**WATER RESOURCES DEVELOPMENT IN THE NORTH EAST: A CASE STUDY OF THE DADIN KOWA DAM IN GOMBE STATE**

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**INTRODUCTION**

All life depends on water. It is a resource without substitute. Water is something everyone needs; a basic necessity that makes life meaningful. From the earliest life on earth, water has been the most essential element next to air to our survival. The rate of consumption of water for domestic purpose bears a general relationship to the quality of life.

In the past decade, however, there have been growing concerns over the construction of dams in terms of direct environmental and social effects. Some expertise such as scientists, conservationist, and environmentalist, among others take the extreme view that all large dams are bad and that new construction should be stopped or greatly modified. They argue that; Water is impounded, upstream areas are inundated, and people are frequently displaced from the reservoir area. In addition, there are also downstream effects that resulted from the changes in the quality, quantity, timing and use of water flows.[[1]](#endnote-2) It is equally important to point out that such criticism is by no means limited to the industrialised nations.

Perhaps, a more balanced approach realizes that there are legitimate concerns raised by critics, but there are also legitimate needs that dams fulfil.[[2]](#endnote-3) Among the important benefits from dam’s construction is its role in assuring domestic water supplies to rapidly growing populations, both urban and rural, Hydro-electric power supply and irrigation. Although, also subject to contamination, surface water in reservoirs are easier to flush or treat than groundwater; once groundwater is contaminated it may take a very long time to purify. This paper, therefore, is set out to discuss how the construction of Dadin Kowa dam led to the development of the North East via water supply to Gombe state.

**Conceptual Clarification**

The word water is defined by the English dictionary as “a liquid without color, smell or taste that falls as rain, found in lakes, rivers, seas, and is used for drinking, washing, etc”. The compound water is very essential to the existence of life on earth. Water is called H20 in scientific terms because it is made up of oxygen and hydrogen. We know that livings things all breathe oxygen to be able to stay alive. 70% per cent of the entire mass on earth is made of water, leaving land and air to make up the remaining 30%. It is the only liquid on earth that exists in three separate forms namely liquid, gas, and solid matter (ice).[[3]](#endnote-4) The significance of water to all living things is multifarious and multifaceted. Therefore, water resources simply refer to the supply of groundwater and surface water in a given area. Water has several significances such as:

* It can be used for basic human needs such as drinking, cooking, washing, bathing etc.
* It can be used for domestic sanitation, cleaning, hygiene, disposal of waste products etc.
* Water acts as the main source of life for aquatic life systems such as toads, fishes, etc.
* Water acts a source of transportation providing the carriage of persons, goods by boats ships, cargo, acting as an important component of admiralty and maritime activities etc.
* Water provides the necessary component for agriculture and food security such as rain irrigations and various farming methods.
* Water regulates the climatic weather patterns of the earth as in rain, temperature, winds by complex global water cycles such as of El Nino and el Nina.
* Water is used to generate different levels of energy such as electricity and hydrological energy by the establishment of Dams etc.
* Water provides ecological sanitation by cleaning the environment, recycling and balancing environmental distortions.
* Water has health and nutritional benefits by cleansing the human body and can actually reduce the threat of several diseases such as diabetes.
* Water provides a balance in the wind and air structure on earth by providing oxygen, hydrogen thereby sustaining life on earth.
* Water has various uses in different religions. It’s used in some religions for cleansing, in others for prayers.
* Water creates an ecological balance on earth by balancing its spread through rivers, tributaries, river basins, lakes etc.
* Water is a natural resource that can commercialized to provide employment, services and generate profit for several countries and multinational companies etc
* Water acts a repository of mineral resources that can be tapped and commercialized such as oil mineral resources etc.
* Water has recreational benefits such including several water sports such as diving swimming, and boat cruising etc.
* Water in large volumes constitutes a tourist attraction and money spinner whereby ocean fronts and beaches can be used to generate money and employ persons.

In similar vein, Development can simply be defined as the on-going progress that something is growing and getting better. It can also be defined as the movement upward of the entire social system.[[4]](#endnote-5) According to Gbenga Lawal, [[5]](#endnote-6) development means not only capital accumulation and economic growth but also the condition in which a country has adequate food; job and income inequality among them is reduced. He went further to say that, it is the process of bringing about fundamental and sustainable changes in the society. In this regard, we can simply say that Nigeria is permanently hunted by the spectre of development, which is why it had series of development plans. For over 51 years of independence it is actually rolling day by day in search of development. Perhaps, the myth of growth and development is so entrenched that the country’s history passes for the history of development strategies and growth models from colonial times up to date. No term has been in constant flux as development. This seems that Nigeria is among the countries where virtually all notions and models of development have been experimented.[[6]](#endnote-7)

**Dams: A Historical Overview**

However, Dam can be defined as a barrier across flowing water, which obstruct direct or retard the flow thereby forming an artificial lake as a reservoir of water.[[7]](#endnote-8) They are large social investments built to fulfil one or more of four primary purposes; domestic and industrial water supply, energy production, irrigation and flood control.[[8]](#endnote-9) By their very nature, dams create changes in the pre-existing environment. Dams can be grouped according to the type of material of which are constructed as follows:

*Concrete Dams* **[[9]](#endnote-10)**

* Concrete Gravity Dams: rely on the weight of the concrete of which they are built to resist the forces (gravity, water pressure, and earthquake) to which they are subjugated.
* Concrete Arch Dams and Buttress Dams: are building using smaller amount of concrete than that required for a gravity dam and, as a result, they are cheaper to build. This is possible because arch and buttress dams are designed to transfer some of the loads (forces) on them to the foundation on which they are built i. e. the strength of the foundation is used to help resist the loads which could not be resisted simply by the weight of the dam wall alone. In all cases the impermeable membrane of the concrete dams is the whole dam wall.

*Fill or Embankment Dams* **[[10]](#endnote-11)**

* Earth dams are built of homogenous impermeable earth material so that the impermeable membrane is the whole dam wall.
* Earth and Rock Filled Dams have a relative narrow, impermeable earth or clay core inside the dam but most of the dam is constructed of permeable rock fill which, by it, would be incapable of retaining water. The impermeable membrane in these days is the clay core. E.g. Dadin Kowa Dam.
* Concrete Faced Rock Fill Dams are constructed of permeable rock fill, the impermeable membrane being a concrete slab constructed on the upstream face of the dam wall. This type of dam has become increasingly popular over the last few decades or so.

The first known existed dam construction was around 2950-2750 B.C in the ancient Egypt. The dam was called the *Sadd el-Kafara*, which in Arabic means “Dam of the Pagans”. The dam was 37 ft tall, 348 ft wide at the crest and 265 ft at the bottom. It was made of rubble masonry walls on the outsides and filled with 100,000 tons of gravel and stone. A limestone cover was applied to resist erosion and wave action. Using the expected hydrology for ancient times, the capacity was estimated to be 20 million cubic ft or 460 acre-ft. Subsequently, the dam failed after a few years. It was concluded that overflow was the cause of failure and poor workmanship from a hasty construction leads to the failure. The Egyptians never attempted to build another dam until modern times.[[11]](#endnote-12)

The second dam known to have been constructed was an earth dam called Nimrod's Dam in Mesopotamia around 2000 BC. The dam is made watertight, with a core wall and filled with an impervious centre usually made of clays. The Nimrod's dam was built north of Baghdad across the Tigris and was used to prevent erosion, reduce the threat of flooding and at the same time to divert the flow in the river and help irrigate the crops.[[12]](#endnote-13) The dam was built of earth and wood, so it is difficult to be certain of the exact characteristics of the dam.

Furthermore, around 100 AD, the Romans were believed to be the first civilization to use concrete and mortar in their gravity dams. The dam at Ponte di San Mauro has a great block of concrete among its remains. The evidence indicates that a large slab of concrete was used as the core and the outer layer finished with masonry.[[13]](#endnote-14)

In later years, due to the large size and amount of building material need to construct dams, then arch dam was invented. An arch dam is dependent on its shape for strength, requires less material to build, and is relatively thin. The first known arch dam is Kebar, which was built around 1280 AD in the Mongol period. [[14]](#endnote-15)

In the seventeenth century, a Spaniard named Don Pedro Bernardo Villarreal de Berriz wrote the first book on designing dams in 1736. In Don Pedro's time only two types of dams were built, arch dams for narrow gaps where the foundations had good solid rocks or gravity dams where the site was wide and shallow. Don Pedro's book suggested how to design dams properly and introduced new ideas such as a multiple arch dam. Don Pedro suggested that multiple arch dams would need artificial supports or buttresses to support the arches. This theory indirectly led to the invention of the buttress dam. These ideas by Don Pedro, however, made the Spanish dam construction superior to all other civilizations.[[15]](#endnote-16) The buttress dam uses a series of cantilevers, slabs, arches or domes to support the face of the dam from the force of the water. Almendralejo dam is one of the earliest examples of a large buttress dam and is able to store water hydropower. Meer Allum dam is the earliest known examples of a true buttress dam of the multiple arch types.

In addition, the Spanish extended the art of dam building from Spain to the Americas. The idea of buttress dams was current in Spain, so many small buttress dams were used for irrigation purposes. In California, the Old Mission Dam which was constructed across the San Diego River in 1770 was one of the first dams. The dam was only 5ft tall and made of masonry and mortar. Soon modern multiple arch dams were built with concrete and rock filled dams was formed from dumped rock. A rock filled dam uses the large stone for stability and is filled with an impervious water face membrane and core wall. In 1884 the arch Bear Valley dam was built of masonry and mortar but replaced with a concrete multiple arch dam in 1910. [[16]](#endnote-17)

However, in Africa, the colonial masters were believed to have brought dam construction into the continent. Most notably were the Aswan dam in Egypt by the British and the Kariba dam in Zambia. The Kariba dam was one of the largest dams in the world at 128 m high and 57 m long.[[17]](#endnote-18) Coming to West Africa, we have the Akosombo dam in Ghana. It is 660 m high, 366 m base width and 114 m high. It was constructed from 1961 to 1965. There is also the Kainji dam in Nigeria which was constructed between 1964 and completed in 1968. The dam is 88.5 m high with lake of 24km breadth at its widest point and 8, 04 km long. The Kainji dam was the first to be constructed across the river Niger at the cost of 209 million naira only.[[18]](#endnote-19)

In Nigeria, most Dams and reservoirs are used for irrigation, water supply, hydro-electric power generation or some combination. They are of particular importance in the north of the country, where rainfall is low. By the end of 1999, Nigeria has a quite number of dams serving different purposes ranging from water supply, irrigation, electricity among other things. The Kainji dam is the largest, followed by the Dadin Kowa dam in Gombe state. While Kainji dam supply hydro-electric power, Dadin Kowa dam provide water for irrigation and domestic purpose.

**Water Resource Development in Nigeria: Demands for Water towards National Development**

Despite the fact the history of dams is all about history of violating the basic rights of the people who lived in dams’ constructed areas and even beyond it, there is no doubt that dams are large infrastructural investments that produce major economic and social benefits. It is worth to note that, Nigeria is the most populous country in West Africa (often regarded as the giant of Africa). At present, its population is estimated to about 167 million with an annual growth rate of 3.2%.[[19]](#endnote-20) Nigeria is endowed with abundant water resources. Areas which are deficient in surface water (e.g. the Sahel zone) or whose surface water is contaminated by saline intrusion or oil pollutant (e.g. Nig Delta) are adequately compensated with ground water resources.[[20]](#endnote-21)

Perhaps, there is a close relationship between water availability and socio-economic development. The Third National Development Plan document States that “the supply of potable water in adequate quantity and quality is a vital factor in the determination of health, welfare and productivity of the population”.[[21]](#endnote-22) Water supply, especially clean pipe-borne water is one of the most needed resources in any society for all sorts of domestic, urban, industrial, agricultural as well as for recreational usage.

In Nigeria, Water Policies are mostly designed for the development of the water resource potentials of the country in order to ensure the availability, equitable distribution and preservation of water for domestic and industrial uses, hydro-electric power, among other things.[[22]](#endnote-23) It appears that water for domestic use, irrigation and fisheries are the most crucial of the water demand. Perhaps, power supply benefits are also important.

Nevertheless, it should be made clear that during the 1960’s, immediately after independence, water supply was largely through individual and community efforts. Subsequently, both the regional and federal government intervened by establishing water agencies, such as the Federal Ministry of Water Resources (1976) National Water Institute (1977) and The River Basin Development Authorities (RBDA 1976). While the ministry of water resources has the responsibility to formulate policies and give advice, the Water Institute is charged with the responsibility of manpower training and research. The RBDA’s served as executive agencies providing irrigation water and domestic water supply to the communities through dams.[[23]](#endnote-24) In the subsequent years that follow, the numbers of RBDA continue to increases from 11 in 1976 to 18 in 1984. However, in 1985, when the military took over power, all the water agencies established hitherto were retained, with a slice of the RBDA, whose number was drastically reduced to 11 as a result of changes in policy. The new government established new agencies at both federal and state level, this includes; the Nigerian Dam Authorities, the States Water Boards/Corporations/Utilities, Agricultural Development Project ADP, among others.[[24]](#endnote-25)

However, electricity generation is vital in economic growth and development in the attainment of satisfactory standard of living. In other word, it is very crucial to nation’s development. Frequent and often power cuts make home and office life uncomfortable, retard industrial activity and cause tremendous and sometimes irreparable damage to a variety of personal effects, business and industrial electric and electronic equipment. The history of electricity in Nigeria dates back to 1896 when electricity was first produced in Lagos fifteen years after its introduction in England.[[25]](#endnote-26) Despite the fact that it existed for more than a century, the rate of its development has been very slow. Throughout the history of Nigeria, several bodies were established, charge with the responsibilities of providing steady flow of electricity in the country, such as Electricity Corporation of Nigeria, (ECN) but now defunct, Nigeria Electricity Supply Company (NESCO), National Electrical Power Authority (NEPA), now Power Holding Company of Nigeria (PHCN). Presently, only two of the country’s dams generate hydro-electric power, namely, the Kainji Dam and Shiroro Dam all located on the river Niger in Niger State. However, at August 2012, the hydropower generation in the country has risen to 4.307.7 Megawatts (MW) plus 170 MW which serves as spinning reserve, bringing the total quantum of power to 4, 477.7 MW.[[26]](#endnote-27)

Similarly, the act ofirrigation farming on a large scale in Nigeria dates back to the early 1960’s when agriculture was the main product of foreign exchange. Prior, irrigation has been in the hands of private farmers especially in the northern part of Nigeria where local farmers use shade out or local system of irrigation along river course. It was believed that about 3,380 hectares’ were under this type of irrigation. As a result of the 1970’s drought, with its toll of 40-60% of the national crops and animal population and its consequent revenue losses, new activities were introduced into the water resource development such as government effort towards formalising irrigation, utilising less than 100 million cubic meters as its annual water requirements, public awareness on the part for farmers to shift to small scale irrigation scheme using dams. [[27]](#endnote-28)

At long last, in other develops the overall demands for water in the country, the federal government executes the idea of constructing more dams in the entire sub regions of the nation especially the northern part where water is not sufficient based on the water policy on the provision of portable drinking water for the nation, irrigation farming for food security as well as provision of adequate electricity power supply for national development. It is within this context, that the federal government proposed the construction of the Dadin Kowa dam in other to provide water supply, irrigation and hydro-electricity for the then planned Gongola sugar plantation project. Thus, the construction began in 1984 and completed by 1987. [[28]](#endnote-29)

**The Dadin Kowa Dam**

Dadin Kowa Dam is located 35 km away from Gombe metropolis, in Yamaltu L.G.A, eastern part of Gombe state. It lies between latitude 10 13 N and longitude 11 23 E of the equator. It covers a total land area of 1, 981 km 2(764.9 miles). [[29]](#endnote-30) It has a total population of about 255, 248 according to the 2006 population census. It shares border with Bayo L.G.A of Borno state to the south Akko to the southwest and Nafada to the north east.

However, the dam is 270 cm height, 550 meters length, 230 meters width with deepest level of 42 meters. It has a capacity of about 800 million cubic meters of water and surface area of 300 square kilometres on the river Gongola which is a branch of the river Benue in Nigeria.[[30]](#endnote-31) It is an earth and rock filled multi-purpose dam. However, the Dadin Kowa Dam is Nigeria's second largest dam after Kanji; it has sufficient hydropower generation capacity to meet the requirements of the six North-East states of Borno, Yobe, Adamawa, Taraba, Bauchi and Gombe. More so, this hydro-power potential is yet to be exploited. Although the generating house has since been completed, turbines and other ancillary hydro-power generating equipment have not been installed.[[31]](#endnote-32) At completion the Dadin Kowa dam is expected to:

* Irrigate agricultural land of about 44,000 hectares from the downstream of the dam;
* Provide 34 mega watts of hydro-electricity to the entire north-eastern region.
* Serve as a source of water supply for the entire Gombe metropolis and other settlement and villages along the road for both human beings and animal usage.
* Promote Fishing development of over 200,000 metric tonnes of fish annually for human consumption and;
* Control flood.

The name Dadin Kowa is a Hausa word meaning “Enjoyment for All”. It is refer to the present day Dadin Kowa town where the Dam is located.[[32]](#endnote-33) A very large percent of land around the Gongola River and its tributaries are suitable for farming and fishing. In fact, over, 80% of the population are farmers, producing crops such as sweet potato, cotton, peanut, sorghum, millet, cassava, and vegetables. More so, the basin is also suitable for grazing for animals such as cattle’s, goat among others.[[33]](#endnote-34)

However, in spite its construction for almost 25 years, it is unfortunate that only water supply to Gombe metropolis and environs was able to achieve among other important aims of constructing the dam. The rest like irrigation, and flood control were more or less 20%, hydro electric power 0%. While the fishing aspect remains traditional, there is no improvement in terms of advancing the method.

**Gombe State and Water Resources**

Gombe state, also known as ‘Jewel in the Savannah’ came into existence on 1st October 1996 as a result of agitation for states creation which dates back to 1979, three (3) years after the creation of Bauchi state from Borno state.[[34]](#endnote-35) Gombe shares boundaries with such sister states of Yobe to the North, Adamawa and Taraba to the South, Borno to the East and Bauchi to the West. Though a predominantly Fulani speaking people, the state is also a multi ethnic and multi religious. It comprises of such groups as Bolewa, Tera, Cham, Dadiya, Hausa, Tangale Waja, and Tula among others. [[35]](#endnote-36)

However, Gombe state is a major food basket in Nigeria, because most of the 20,266km2 landmass is cultivable and about 60% of the population is engaged in agriculture. Year round cultivation is possible in some parts of the state due to favourable weather, soil and an extensive irrigation programme.[[36]](#endnote-37)

Gombe state is Sahel vegetation, an area with deficient surface water and blessed with high level of Underground water.[[37]](#endnote-38) There are three dams in the state, namely, Dadin Kowa, Balanga and Cham Dams, with a combined capacity of about 1.85 million cubic meters of water.[[38]](#endnote-39) The Dadin Kowa Dam, which is the biggest of the three existing dams irrigates about 6,200 hectares of farmland yearly and can support the production of more than 30,000 tonnes of grains including rice, maize and groundnuts as well as 5,700 tonnes of cotton and up to 20,000 tonnes of fish annually. Beyond providing irrigation water to meet agricultural production targets, the Dadin Kowa dams is central to government's efforts at providing portable water for domestic and industrial use.[[39]](#endnote-40) Below are table showing number of dams and water bodies in Gombe state.

*Dams and water bodies in Gombe State* [[40]](#endnote-41)

|  |  |  |
| --- | --- | --- |
| S/N | L.G.A | Number of Dams/Streams/Lake etc |
| 1. | Akko | 5 |
| 2. | Balanga | 4 |
| 3. | Billiri | 4 |
| 4. | Dukku | 5 |
| 5. | Funakaye | 1 |
| 6. | Gombe | 2 |
| 7. | Kaltungo | 1 |
| 8. | Kwami | 1 |
| 9. | Nafada | 3 |
| 10. | Shongom | 7 |
| 11. | Yamaltu Deba | 1 |
|  | Total | 34 |

These figure above shows that Gombe state has abundant water resources with a lot of potentials in the provision of hydrological infrastructure, providing irrigation water to meet agricultural production targets and providing portable water for domestic and industrial use.

However, in spite of the effort of various Gombe state administration in channelling efforts and resources to tap into the water resource potentials of the state, the main source of water supply to Gombe metropolis “before now”, came from Bauchi State Water Board, and boreholes scattered in certain locations within the city.[[41]](#endnote-42) For instance, the Malam Inna water scheme consisting of about 13 centralised boreholes in Gombe metropolis. Apart from the boreholes, there were water tankers (both government and private owned) delivering to people's homes. Thus, even with the boreholes and tankers delivering to people's homes, the situation was still bad. Then, selling water was a big business. Despite that, the demand for water has outstripped that of the supply. More so, after state creation, Gombe witnessed increase in business activities as well as large number of rural-urban migration.[[42]](#endnote-43) This however, makes the problem of water a serious challenge in the state. For example, the inhabitant of state barely bathes three times a day, washes their clothes weekly, among other things.

Having this potential resource and the water scarcity in the state, it became necessary the provision of a lasting solution in order to meet the water needs for various purposes. In other to overcome these problems, Gombe state government invests more efforts and resources available in exploiting the benefits of the hydrological infrastructure already in place. To this end, the state government began by rehabilitation and increasing the number of boreholes from over 60 to about 100; more water tankers to transport water from various boreholes into the cranes and corner of the state for easy access for people to buy; and above all, was the idea of constructing a storage capacity known as the Gombe Regional Water Scheme.[[43]](#endnote-44)

**Gombe Regional Water Supply Scheme**

The Gombe Regional Water Supply Scheme is one of the long lasting impacts of Dadin Kowa dam in the North East. The project was design to utilise the water of Dadin Kowa Dam as primary source of water, to be treated for distribution to the metropolis and environs of Gombe state.[[44]](#endnote-45) The project was first initiated by the former civilian Governor of Gombe state Alhaji Abubakar Hashidu (1999-2003) who happens to be a Federal Minister for Water Resources during the military government i.e. General Ibrahim Badamasi Babangida. Governor Hashidu awarded the contract to a Pakistani company known as the Shaukat and Raza Pvt in 2001. Moreover, as a result of change in government policies, the contract was later revoked and awarded to a Chinese company Chinese company (CGC) when Governor Danjuma Mohammed Goje became the governor of Gombe in 2003-2007.[[45]](#endnote-46) To this end, the company was given the mandate to construct a reservoir i.e. a water treatment plant, at the cost of about 8.2 billion naira only.[[46]](#endnote-47) Three years later, on 13 March, 2006, the water treatment plant which is located about 3km from the Dadin Kowa dam was ready for water utilisation.

Accordingly, the project was divided into two phases, the first phase is to provide 50,000 litres of water on daily basis to Gombe town and environment, while the second phase is to provide 70,000 litres of water by 2025, as the population is been projected to double fold.[[47]](#endnote-48) The water system is designed in such a way that it can be operated manually or electronically under the supervision of the Gombe State Water Corporation.

At present, about 30,000 litres of water is been supplied for domestic use for the people of Gombe metropolis and environs on daily basis. More litres are predicted to increase in the near future.[[48]](#endnote-49) As the government began supplying pipe-borne water from Dadin Kowa dam treatment plant reservoir, which is located 3km away from the dam, the tanker owners went out of business.[[49]](#endnote-50) Even when supply is cut off, this does not last more than a day or two.

**Conclusion**

Dam has been defined as a barrier that impounds surface water or undergrounds streams. Generally they serve primarily the purpose of retaining water. They are categorised into barrage dam, gravity dams, earth-fill dams, etc.Thus, history of dams is all about history of violating the basic rights of the people who lived in dams’ construction area. Not only that, their impacts are not limited to the areas of the reservoirs, but it goes beyond it. However, it appears that water for domestic use, irrigation and fisheries are the most crucial of the water demand. Perhaps, power benefits are also important. Despite the fact that the Dadin Kowa dam was constructed to provide portable water supply, irrigation and hydro-electricity for the planned Gongola sugar plantation project, upon all these reason, it is only water supply aspect that is achieved. The water supply component of the dam has been utilised by the Gombe State Government through a project known as the Gombe Regional Water Scheme. At present, the project generates 30,000 cubic meter of water daily which satisfies the consumption requirements of the people of Gombe metropolis and environs. The value of this project is better appreciated if it is realize that Gombe the capital of Gombe State has been suffering from acute water shortage for a long time before. When fully completed, not only Gombe but the north east at large will benefit from it. What a wonderful experience!!!

**Work Cited**

1. John A. Dixon Lee M. Talbot and Guy Le Moigne, *Dams and the Environment*, World Bank Technical Paper, Number 110, Washington DC. P3 [↑](#endnote-ref-2)
2. For example, the World Bank, UNDP, See John A. Dixon et al, *Dams and Environment,* p3 [↑](#endnote-ref-3)
3. http://www.google.com.ng/url?q=http://www.martindale.com/natural-resources-law/article\_\_240640. [↑](#endnote-ref-4)
4. Gunner Myrdal, what is development; Journal of Economic Issues Vol 8, No.4 December 1974, pp729-736 [↑](#endnote-ref-5)
5. Gbenga Lawal, Corruption and Development in Africa, *Humanity & Social Sciences Journal, 2(1*) 2007 P1 [↑](#endnote-ref-6)
6. Gbenga Lawal, *Humanity &Social Sciences Journal, 2(1*) 2007 P2 [↑](#endnote-ref-7)
7. Okelighlomike Iroughere, *Adjustment and error analysis for control network for dam deformation monitoring by GPS,* [www.scribed.com/doc/damsinnigeria](http://www.scribed.com/doc/damsinnigeria) accessed on 27/7/2012. [↑](#endnote-ref-8)
8. John A. Dixon et al, *dams and the environment*, p1 [↑](#endnote-ref-9)
9. en.wikipedia.org/typesofdams [↑](#endnote-ref-10)
10. en.wikipedia.org/typesofdams [↑](#endnote-ref-11)
11. Yang H. Haynes, M. Winzenread and Okada K., *the History of Dams*, [www.cee.engr.uacdavis.edu](http://www.cee.engr.uacdavis.edu) accessed on 28/7/2012 [↑](#endnote-ref-12)
12. Yang et al, *History of Dams* [↑](#endnote-ref-13)
13. Yang et al, *History of Dam*s [↑](#endnote-ref-14)
14. Yang et al, *History of Dams* [↑](#endnote-ref-15)
15. Yang et al, *History of Dams* [↑](#endnote-ref-16)
16. Yang et al, *History of Dams,* [↑](#endnote-ref-17)
17. en.wikipedia.org/karibadam [↑](#endnote-ref-18)
18. en.wikipedia.org/kainjidam [↑](#endnote-ref-19)
19. J. A. Handidu, National Growth, Water Demand and Supply Strategies in Nigeria in the 1960’s, in *Journal of the Nigerian Association of Hydro geologist (NAH)* Vol 2 No.1 Oct 1990 [↑](#endnote-ref-20)
20. [www.onlinenigeria.com/water](http://www.onlinenigeria.com/water) accessed on July 27/7/1012 [↑](#endnote-ref-21)
21. Nigerianwiki/wiki/national \_development\_plan [↑](#endnote-ref-22)
22. Handidu, *National Growth, Water Demand and Supply Strategies in Nigeria*, P2 [↑](#endnote-ref-23)
23. River Basins Development Authorities; are Act to establishes and regulates all river basin authorities in Nigeria. The Act lists their functions as agriculture, irrigation, fisheries, forestry and veterinary institute. The Act also establishes the 12 river basin authorities as: Anambra- Imo River Basin Authority, Benin-Owena River Basin Authority, Chad River Basin Authority, Cross-River River Basin Authority, Hadeija-Jamaare River Basin Authority, Lower Benue River Basin Authority, Upper Benue, Upper Niger River Basin Authority, Lower Niger River Basin Authority, Niger-Delta River Basin Authority, Ogun-Oshun River Basin Authority, Sokoto-Rima River Basin Authority. These twelve River basin authorities are under the Federal Ministry of Agriculture. See Federal ministry of Agriculture Water Resources And Rural Development, *Feasible Studies for the Dadin Kowa Irrigation Project,* Nene co Nig Ltd, Ibadan, 1992. pp1-3 [↑](#endnote-ref-24)
24. Handidu *National Growth, Water Demand and Supply Strategies in Nigeria,* p2 [↑](#endnote-ref-25)
25. A.S. Sambo, *Matching Electricity Supply with Demand in Nigeria,*  paper presentation in aWorkshop on 29 July 2008 [↑](#endnote-ref-26)
26. Comparing the two largest economies in Africa, Nigeria with a population of about 167 million people is generating less than 5,000 MW while South Africa with a population of 47 million people is generating 40,000 MW. Daily Trust, 15 August, 2012. p 17 [↑](#endnote-ref-27)
27. Handidu, *National Growth, Water Demand and Supply Strategies in Nigeria* p3 [↑](#endnote-ref-28)
28. It was officially commissioned on 15th June 1987 by General Ibrahim Badamasi Babangida. [↑](#endnote-ref-29)
29. en.wikipedia.org/dadinkowadam [↑](#endnote-ref-30)
30. en.wikipedia.org/dadinkowa dam [↑](#endnote-ref-31)
31. Interview with Malam Abdulhamid Bature, Area Cooperative Officer, Dadin Kowa Dam, on 1st August, 2012. [↑](#endnote-ref-32)
32. The name Dadin Kowa was given to the present day town of Dadin Kowa by Hausa migrant from Sokoto area in the 1960’s who mostly are farmers. At arriving Gombe areas, they seek for land from the then Emir of Deba who later refer them to Gwani, a nearby village. Upon their arrival, the then Hakimi of Gwani allocated to them the land of the present day Dadin Kowa town. As a result of the fertile soil for farming and grazing animals which is far better than their previous location, the newly Hausa migrant name it Dadin Kowa meaning enjoyment for all whoever settle there. Interview with Malam Abdulhmid Bature, on 1 August, 2012. [↑](#endnote-ref-33)
33. Interview with Malam Abdulhamid Bature, on 1 August, 2012 [↑](#endnote-ref-34)
34. Maryam M. Jungudo and A. M. Ashafa, *“State Creation and Urbanisation in Northern Nigeria: Examples of Sokoto and Gombe States*” In A.M.Ashafa (Ed) Urbanisation and Infrastructure in Nigeria since he Twentieth Century: Festscrhiff in Honor of Prof. Ezzeldin Mukhtar Abdulrahman Kaduna State University 2011, p211 [↑](#endnote-ref-35)
35. Maryam M. Jungudo and A. M. Ashafa, *State Creation and Urbanisation in Northern Nigeria: Examples of Sokoto and Gombe States,* p211 [↑](#endnote-ref-36)
36. Sani Abba et al, *Gombe State: A History of Land and the People*, Ahamdu Bello University Press Ltd, 2000 p15. [↑](#endnote-ref-37)
37. Sani Abba et al, *Gombe State: A History of Land and the People,* p1 [↑](#endnote-ref-38)
38. Interview with Malam Abdulhamid Bature, on 1st August 2012 [↑](#endnote-ref-39)
39. Interview with Malam Abdulhamid Bature on 1st August, 2012 [↑](#endnote-ref-40)
40. Compiled from http//gombesatate.gov.ng/investment-potentials accessed on 29/7/2012 [↑](#endnote-ref-41)
41. Interview with Usman J. Umar, Department of Geology and Drilling, Gombe State Water Board (GSWB) on January 2011 [↑](#endnote-ref-42)
42. Maryam and Ashafa, *State Creation and Urbanisation in Northern Nigeria: Examples of Sokoto and Gombe States,* p 212 [↑](#endnote-ref-43)
43. A regional water project aiming at utilising the waters of Dadin Kowa dam initially awarded throughout the tenure the state government but it did not achieve up to 10 percent execution. Interview with Mr Samuel, January 2011 [↑](#endnote-ref-44)
44. Interview with Mr Samuel, Planning and Project Manager, Gombe State Water Board, on January 2011 [↑](#endnote-ref-45)
45. Interview with anonymous on January 2012 [↑](#endnote-ref-46)
46. Interview with Engineer Salisu A. Boyi, Operation and System Manager, Gombe State Water Board (GSWB) on February 2011 [↑](#endnote-ref-47)
47. Interview with Engineer Salisu A. Boyi, on February 2011 [↑](#endnote-ref-48)
48. Interview with Engineer Salisu A. Boyi on February 2011 [↑](#endnote-ref-49)
49. Interview with engineer Salisu A. Boyi on February 2011 [↑](#endnote-ref-50)