing (22.6%) of the respondents said their benefit is drinking water. This implies that majority of respondents benefited from the construction of Dadin-Kowa dam in terms of dry season farming and fishing than drinking water in the area.

A respondent during the interview attested to the fact that construction of Dadin Kowa Dam has immensely benefited the people of the area in ways mentioned by most of them. Some

of the areas of benefit include irrigation farming, improvement in fishing activities and provision of portable water supply, (Interview, Dec 13, 2017)

In an interview with a respondent at Dadin Kowa Dam, he explained that the construction of the dam has greatly contributed to the area in terms of employment opportunities. In terms of working in the Dam office and improving economic activities of the local farmer. (Interview, Dec 9, 2017)

While, in his view another respondent who was one time senior staff of Hadejja Jama'are River Basin Authority lamented that the Dam is on the verge of becoming a failure given the fact that its initial installed capacity and what is on ground presently and how it negatively impacted his people upstream with no help from authorities concern which it was meant to serve. He confessed that the Dam was meant to cover 26 thousand acres of dry season farming through canal building but unfortunately less than 200 hectares were presently put to use. This was due to poor funding, unqualified staffing and mismanagement. (Interview, Dec 17, 2017)

Generally, most of the respondent are of the view that the dam despite shortcomings it equally benefitted them in improving their farming output as a result of its construction, while few lamented due to negative environmental factors of flooding and diseases.

**Table 4.6 Responses on improves recorded in harvest output yearly utilising Dadin Kowa dam**

Respondent	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	283	74.3	74.3	74.3
No	98	25.7	25.7	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

The table shows that 283 respondents, representing (74.3%) of the respondents said the construction of Dadin-Kowa dam has helped them in improving their harvest while 98 respondents, representing (25.7%) of the respondents said it does not improve them. This implies

that majority of the respondents have since the construction of Dadin-Kowa dam benefitted. They harvested their farm lands despite shortcomings in Yamaltu local government of area of Gombe state.

This is in tandem with the views of a respondent who in an interview maintained that due to the increase in irrigation water supply annually by the Dam, the harvest of the local people in the area has greatly increased. He added that “the Dadin Kowa dam construction increases the level of ground water recharge not within the Dadin Kowa area alone but a vast area within the state as boreholes were sunk to serve people” (Interview, Dec 18, 2017)

A respondent also attested to the fact that though, the Dam did not meet its initial requirement of providing for 26,000 hectares of irrigated agriculture, but had surely has increased the productiveness of the area and provision of portable water supply. Fishing activities had also increased significantly. In another view a respondent from Dadin Kowa dam and the sectional head of irrigation in Dadin Kowa dam maintains that despite shortcomings the dam made possible a good improvement in dry season farming and improved system of navigation to the people of Yamaltu Deba Local Government in Gombe state. (Interview, Dec 9, 2017)

**Table 4.7 Beneficiaries of Dadin Kowa Dam**

		Frequency	Percent	Valid Percent	Cumulative Percent
	The dam makes irrigation activities easier	217	57.0	57.0	57.0
	The dam helps increases portable water supply in the state	22	5.8	5.8	94.2
	The dam helps increases fishing activities in the area	142	37.3	37.3	100.0
	Total	381	100.0	100.0	

Source: Field Work, 2017

Two third of the respondents 217 respondents, representing (57.0%) affirmed that, there are increase dry season farming and 142 respondents, representing (37.3%) of the respondent believed that, it has increased fishing activities in the area while 22 respondents, representing (5.8%) of the respondent say that, the dam provides portable water supply in the area.

Two personalities among the respondents highlighted increase in water supply by the Dam, improve irrigation techniques, irrigation extension services, improve navigation and fishing business as the results of Dadin Kowa dam construction. (Interview, on 9 Dec and 13 Dec 2017)

**Table 4.8 The table below contains the responses on ecological problems that came along with the construction of Dadin Kowa Dam**

	Frequency	Percent	Valid Percent	Cumulative Percent
The dam is a failure	11	2.9	2.9	2.9
The dam causes flood	239	62.7	62.7	65.6
The dam occupied Spans of land	99	26.0	26.0	91.6
The dam has no benefit at all	32	8.4	8.4	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

Majority of the respondent said that it causes flood. 239 respondents, representing (62.7%) and 99 respondents, representing 26.0% of the respondents said it occupied spans of land, while 32 respondents, representing 8.4% believed that no benefit is accorded from the construction of Dadin-Kowa dam, and 11 respondents, representing (2.9%) believes that Dadin Kowa dam was a failure.

In the same vein, a respondent during an indepth interview maintained that the dam did not benefit the people to his district especially, the result of constant flood which lead to divide the people into two district who once very close to each other (Interview, Dec 17, 2017). So also

one of the respondent reiterated that the dam was a curse to his people as his village was completely submerged by the dam and for that they had to resettle to another area and as a result conflict erupt between them and their host community. He added that “till date no individual from government come to their rescue apart from empty promises they were gotten when ever they meets politicians” (Interview, Dec 17, 2017).

Similarly, another respondent in an in-depth interview maintains that the dam activity was catastrophic to the villages as a result of constant flood during rainy season as well as dust and noise pollution which brought different kind of diseases particularly during wet seasons. He added that the incident of black fly and mosquitoes become the order of the day in Dadin Kowa area and its environs (Interview, Dec 18 2017).

**Table 4.9 Effectiveness the dam services to the farmers/fishermen**

	Frequency	Percent	Valid Percent	Cumulative Percent
Better	207	54.3	54.3	54.3
Average	152	39.9	39.9	94.2
Bad	22	5.8	5.8	100.0
Total	381	100.0	100.0	

**Source: Field Work, 2017**

The above table shows that 207 respondents, representing (54.3%) of the respondent say that, the dam provides services to them as farmers or fishermen better. While, 152 respondents, representing (39.9%) responded that, the dam provides average service to them. Meanwhile, 22 respondents, representing (5.8%) of the respondent said that; the dam provided poor services to farmers and fishermen in the area. This implies that majority of the respondents said the dam services to them is better.

In addition to that, on my observation, I believed the dam has come along with many celebrated benefits, But not with negative consequences to the people of the area. For instance in

last rainy season alone more than 200 houses were washed away by overflow of the dam and many farmlands included this was just a single year and yet nothing was put in place to manded the situation for further occurrences (Personal Observation, Dec 18, 2017).

Similarly, a respondent during the interview averred that the dam has always being a disaster to them and they added that only few people are happy with the dam. (Interview, Dec 17, 2017)

**Table 4.10 Responses on income the respondents were making yearly using Dadin-Kowa dam in Yamaltu-Deba area**

		Frequency	Percent	Valid Percent	Cumulative Percent
	Less than N200,000	163	42.8	42.8	42.8
	N200,000-400,000	185	48.6	48.6	91.3
	N500,000 and above	33	8.7	8.7	100.0
	Total	381	100.0	100.0	

**Source: Field Work, 2017**

Although prior to the construction of the dam there are no available baseline data showing the level of income vis-a-vies the size of irrigation services as it was just a normal run-off river. However, after the construction of the dam.

163 respondents, representing (42.8%) said what they are making yearly was less than N200, 000 and 185 respondents, representing (48.6%) of the respondents said they make between N200,000 -400,000 income yearly while 33 respondents, representing (8.7%) of the respondents said N500, 000 and above yearly. This implies that majority of the respondents said they made between N200, 000-N400, 000 yearly using Dadin-Kowa dam in Yamaltu-Deba local government area. As such majority number of people make between N150,000 to 400, 000 Naira yealy using Dadin Kowa Dam

**Table 4.11 Effect of utilising Dadin-Kowa dam interms of income and general wellbeing to the farmers and fishermen**

		Frequency	Percent	Valid Percent	Cumulative Percent
	The dam has increase my fishing & farming greatly	152	39.9	39.9	39.9
	I make more money using the dam than before	197	51.7	51.7	91.6
	The dam create more jobs	32	8.4	8.4	100.0
	Total	381	100.0	100.0	

**Source: Field Work, 2017**

The table shows that 152 respondents, representing (39.9%) of the respondents said the construction of Dadin-Kowa dam has increased their fish farming business greatly and 197(51.7%) of the respondents said they make more money than before while 32 respondents, representing (8.4%) of the respondents said it has create more jobs for them. This implies that the construction of Dadin-Kowa dam has positively affects fishing and farming business of the respondents in the study area.

**Table 4.12 Responses on problems associated with the utilising of Dadin-Kowa dam in Yamaltu Deba local Government in Gombe State**

		Frequency	Percent	Valid Percent	Cumulative Percent
	The dam causes flood during raining season	239	62.7	62.7	62.7
	The dam covers large area of land	142	37.3	37.3	100.0
	Total	381	100.0	100.0	

**Source: Field Work, 2017**

Table 12 shows that 239 respondents, representing (62.7%) of the respondents said the problem associated with the construction is flood during raining season while 142 respondents, representing (37.3%) of the respondents said the construction of dam covers large area of land.

This implies that majority of the respondents faced flooding problem during raining season in the study area.

Similarly during an in depth interview with one among the important stakeholders of Dadin Kowa Dam, a respondent confirmed that the incidents of flooding became a yearly routine as each year houses and farmlands were in constant danger of being washed away by the flood due to the dam overflow. He added “this year alone more than 200 houses and farmlands were washed away by the dam in Dadin Kowa Town alone”(Interview, Dec 13, 2017)

In the same vein, a respondent explained that the construction of the dam has created a new version of hostility between the two villages of Kinafa and Gwani west. The dam is situated in between the two communities where one is resident off shore and the other on-shore. This flooding during raining season to affected the downstream part of the villages (Interview, Dec 19, 2017).

However, a respondent explained that flooding due to the overflow of the Dam sometimes in a year is part of the problems confronting the farmers and fishermen. This flooding and intermittent conflict between the locals is posing a threat to the communities. (Interview, Dec 19, 2017).

**Table 4.13 Responses on ways and measures to be taken towards tackling challenges associated with the establishment of Dadin-Kowa dam**

	Frequency	Percent	Valid Percent	Cumulative Percent
Credit schemes should be created for dam users	65	17.1	17.1	17.1
Building Good roads, drainages and hospitals along the area	153	40.2	40.2	57.2
Alternative land for farmers that lost their farm to the dam	86	22.6	22.6	79.8
Compensating flood victims living near the dam	77	20.2	20.2	100.0
Total	381	100.0	100.0	

Source: Field Work, 2017

From the table 65 respondents, representing (17.1%) of the respondents said the way to tackle the challenges is by providing credit schemes to farmers and fishermen; 153 respondents, representing (40.2%) of the respondents said by providing good roads and good hospitals for treating patients along the dam area, and 86 respondents, representing (22.6%) of the respondents said there should be alternative for farmers that lost their land to growing body of water, while 77 respondents, representing (20.2%) of the respondents said there should be a good compensation scheme for farmers who lost their farmlands to flood. This implies that there are many challenges facing the dam site and does not support business activities and development of the area.

In response to similar question, a respondent noted that infrastructural development in terms of roads construction, health facilities for Dam workers and farmers, power supply and modern irrigation facilities are very crucial in converting the challenges facing the dam. This goes in tandem with the responses of the emirs of Kinafa and Dadin Kowa. They positioned that increased government empowerment in terms of credit facilities and modern irrigation methods will go long way in improving the situation (Interview, Dec 18, 2017).

Based on these therefore, the construction of Dadin Kowa Dam is benefiting the people around the area particularly in agricultural related sector i.e farming and fishing than using the dam for domestic purpose only. Thus, the construction of the dam helps significantly in the improvement of dry season farming. So also, the research shows despite the dam been beneficial to people of Yamaltu Deba area, it has also come along with some difficulties particularly to the people of Dadin Kowa town and environs. Such challenges include but not limited to the flooding that always lead death and destruction of properties worth of millions of Naira every year.

## 4.2 Discussion of Findings

The impact of Dadin-Kowa dam on the Socio-Economic Development and Environmental Sustainability of Yamaltu-Deba local government area, Gombe State (1982-2012). It was discovered that the rationale behind the construction of Dadin-Kowa dam, was for improvement of socio economic activities, development and environmental sustainability of both fishing and farming activities. Majority of the respondents said the construction of Dadin-Kowa dam has helped in improving their harvest output in Yamaltu local government of area of Gombe state.

In accordance with FMAWRRD (1993) several dams were constructed in Nigeria for the purposes of irrigation, power generation, water supply and flood control. These dams are sources of hydro-electric power to Nigeria and some other West African countries. For instance the dam made possible modern irrigation and fishery system as many agricultural extensions services were put in place to ensure it boast dry season farming in the area. So also as a result of the dam rural electrification project is ongoing and which believes that if completed will be able to generate about 40 megawatts of electricity capable of feeding Gombe and neighboring states.

Other intended and achieved benefit of the dam was water supply to the metropolitan towns and neighboring villages, and in this part treated water from the dam was piped to Gombe metropolis and which ease long term shortage of water in the town for many years, as well Dadin Kowa, Kwadon town, Baure village and many more. This and many more reasons shows that it is evident that Dadin Kowa dam was a blessing to Gombe State and Yamaltu Deba local government in particular.

Secondly, the finding shows socio-economic benefits derivable to the people of the area as a result of the construction of the Dadin-Kowa dam which includes, improved security, expansion of local markets, presence of higher institutions of learning for research purposes

agricultural extension services modern fish farming, modern irrigation etc this is in line with Ali (2013) who opines that socio-economic development as an idea embodies all attempts to improve the conditions of human existence in all ramifications. It implies improvement in material wellbeing of all citizens, not the most powerful and rich alone which people particularly in Dadin Kowa town and environs enjoy from the construction of the dam in the area.

Thirdly, the finding revealed the impact of the dam on the ecology of the area which to some extent harmful this was a result of constant flood and diseases that the dam came along with e.g black fly or schistosomiasis and increase incident of malaria and other communicable diseases.

Finally, the finding shows that there are other challenges facing the dam and it does not support business activities and development of the area some of this challenges includes lack of enough canals for irrigation as proposed by the dam initial installed capacity of the dam, poor or lack of road networks, lack good of schools, standard hospitals and electricity to mention but few.

From the foregoing analysis of the major findings our research questions can be unravel here as:

**Findings number one;**

**Objective number one; seeks to identify the rationale behind the construction of Dadin Kowa dam.**

The reasearch discovered that Dadin-Kowa dam was consructed for the purpose of solving problem of portable water for domestic use, mordern irrigation farming, agricultural extension services and to adress ground water shortage as well as hydro electric generation to the state and its immidiete neighbors. This is evident from the submission of Sectional Head of irrigation in the dam as well as the Area Manager. both

maintains that the dam was put in place to provides socio-economic development, modern irrigation system, electricity generation and general well being of the people in the area.

This confirms **assumption 1**, that states that the rationale behind the construction of Dadin Kowa dam was to generate electricity, provide modern irrigation farming, fishing and agricultural extension services .

**Findings number two;**

**Objective two; Seeks to examine the socio-economic benefits derivable to the people of the area as a result of construction of Dadin Kowa dam from 1982-2012.**

The findings show that socio-economic benefits derivable to the people of the area as a result of the construction of the Dadin-Kowa dam were achieved, this includes but not limited to the provision of higher institution of learning for research purposes, expansion of markets, portable water supply, agricultural extension services, improved security system as well as general wellbeing to the locals which is not restricted to the powerful and rich alone. This is evident from from the submission in Table 4.5, 4.6 and 4.7 as well as the submission of the interviewed Emir of Yamaltu who confirmed that the dam was indeed a blessing to his people if not some minor problems that can be managed by the authority in due course.

This therefore, confirms our **assumption 2** that; Dadin Kowa dam has created opportunities for improved socio economic benefits to the people such as expansion local markets, security, portable water, provision of higher institution for research purposes, agricultural extension services, as well as general well-being of the locals.

### **Findings number three**

#### **Objective three; Seek to assess the negative impact of the dam on the ecology of the area**

The research discovered that the impact of the dam on the ecology of the area which to some extent is harmful to the environment. This was as a result of, displacement and resettlement of persons, noise and air pollution, constant flood during heavy down pour, disease outbreak that the dam came along with e.g black fly or schistosomiasis and increase incident of malaria, diarrhea and other communicable diseases. This was evident in the submission from the sample responses on table 4.8, as well as the submission from a District Head in the area during the interview who maintains that " the dam did not benefit his people as a result of constant year round flood during heavy down pour which as a result submerged a large portion of their lands and their houses. He added that " No serious intervention or attention was given to his people in times of floods apart from empty promises by politicians"

This also confirms our **assumption 3** which states that; The presence of Dadin Kowa dam led to huge human cost of displacement and replacement of persons, diseases outbreak, flooding, air and noise pollution

### **Findings number four**

#### **Objective four; Seeks to identify possible challenges posed by the dam establishment in the area and proffer possible solutions.**

The research discovered that there are other challenges facing people living around the dam and it does not support business activities and development of the area; some of these challenges include lack of enough canals for irrigation as proposed by the dam initially installed capacity, poor or lack of road networks, standard hospitals and electricity to mention but a few.

Increased funding and supervision, sensitisation Programmes for the locals on modern agricultural extension services, provision of infrastructural development of roads, power, provision of credit facilities, employment of qualified staffs will go a long way in solving some of the lingering problems bedeviling the area in terms of developmental prospects.

This is in tandem with a submission from a sampled respondent in table 4.13 as well as the submission from the District Head of Kinafa and the Emir of Yamaltu who maintained that increased government intervention in solving problem encountered by the locals will go far in improving the the situation, they added that "provision of empowerment schemes, creation of credit facilities, timely intervention during flooding with provision of relief materials, provision of modern health centres, construction of feeder roads, schools and completion of canals for irrigation services will improve the lives of the people in the area".

This confirmed our **assumption 4** that the challenges caused by the dam can be solved through the review of compensation scheme of the displaced inhabitants as a result of the dam construction, provision of modern health centres, adequate management dam to prevent flooding and timely government intervention during flooding etc

#### **4.3 Relevance of the Study/ Contribution to Knowledge**

This research work is placed under the area of Public Policy Analysis within the discipline of Political science as Dadin Kowa Dam was a project developed and and executed by Federal Government for the benefit of poeple of Yamaltu Deba Local GovernmentArea, Gombe State and Nigeria in general.

How ever, in spite of the existing literature on Dams in the Sub Saharan Africa and Dadin Kowa Dam in particular, a systematic impact assesment of the impact of the Dadin Kowa Dam on the socio economic development of the people of Yamaltu Deba Area in Gombe State, to my

knowledge, has not been conducted particularly in relation to finding out from the people on the part of its effectiveness on socio economic sustainability. In other words the research work dig deep in finding out from the people whether in the long run the advantages of having the dam will outweigh the positive impact it provides to them.

The little work here is done to ascertain the very nature of socio economic implication of the dam on the environment and to find out ways of addressing it for generation long after have equal access without experiencing any hindrance as a result of its usage by people before them. This invariably means that the people that were enjoying the services of the dam must observe proper ways to sustain its services to the next generation in the future.

The literature reviewed provided a narrow perspective of analysis on the dam impact in relation to people enjoying its services with little or none in the case of sustainable economic question in the case of Dadin Kowa dam in particular. This study therefore, contributed in advancing the knowledge by expanding on the variety of issues characterised the usage of the dam to people and how it affects government policies and programmes on ways to manage infrastructures like dams in a sustainable manner. This therefore, clearly pointed out a gap in the body of literature and filled as a contribution to knowledge.

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary, conclusion and recommendations. The research has shown the impact of Dadin-kowa dam on the socio-economic development and environmental sustainability of Yamaltu-Deba local Government Area.

#### 5.2 Summary

This study examines the impact of Dadin-Kowa dam on the socio-economic, development and environmental sustainability in the study area from 1982-2012. In order to achieve the objectives of the study, four specific objectives were raised which included to examine the socio-economic benefits derivable to the people of the area as a result of the construction of the Dadin-Kowa dam.

Also, four the research question which included what are the reasons responsible for the construction of Dadin-Kowa dam in Yamaltu-Deba local government area of Gombe State? A total of (391) three hundred and ninety one structured instruments were used to gather data from the respondents and from which (381) questionnaires recovered with (8) eight interviews were carried out. The data collected were presented in tables and percentages.

The study shows that despites multiple shortcomings (ie flooding and diseases outbreak) associated with the construction and utilisation of Dadin Kowa Dam significant success was recorded as the dam had go along way in improving the lives of people particularly the locals. The findings also revealed that the socioeconomic benefits derived from the dam in terms of fishing and farming activities have contributed in reduction of rural urban migration and also

aided in boosting economic activities in the area as daily and weekly markets thrive as a result of the activities of the dam.

Conclusively perhaps one should not deny the presence of difficulties people around the Dadin-Kowa town and environs suffers from as a result of lack of basic amenities to disease prevalence and increase in the incidence of flood during rainy seasons as such to some the dam was both a blessing and a curse as many villages and farmlands were washed away by increased body of water in the area which divided villages and bring untold damages to people were also among the findings

### **5.3 Conclusions**

These study on Dadin-Kowa dam confirms that the most important key issues revolve round the way various elements that are accommodated in the whole project which was aimed at developing the area. Although deficiencies are identified, ranging from non involvement of affected persons in the early planning process, monitoring, mitigation and negligence in handling unfavorable impacts, as well as to the non adherences to environmental and social considerations. The study thus provides a wider sectoral coverage which includes either dam was built with significant objectives other than the irrigation, supply of enough water for hydropower, flood control navigation or both.

It is; perhaps, appropriate to reiterate some of the stand of world commission on dams (WCD) the key points on benefits of dams in general. These are:

- (a) Dams have made an important and significant contribution to human development, and the benefits derived from them have been considerable,” and

- (b) In too many cases an unacceptable and often unnecessary price has been paid to secure these benefits, especially in ecological and social terms, by people displaced, by communities downstream, by taxpayers, and by the natural environment.”

But nonetheless, it was discovered that Dadin-Kowa dam has impact on the socioeconomic development, improvement and material wellbeing of all citizens, not the most powerful and rich alone. The economic benefit of the dam includes raising the level of prosperity through increase production distribution and consumption of goods and services in Yamaltu-Deba. For instance the dam made possible modern irrigation and fishery system as many agricultural extensions services were put in place to ensure it boast dry season farming in the area.

#### **5.4 Recommendations**

The following are the recommendations:

1. Government should speed up the completion of canals dredging in the dam downstream area mainly to fulfill the overall objective of constructing the the Dadin Kowa Dam (ie fishing and farming)

This is because less than 10% coverage is recorded from the period of its construction to date as against initial installed capacity and the completion of hydroelectric generation for the benefits of the people of the area and the state at large which will be of paramount importance.

2. Government should make available a comprehensive Social impact assessment largely to reduce to the bearest minimum the hardship encountered by the communities through proper payment of compensation and giving out relief materials to the communities

largely affected by resettlement during the initial work of the dam construction in the 1980s and those affected by year round flood incidence.

This will enable the host communities to drive the benefit of dam construction and utilisation particularly, that of income generation, employment opportunities as well as general standard of living. This could be done through the following steps; Government should review consultation with the local people affected by Dadin Kowa dam activities to redress their problems e.g. people of Kinafa, Gwani West and East Dadin-Kowa and Hinna villages.

Also the consultation with local people should take place at the lowest level of local government/administration (usually cluster of villages). Without these earlier steps, it may be difficult and “too late” to gain community consensus and that was the reason the locals are complaining about the issue of Dadin-Kowa dam Construction.

3. Government should make sure that Resettlement Policy plan to the affected persons in Dadin Kowa and environs must be reviewed to National guidelines and regulations in addressing the ecological problems faced by families affected negatively by large body of water as a result of the dam construction e.g people of Gwani west and Kinafa village and Dadin-Kowa town itself who were among the hard hit areas of the dam projects.

Guidelines should include;-

- Provisions for consultations with stakeholders from various levels e.g. traditional rulers and dam official, representatives from ministries of environment, water resources and representatives of NGO's.

- To look into a decent eligibility for, and nature with levels of, compensation to be allowed for loss of livelihood; funding of livelihood subsidies and development activities; grievance procedures.
  - Detailed provisions should be set out as minimum entitlements (rights) for the locals residing by the Dadin-Kowa dam bank and those with plantations, the guidelines should be designed in such way flexible to dialogue with most affected persons, and for regular revision, according to inflation and market considerations.
4. Government should put in place a well coordinated compensation scheme and should be all inclusive, based upon needs and not the possession of legal title deeds. Basic rights to compensation should be enshrined in national guidelines for large water resource development projects. These norms should be used as the basis for calculating compensation and resettlement costs at the time of pre-feasibility study.
- Compensation for loss of assets (land, home, trees and facilities), either in cash or by replacement;
  - Compensation to cover the costs of moving and other transitional assistance;
  - Compensation for loss of livelihood, which should be in the form of alternative plots of land or start-up grants to allow project affected persons to establish alternative livelihoods. Land allocations should be based upon the holding needed to improve on the equivalent income earned before inundation, and not upon the amount of land available. If sufficient land is unavailable, alternative occupations should be offered;
  - Provisions to compensate for income lost before the situation of the resettled population is stabilised in the new situation;
  - Provision for training to enable the resettled persons to adjust to new job situations;

- Provision for compensation to those host communities that may be adversely affected by the influx of resettled, persons, e.g., additional and increased use of their schools, hospitals, roads etc.
5. Government should also be proactive in making sure that the operation of Dadin-Kowa dam to render quality services (i.e Feeder Roads, Improved Electricity, Good Hospital facilities, Security e.t.c) on peasant population living by the dam bank is realised to increase production of goods and services in the Yamaltu-Deba Local Government Area, and Gombe State at large. While in their part people of Yamaltu-Deba should cooperate with the Dadin- Kowa dam authority in ensuring adequate distribution of the services,
  6. Policies should be put in place to tackle any strange occurrences, difficulties and to militate against any negative effect of Dadin-Kowa dam in Yamaltu-Deba Local Government Area.

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## APPENDIX 1

**Department of Political Science and International Studies,  
Faculty of Social Sciences,  
Ahmadu Bello University. Zaria.**

**Dear Respondents,**

I am a postgraduate student in the above mentioned department and institution, conducting research on **THE IMPACT OF DADIN-KOWA DAM ON THE SOCIO ECONOMIC DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY OF YAMALTU-DEBA LOCAL GOVERNMENT AREA, GOMBE STATE (1982-2012)**. Please kindly tick the appropriate box provided against the questions overleaf. Meanwhile, you are to be rest assured that your responses would be treated with high level of confidentiality and to be used for the purpose of this research work.

Thank you.

**BELLO MUHAMMAD BOSE**

**M.SC/SOC-SCI/41825/2012-2013**

### **SECTION 'A' Bio Data of the Respondents**

1. Gender-----  
a, Male b. female
2. Occupation of the Respondents-----  
a. farmer b. fishermen c. civil servant d. others
3. Level of Education of Respondents-----  
a. No formal education b. Only primary education c. Secondary school only  
d. Tertiary education

### **Section 'B' Responses in Relation to the Activities of the Dam**

4. How long have you been fishing or farming in Dadin-Kowa dam-----?  
a. 1 - 10 years b. 10 – 20 years c. 20 years and above
5. In what ways do you benefits from the construction of Dadin-Kowa dam--?  
a. farming b. fishing c. drinking water
6. Has the construction of Dadin-Kowa dam helps in improving your harvest output-?  
a. Yes b. No

7. If yes how-----?

a. The dam makes irrigation activities easier b. The dam helps increases portable water supply in the state c. The dam helps increases fishing activities in the area

8. If No why-----?

a. The dam causes flood b. The dam occupies spans of land c. The dam is a failure  
d. The dam has no benefit at all

9. How effective the dam services to you as a farmer or fisherman-----?

a. Better b. Average c. Bad

10. How much in terms of income were you making yearly using Dadin-Kowa dam in Yamaltu-Deba area-----?

a. less than 200,000 b. 200,000-400,000 c. 500,000 and above

11. How has the utilization of Dadin-Kowa dam affected your fishing/farming--?

a. The dam has increased my farming and fishing greatly b. I make more money using the dam than before c. The dam creates more jobs

12. What are the problems associated with the utilization of Dadin-Kowa dam

in Yamaltu Deba local Government in Gombe State-----?

a. The dam causes flood during raining season b. The dam covers large area of land

13. What measures would you proposed as a farmer/fisherman towards tackling the challenges posed with the establishment of Dadin-Kowa Dam-----?

a. Credit schemes should be created for the dam users' b. Building good roads, drainages and hospitals along the area c. Alternative lands for farmers that lost their lands to the dam d. Compensating flood victims living near the dam

**APPENDIX 11**

**Department of political science,  
Faculty of Social Sciences,  
Ahmadu Bello University, Zaria**

**INTERVIEW FOR GENERATING RESEACH DATA**

**Dear Sir,**

I herby seek cooperation for an interview to generate information on the topic;

**THE IMPACT OF DADIN-KOWA DAM ON THE SOCIO ECONOMIC  
DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILTY OF YAMALTU-DEBA  
LOCAL GOVERNMENT AREA, GOMBE STATE (1982-2012).**

Please be rest assured that all information supplied here will be used for the purpose of this  
research only and would be treated with full confidentiality,

I appreciate your cooperation.

Yours Sincerely

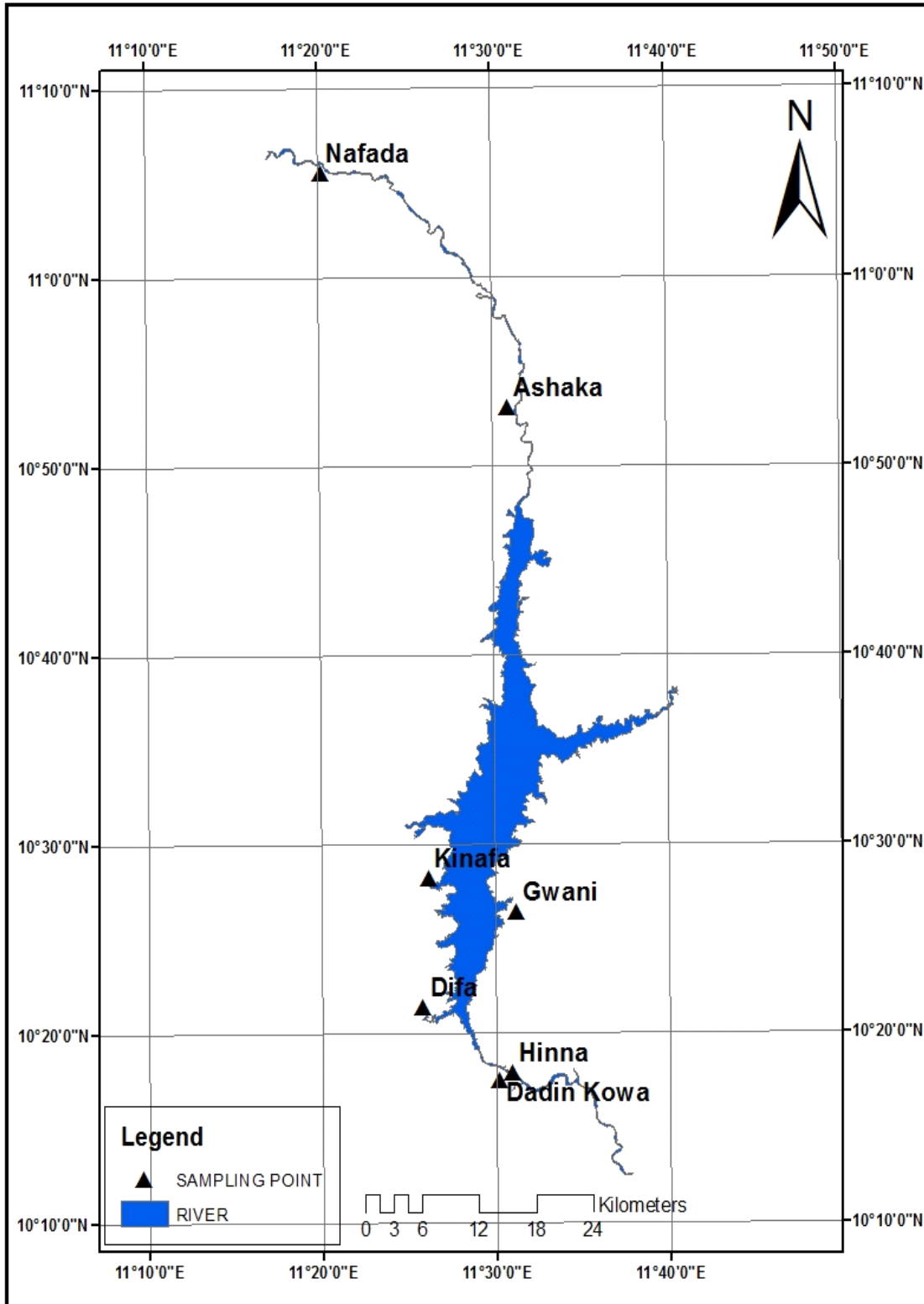
**BELLO MUHAMMAD BOSE**

**M.SC/SOC-SCI/41825/2012-2013**

- Which organization do you work, and your rank?-----  
-----
- What do you think are the reasons for constructing the dam in Dadin-Kowa, Yamaltu-  
Deba L.G.A of Gombe State?-----  
-----
- How long does it take the Government to construct Dadin-Kowa dam from start to  
finish?-----  
-----
- In what ways does the neighbouring communities benefited from the dam?-----  
-----
- At what level, in your view, does the Dam provides the following to the community:  
Schools, Road network, Employment, Electricity, Pipe borne water

- Satisfactorily [ ] 2- Fairly. [ ] 3- Non satisfactorily [ ]
  
- How effective are the dam services to the inhabitants particularly farmers and fishermen?
  - Effective. [ ] 2- Fairly Effective. [ ] 3. Non Effective. [ ] 4- Poorly [ ]
  
- What environmental problems does the Dam brings to the neighbouring community ?----  
-----
  
- In what ways does the operations of the Dam affects the farming process of the area?  
-----
  
- what measures would you propose as a stakeholder towards tackling the challenges posed by of Dadin Kowa dam?-----  
-----
  
- How has Dadin-Kowa dam been a source of sustainable development to people of Yamaltu-Deba area?-----  
-----

APPENDIX 111  
DADIN KOWA DAM ROUTE



## **APPENDIX 1V**

### **List of the people interviewed during the field work survey, 2017**

- 1, The Emir of Yamaltu and who is also the Emir of Dadin Kowa town
2. The District Head of Kinafa
3. The Representative of District head of Gwani at Gwani west
4. The Area Manager of Upper Benue River Basin Development authority Dadin Kowa
5. The Engineering officer of Upper Benue River Basin Development authority Dadin Kowa
6. The Irrigation officer of Upper Benue River Basin Development authority Dadin Kowa
7. The Director Water Resources Ministry of Water Resources Gombe State  
Headquarters
8. The Director Environment ministry of Environment and Forestry Gombe State  
Headquarters

## APPENDIX V1

### Researcher and the personalities interviewed during field work survey, 2017



Researcher with Engineering officer of Dadin Kowa Dam after an interview during field work survey, (2017)



**Researcher with the Area Manager of Dadin Kowa Dam after an interview during field work survey, (2017)**



**Researcher with irrigation officer of Dadin Kowa Dam after an interview during field work survey, (2017)**



**Researcher with the Emir of Yamaltu in his palace at Dadin Kowa after an interview during field work survey, (2017)**



**Researcher with the District head of Kinafa and his people after an interview during field work survey (2017)**



**Researcher with the Representative of Gwani West District head after an interview during field work survey (2017)**





**Researcher with some farmers using diesel powered generator for irrigation due to shortage of canals during irrigation during field work survey (2017)**



**Researcher with Director Water Resources and his Deputy After an interview at Ministry of Water Resources Gombe State Headquarters during field work survey (2017)**



**Researcher with Director Environment and his staff at Ministry of Environment And Forestry Gombe State Headquarters After Interview during field work survey, (2017)**

