International Journal of Intellectual Discourse (IJID)
ISSN: 2636-4832 Volume 5, Issue 2. June, 2022

Effect of Dadin-kowa dam on rural development in Yamaltu Deba Local Government Area of Gombe State

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Abstract
Water is central to both global population and the expanding economic activities. The increasing need for water and without the corresponding increase of its sources lead to its depletion which causes severe scarcity thereby compelling people to look for alternative sources, the consequence of which is the construction of Dams. While these dams create opportunities to people, they also pose some environmental and socio-economic problems to human population in communities where they are constructed. This study assesses the effect of Dadin Kowa dam on rural development in Yamaltu Deba Local Government Area (LGA) of Gombe State. Predicated on the popular Ecological modernization theory, the study generated data through questionnaires administered to 399 respondents which was corroborated with data from secondary sources. The study reveals that Dadin Kowa Dam has brought forward difficulties due to constant flooding in some communities during heavy downpour which in some cases washed away farmlands and caused displacement of the population, coupled with outbreak of diseases. The Dam is therefore seen to have had overriding negative impact on rural development in Yamaltu-Deba LGA. Accordingly, the study recommends that government should complete the building of canals and hydroelectric generation for the benefits of the people. Also Government should provide a comprehensive social impact assessment with the view to understanding and reduce to the barest minimum the hardship encountered by the communities through proper payment of compensation and giving out relief materials.

Keywords: Ecology, Disease, Irrigation, Resettlement, Rural development

1. Introduction

Water is one of the most essential natural resources and a key element in socio-economic development of any civilization. Most economic activities like agriculture, industry, transportation among others largely depend on this vital resource. Its availability is one of the basic building blocks of any given society. However, the ever increasing world population and expanding economic activities deplete water resources, cause scarcity and foster immense competition; thus compel 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) and also enhance livelihood through the provision of electricity, irrigation and so on. Critical infrastructures such as Dams could improve standards of living of people in communities where they are situated thereby bolstering rural development.

Rural development essentially entails an improvement in the living standards of people living in rural communities. Dam can serve as major source of rural development as it cannot only provide

water for domestic use and irrigation, but could also provide electricity. These amenities are the essential ingredients needed for the improvement of peoples' living standards in communities anywhere in the world. Through provision of clean water, peoples' quality of life improves; through irrigation, food production would increase thereby enhancing food sufficiency and ensuring food security while through electricity, local industries such as food and agro processing could thrive. These would translate to economic growth and development which in turn could translate to rural development.

However, some socio-economic and environmental consequences associated with dam construction across the globe have made experts to debate whether such critical infrastructures are beneficial or detrimental to either environment or human population. Hazards such as ecosystem fragmentation, blockade of downstream sedimentation, riverside and coastal erosion, disease outbreak, resettlement issues, flooding and other climatic disorders/problems have been identified with dam construction world over.

The construction of Dadin Kowa dam came as a rural development project to increase availability of water, enhance irrigation and provide electricity. Therefore, provision of water for consumption and domestic use; irrigation to reduce over reliance on rain fed agriculture and improve food production and rural electrification to empower communities were among the major objectives of the dam for the overall development of rural communities in Yamaltu-Deba LGA in particular and Gombe State in general. This study therefore, assesses the effect of the dam on rural development in Yamaltu-Deba LGA. The objective is to determine the extent to which irrigation bolstered rural development in Yamaltu-Deba LGA. Accordingly, the study formulates the following hypothesis;

H_0 Irrigation has a significant positive impact on rural development in Yamaltu-Deba LGA.

2. Literature review

Critical infrastructures such as dams are important for development as they are not only sources of drinking water but electricity, irrigation, transportation and so on (Tahmicooglu et al., 2007; Cuciureanu & Latu, 2016). However, studies abound where negative impacts of dams such as flooding, outbreak of diseases, land degradation and even poverty were emphasized (Egre & Senecal, 2003; Dufl & Pande 2007; Bhaitia et al 2008; Tilt et al 2009; Strob & Strob, 2011; Scudder, 2012; Rahamati, 2012; Riahi, 2013; Huiyi 2013 and Krichher & Charles, 2016). This had made some to advocate for a halt in the construction of dams especially in the developing countries where the impacts are more devastating. This view is considered extreme when the importance of dam is considered. Therefore, what is needed is how to curtail, to the barest minimum, its negative effect. For instance, Sahdati et al., (2009) argue that if management is efficient and optimal both before and after dam construction, many negative consequences could be prevented, while directing the development process towards environmental sustainability. Numerous studies conducted on dams across the world show that communities have benefited and suffered from its construction.

The Pak Mun Dam in Thailand has contributed to economic wellbeing of communities around causing a rise in their standard of living (The World Commission on Dams, 2000). On the hand, local communities in China were environmentally vulnerable with increased farmland erosion and landslide rate as a result of the Three Gorges Dam (Campbell-Hyde, 2013). To communities in Manipur, North-east India, the Khoupum Dam was both a blessing and curse (Rongamei & Manipur, 2013). According to the study, it

provided irrigated water to about 50 hectares of land but submerged over 60 hectares. Swamps in the area dried up and turned uncultivable due to impounding of water by the dam thereby increased the net sown agricultural areas which in turn had devastating effect on the wetland ecosystem and decreased soil fertility due to active erosion in the downstream valley.

In Nigeria, Usman & Ifabiyi (2012) analyze the socio-economic impacts of Shiroro Hydropower generation in lowland areas of middle river Niger. Result shows the distortion of economic engagements of the riparian communities, noticeable on both fish biodiversity and ecosystem with a resultant loss of some fish-species; a dismal fall in productivity of small holder farmers and fishermen occasioned by avoidable flooding and deterioration of strategic social and economic infrastructure which have slowed down socio economic development in the area. In the same vein, Ngabea (2013) assessed the impacts of Kishimbilla Dam in Takun LGA of Taraba state. The study reveals that despite the enormous importance of the Dam, serving as buffer should there be a collapse of the lake Nyos in Cameroon. There were a number of negative impacts ranging from relocation of people in large numbers from Birama to other villages like Hanki, Mango, Alahu, Tundun and so on with attendant high cost of resettlement; outbreak of water borne diseases like schistomomiasis, malaria, and yellow fever among people of Jinagbanshin, Lukpo, Shibon igba and Biriki lisa and the loss of Historical and Archaeological site like the valley between "Kuna Bete" and "Kuna Kashinbilla" which was a site for Takaciyawa festival. From the foregoing, Dams all over the world have been both a blessing and a course to communities and also have a double edged impact on rural development.

Rural development has been viewed as that part of development that seeks to enhance the quality of life in the rural areas by providing basic infrastructural facilities (Ezeah, 2005; Omale, 2005 and Barrios, 2007). Uma Lele in her seminal work describes it as improving living standards of the mass of the low-income population residing in rural areas and making the process of their development self-sustaining (Lele, 1975). Others describe it as an integrated approach to food production, provision of basic amenities for the overall improvement of quality of life and economic well-being of people living in rural areas (Ogeidefa (2010) in Paul et. al, 2014; Aboniyi & Nnamani 2011; Otigba 2013 and Sam, 2014). From the foregoing, it is clear that rural development entails a deliberate planned change in all aspect of rural communities with a view to attaining desired improvement in living standards. Rural development is a state in which rural areas attain to enable its populace achieve improved living condition which drives economic growth and prosperity.

Rural development entails an overall improvement of living standards of people living in rural communities. It is also, about reduction of poverty, increasing productivity, provision of basic services like health, education, drinking water, sanitation, extending infrastructure, attempt to reverse distorted land distribution and ownership and host of other aspects redressing inequality, exploitation and deprivation in any conceivable sense.

From the foregoing, dams across the world have made both positive and negative impacts to communities where they are constructed. The Dadin Kowa dam was constructed to provide drinking water, irrigation and electricity for the planned Gongola sugar plantation project which are all components of rural development. From the numerous studies conducted on several dams in Nigeria, none focuses on the in impact of Dadin Kowa Dam on communities around and beyond it. Hence this study, the purpose of which is to assess the effect of the Dam on rural development in Yamaltu-Deba LGA of Gombe State.

Theoretical Framework

This research is built on the theory of Ecological Modernization. This 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 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 organization of production, based upon the theory of a changed relationship between the economy and ecology.

Dadin-Kowa Dam 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 neighbors. Ecological Modernization theory, therefore, presupposes the construction of Dadin-Kowa dam for the 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 modernization 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 a way to effectively improve the socio-economic life of the people at the same time sustain the environment for future generation. Irrigation agriculture benefits should be achieved in retention of soil content and fertility, fish farming should flourish without fish extinction, hydro-electric generation should flourish without pollution and portable water without spill.

3. Methodology

This study adopts descriptive survey design. Data was obtained through review of relevant literature and administration of questionnaires. Population of the study comprises of all inhabitants of Yamaltu-Deba LGA of Gombe State. The study was conducted in three wards namely; Hinna-Dadin Kowa, Gwani-Shingen Wade and Difa-Lubo-Kinafa with an estimated population of 48765 (NPC, 2006). The sample size was determined using Yamani's (1967) formula where 399 was the approximated sample size. A multistage cluster sampling technique was employed to draw respondents for the study. The method was found apt as it allows for a population stratified into subgroups with similar characteristics, it the allows the use of simple random sampling to select from each of the strata giving each element within the same strata the chance of selection, randomly and unbiased. The LGA was first clustered into wards; from the wards, three were purposely selected due to their proximity to the dam; from the selected wards, 133 households were systematically selected and finally, an adult was selected from each of the 399 households.

Data from the field was edited for accuracy, completeness and consistency, then analysed using descriptive statistics. This entailed the use of measures of central tendency. The descriptive statistical tool (Statistical Package for the Social Sciences version 23 and Excel) was used during the analysis. The results were presented in tables, percentages, and measure of central tendency measured on a five-point Likert scale for easier interpretation and reporting. 3.0 was adopted as the starting point of acceptance for each Likert item while chi square was used in testing hypothesis.

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; Deba lies within latitude 11.13˚, and longitudes 11.24˚, of the equator. The local government has an approximate population of 255,248 thousand people with 1,981 km2 land mass (NPC, 2006). The LGA consists of (11) wards vis: Deba, Difa-Lubo-Kinafa, Gwani-Shinga, Wade; Hinna; Jagali north; Jagali south; Kanawa, Wajari. Kwadan, Liji, Kurba; Lubo, Kunawa, Wuro birdaka; Kuri, Lano, Lambam; and Zambuk Kwali.

4. Results and Discussion

Data generated for this study are presented, analyzed and discussed in this section. From the 399 questionnaires distributed, 388 were retrieved loosing 11. Another 7 were discarded during data cleaning. The total number of valid questionnaires used for the analysis was 381 making a return rate of 95.4%.

Table 1: respondents' views on the impact of Dadin-kowa Dam in Yamaltu-Deba LGA

Likert Item	S.A	A	N	D	SD	Total	Mean	Decision
The dam led to the destruction of natural habitats	52 (13.65)	178 (46.72)	61 (16.01)	53 (13.91)	37 (9.71)	1298	3.41	Agree
The surrounding communities experience flooding yearly due to the dam	92 (24.15)	169 (44.36)	47 (12.34)	46 (12.07)	27 (7.08)	1396	3.66	Agree
People displaced by the dam faced enormous challenges in resettling	76 (19.95)	133 (34.91)	74 (19.42)	57 (14.96)	41 (10.76)	1289	3.38	Agree
There was prevalence of water borne diseases in the communities due to the dam	79 (20.73)	140 (36.75)	63 (16.54)	57 (14.96)	42 (11.02)	1300	3.41	Agree
During construction of the dam, the communities were polluted	49 (12.86)	99 (25.98)	79 (20.73)	87 (22.84)	67 (17.59)	1119	2.94	Disagree
Construction of the dam led to conflict in the communities	47 (12.34)	82 (21.52)	87 (22.83)	92 (24.15)	73 (19.16)	1081	2.84	Disagree
People from the communities lost their lives due to the dam	44 (11.55)	52 (13.65)	69 (18.11)	149 (39.11)	67 (17.58)	1000	2.62	Disagree
Large area of arable land was submerged in the dam	86 (22.57)	163 (42.78)	54 (14.17)	46 (12.07)	32 (8.39)	1368	3.60	Agree
Large number of fishes were lost due to the dam	47 (12.34)	94 (24.67)	89 (23.36)	87 (22.83)	64 (16.80)	1116	2.93	Disagree

Source: Field Survey, 2019.

S. A=Strongly Agree; A=Agree; N=Neither; D=Disagree; S. D=Strongly Disagree.
If mean is <3.0, respondents Disagree.
If mean is >3.0 but ≤3.5, respondents are Undecided.
If mean is >3.5, respondents Agree.

Table 2 above shows views of respondents on the impact of the Dadin-kowa dam on communities in Yamaltu-Deba LGA base on a 5-point likert scale.

The first, third, fourth and eighth items with mean scores of 3.41, 3.66, 3.38, 3.41, and 3.60 respectively show that respondents agreed with the statements. This implies that the Dadin-kowa dam has contributed to the destruction of natural habitats, caused yearly flooding in the surrounding communities, people who were displaced faced enormous challenges resettling, there was prevalence of diseases and large areas of arable land were submerged in Yamaltu-Deba LGA.

Conversely, the fifth, sixth, seventh and ninth items have mean scores of 2.94, 2.84, 2.62 and 2.93 respectively. This shows that communities were not polluted due to construction of the dam, there was no conflict, lives were not loss and fishes were not lost in Yamaltu-Deba LGA due to its construction.

Table 2: Summary of results

Variable	SA	A	N	D	SD	Total
The dam led to the destruction of natural habitats	52	178	61	53	37	**381**
The surrounding communities experience flooding yearly due to the dam	47	94	89	87	64	**381**
People displaced by the dam faced enormous challenges in resettling	76	133	74	57	41	**381**
There was prevalence of water borne diseases in the communities due to the dam	79	140	63	57	42	**381**
During construction of the dam, the communities were polluted	49	99	79	87	67	**381**
Construction of the dam led to conflict in the communities	47	82	87	92	73	**381**
People from the communities lost their lives due to the dam	44	52	69	149	67	**381**
Large area of arable land was submerged in the dam	86	163	54	46	32	**381**
Large number of fishes were lost due to the dam	92	169	47	46	27	**381**
Total	**572**	**1110**	**623**	**674**	**450**	**3429**

X^2 calculated = 362.463 d.f= 32 X^2 table value= 46.194 α=0.05

Decision rule

From table 3 above, the table value (46.194) is less than the calculated value (362.463). Therefore, the Null Hypothesis is rejected and the Alternative Hypothesis is accepted which states that: Irrigation had no significant positive impact on rural development in Yamaltu-Deba LGA.

Discussion of Findings

Findings from this study indicates that the Dadin-Kowa Dam have considerable negative impact on both the environment and socio-economic activities of communities in Yamaltu-Deba LGA of Gombe State. Result shows that natural habitat was destroyed due to the dam, this supports the finding by Campbell-Hyde (2013) where it shows how communities experienced increased in farmland erosion and landslide rate due to the Three Gorges Dam in China. Equally, result indicate a high rate of flooding in Yamaltu-Deba LGA which corroborates finding by Rongamei & Manipur (2013) where over 60 hectares of farmlands were submerged across Minipur in North-East India due to the Khoupum Dam.

This study reveals that in the year 2017 alone, more than 250 houses were destroyed in addition to many lives lost in Dadin-Kowa town, including farmlands, crops and livestock. This left a lot of people in those communities homeless while others were displaced. This is similar to what people experienced Birama where they had to relocate places like Hanki, Mango and others in Takun LGA of Taraba State due to the Kishimbila Dam, according to Ngabea (2013). Not only that, as the result shows here, communities in Yamaltu-Deba LGA suffered from

outbreak of some waterborne diseases, like their counterparts in Jinagbanshin, Lukpo and others in Takun LGA of Taraba State who suffered from outbreak of diseases such as schistomomiasis, malaria and yellow fever due to the Kishimbila Dam (Ngabea, 2013).

The adverse effects of the Dadin-Kowa Dam on populations in Yamaltu-Deba LGA include displacement of families, even host communities; where families are resettled have been affected. Those downstream of the dam, whose livelihood and access to resources are affected in varying degrees by altered river flows and ecosystem fragmentation, while those in the upstream were affected by the growing body of water that causes serious floods in their area.

The challenges of flooding, outbreak of water borne diseases as well as displacements with attendant difficulties in resettlements occasioned by the Dadin-Kowa Dam only implies a drastic drop in agricultural activities which is the major occupation of people living in Yamaltu-Deba LGA. Decrease in agricultural activities means food insufficiency which in turn means low quality of life.

5. Conclusion and Recommendations

Dams are critical infrastructure that have contributed in the improvement of living standards of people especially those residing within the environment it is resided. This is through the provision of amenities such as water, electricity and irrigation. However, studies abound which show how dams have adversely affected communities around the world. This study highlights the effects of Dadin-Kowa dam on rural development in Yamaltu-Deba LGA of Gombe State. The study has shown that the Dadin-Kowa dam despite its good intensions have become more of a curse than a blessing to the communities in Yamaltu-Deba LGA who suffered some biophysical, socio-economic, and geopolitical impacts due to the Dam. Often through the loss of ecosystem services provided by fully functioning aquatic systems, the dam wiped out different aquatic species, flooded huge wetlands, forests and farm lands; and displaced villages living both up and down stream. The results here show that the Dadin-Kowa dam has not bolstered rural development in Yamaltu-Deba LGA of Gombe State.

To manage reoccurrence of such catastrophe it does not just mean simply consulting the tables and making comparisons, or applying mathematical formulae. 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 protection of this zone against flooding and other unpleasant consequences of sustainability. While the results will allow the population to better organize their activities in terms of seasonal agricultural work. 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.

The study makes the following recommendations:

1. Government should make available a comprehensive social impact assessment largely to reduce to the barest 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 1980s and those affected by year round flood incidence. This will enable the host communities to derive the benefit of dam construction and utilization particularly, that of income generation,

employment opportunities as well as general standard of living. 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.

2. 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.

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