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SOCIOECONOMIC IMPACT OF THE KASHIMBILA DAM ON HOST COMMUNITIES IN TAKUM LOCAL GOVERNMENT AREA, TARABA STATE, NIGERIA

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Abstract

Dam construction and operations are known to bring a range of benefits; however, they also often result in significant negative environmental, social, economic, and livelihood impacts on nearby communities. This study evaluates the socioeconomic and environmental impacts of the Kashimbilla Multipurpose Dam on the adjoining communities in Takum Local Government Area, Taraba State, Nigeria. A field survey was conducted using questionnaires, personal observations, and interviews with community members to gather comprehensive data. The findings revealed that most of the population in the study area relies on rain-fed agriculture, with maize and guinea corn being the primary crops. Irrigation practices are minimal, but fishing activities have notably increased since the dam's construction, contributing to a boost in local trading activities. Several socioeconomic benefits were observed, including the construction of access roads to previously isolated communities, enhanced navigation opportunities, and the creation of employment for residents. However, the dam has also had considerable adverse impacts. Notably, the displacement of entire communities such as Birama and Ngadi Gadin has occurred, leading to the loss of over 80% of farmlands and the destruction of historically significant areas used for cultural festivals. The impoundment of the river has also led to an increase in waterborne diseases among the affected populations. Despite these challenges, over 75% of respondents acknowledged that the dam has brought development and employment opportunities to the local communities.

Keywords: Dam, Host, Impact, Socio-economic, Takum

1. Introduction

Oruonye (2015) notes that most of the primary civilizations of the world emerged in or near river valleys, highlighting the significance of water bodies in human history. The construction of dams and other hydraulic structures is one of the oldest branches of engineering, dating back to ancient times. Dams are not merely ordinary engineering structures; they are vital in meeting water demands during dry periods and in regulating stream regimes. Beyond controlling stream flows, dams have substantial positive and negative impacts on the environment and society.

Historically, dams have been constructed to prevent floods, supply drinking and domestic water, generate energy, and facilitate irrigation. The earliest dams likely served primarily for irrigation, flood control, and water supply. Over time, water impoundment also enabled the controlled release of water to generate energy, initially through water wheels and later via hydroelectric generators. Other purposes of dams include maintaining adequate river flow for navigation and providing facilities for recreation (Ngabea, Liberty, & Bassey, 2013).

Most modern reservoirs are designed to serve multiple purposes. Typically, the role of a water storage reservoir is to impound water during periods of high flow and release it gradually during low flow periods. In some cases, the sole purpose of impoundment is to create a new body of standing water for uses such as fishing, boating, or water-heat dissipation from a thermoelectric-generating plant (Baxter, 2005). Despite their advantages, such as meeting society's basic needs and improving living standards, dams also pose significant risks to living beings and the environment (Ngabea et al., 2013).

According to Sait et al. (1995), nearly 700 dams were built every ten years up to the 1950s, with the number increasing rapidly thereafter. However, it was observed that while these dams were constructed and completed, something critical was often missing, leading to detrimental effects. Although the positive impact of water on human life and the development of civilizations is well-known worldwide, it is claimed that the economic benefits expected from water resource projects were not always realized, and necessary precautions to mitigate environmental, economic, and social losses were frequently overlooked.

This study aims to assess the socioeconomic and environmental impacts of the Kashimbilla Multipurpose Dam on the host communities in Takum Local Government Area, Taraba State, Nigeria. Specifically, it examines how the dam has influenced local ecosystems, agricultural practices, and economic development, including the creation of employment opportunities and the enhancement of trading activities. The study also explores the displacement and resettlement challenges faced by affected communities, particularly the loss of farmlands, historical sites, and livelihoods.

2. Methodology

2.1 Study area

Takum is geographically situated between latitudes 6°22'N to 7°30'N and longitudes 9°40'E to 10°20'E (Fig.1). The Local Government Area (LGA) is bordered to the north by Donga and Wukari LGAs, to the west and southwest by Benue State, to the east by Ussa LGA, and the southeast by the Republic of Cameroon. Takum LGA spans a landmass of 2,542 km² and, according to the 2006 national census, has a population of 135,349 people, comprising 68,863 males and 66,486 females. The LGA is administratively divided into 11 political wards and 3 districts: Chanchanji, Kashimbila, and Takum. The Kashimbilla Dam is located in the Kashimbilla district, approximately 50 km southwest of Takum town in Taraba State.

The Kashimbilla Multipurpose Buffer Dam, located in Takum Local Government Area of Taraba State, Nigeria, has played a significant role in fostering local economic development through the creation of employment opportunities during its construction and operation. The construction of the dam began in 2014, was completed in 2019, and was officially commissioned by the Federal Government of Nigeria on Thursday, May 18, 2022.

The primary purpose of the dam is to serve as a buffer against potential flooding resulting from the collapse of the upper reaches of Lake Nyos, situated in the hills of Cameroon upstream of the Kashimbilla River. In addition to its flood control function, the dam supports an irrigation scheme covering approximately 3,286 hectares, provides a water supply network to Takum, Kashimbilla, and neighbouring villages, and serves as a source of hydroelectric power generation.

Majority of the people in Takum area are engaged in Agricultural, commercial and trading activities and only a few are civil servants. Agriculture is the main source of income and highly important economic and cultural activities of the people of the area. The main crops grown in the area are maize, yam, groundnut, cassava, vegetables, rice and guinea corn. Other farm products like plantain, oranges, oil palm, etc. are also produced in the area (for both commercial purposes and household consumptions).

Communities living on the banks of Kashimbilla, Sufa and Manya rivers engage in fishing activities all year round. However, the fishing activities are carried out in a small scale due to fluctuations in the size of the rivers (mainly influenced by the seasons), except for river Kashimbilla whose fishing activities have greatly been improved by the dam construction.

In terms of trading and commercial activities, the primary economic pursuit of the people in Takum LGA revolves around the buying and selling of agricultural products, particularly farm produce such as plantain, banana, maize, guinea corn, and rice. These goods are sourced from the rural areas, either in bulk or smaller quantities, and are then traded both within and outside the communities where they are produced. The abundance of agricultural activities has led to a significant portion of the population residing in rural areas, with only a small fraction living in the local government headquarters, Takum town. Buyers come from within and beyond the state to purchase these farm products.

According to Udo's (1991) climate classification in northern Nigeria, Takum LGA experiences a tropical climate characterized by distinct dry and wet seasons. The wet season begins in March and lasts until late October, with the wettest months being July and September. The southwest winds from the Atlantic Ocean significantly influence the area's climate during this period. The dry season, which starts in November and ends in mid-March, coincides with the harmattan period when dusty North-East trade winds from the Saharan desert have a marked effect on the region's climate. This season is characterized by cold, dry conditions, with January and February being the driest months. March is typically the hottest month, with temperatures ranging from 27°C to 28°C and relative humidity dropping to around 38%. The mean annual rainfall in Takum LGA ranges between 1,020 mm and 1,035 mm.

The vegetation in the Takum area is classified into Guinea Savannah and Savannah Woodland, with tree heights ranging from a maximum of 18 meters to a minimum of 10 meters. The region is situated in the southern part of the Southern Guinea Savannah. To the north, around latitude 7°15'N, the area is characterized by tall tree savannah, with associated grasses and plants varying depending on soil types. However, the vegetation has been significantly impacted by ongoing deforestation, frequent bush fires, and overgrazing (Mitchell, 1991).

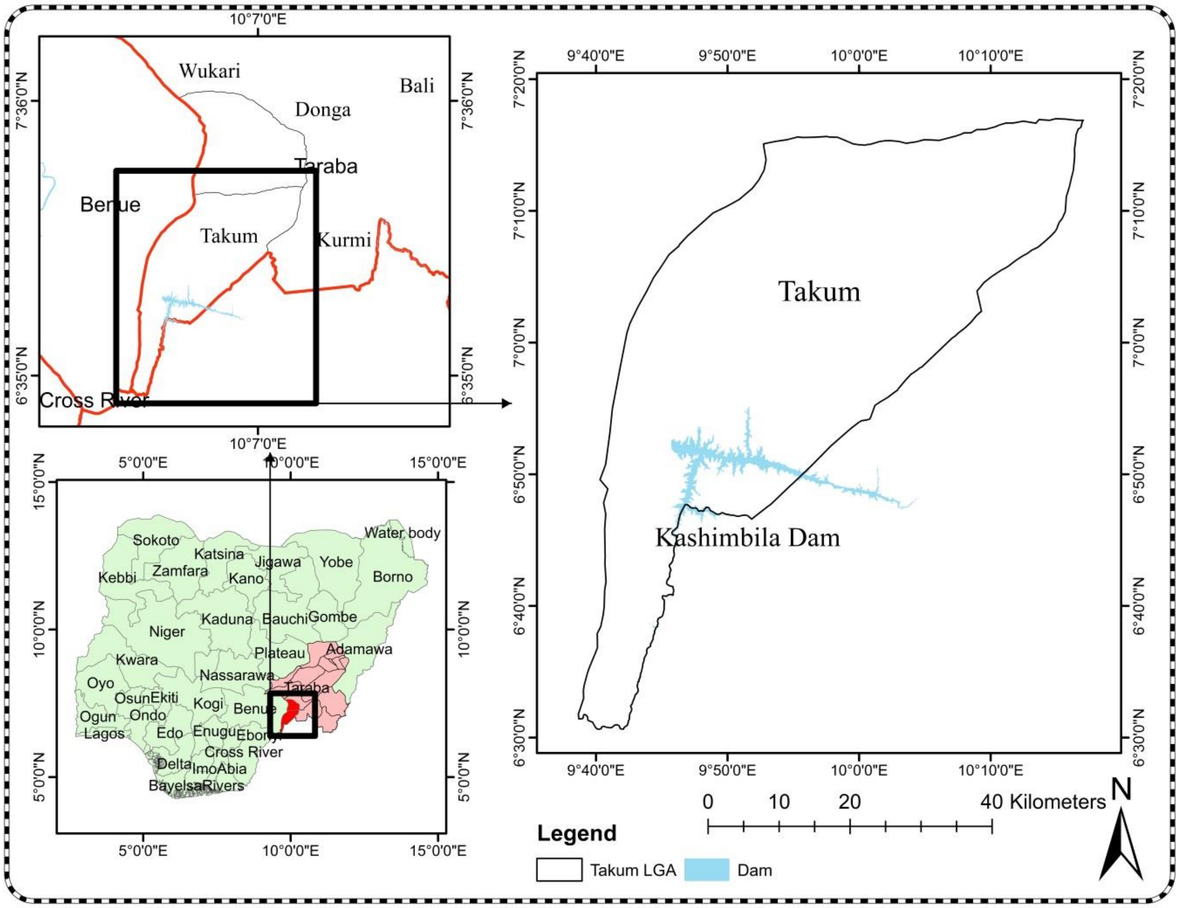

Figure 1: Study Area
Source: GIS and Remote Sensing Unit, Department of Geography, Gombe State University, Gombe.

2.2 Methods

Primary data were collected directly from field surveys, personal interviews, and questionnaires to achieve the study's stated objectives. Secondary data were sourced from previous research, journals, textbooks, newspapers, unpublished and published theses, the internet, and census data.

A comprehensive range of data was essential for effectively examining the issues related to the Kashimbilla Dam. Therefore, both primary and secondary data sources were utilized. A structured questionnaire served as the primary tool for data collection. Responses gathered from the questionnaires were statistically analyzed using frequency percentages within the study area.

The unit of analysis for this study was individual households, while the unit of observation was at the personal level. Face-to-face interviews, facilitated through structured questionnaires, were conducted to collect data. Convenience sampling was employed as the sampling strategy due to the uncertainty of whether individuals resided in the villages, given that many worked in urban cities. Additionally, sending questionnaires by post was deemed ineffective, as respondents were not accustomed to using postal mail. Face-to-face interviews proved advantageous for obtaining qualitative information, which was used to corroborate survey results.

The household survey was conducted between January and March 2015. This dataset addresses the socio-economic profile of the respondents, including age, occupation, and years of experience in work, as well as the socio-economic and livelihood impacts of the dam on the communities. The impact assessment was carried out in six selected communities within the study area: Mgbye, Bawuru, Bibi, Birama, Mutum-Daya, and Ngadi Gadin (Tab. 2). Structured questionnaires were used to gather information on the dam's impact.

The population of Kashimbila is about 116,798 persons based on population projection of 2023 (NPCN, 2023). A formula developed by Krejcie and Morgan (1970) with 0.5% confidence level has used to determine the sample size of this study.

The formula is Denoted by $s = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$.

s = required sample size. X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841). N = the population size. P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

Table 1: Sample Size of the Study Area

S/N	Selected Community	Population 1991	Projected population 2023	Sample size
1.	Mgbye	7,421	14,623	48
2.	Bawuru	11,002	21,680	71
3.	Bibi	13,205	26,021	85
4.	Birama	8,502	16,753	55
5.	Mutum-daya	8,920	17,577	58
6.	Ngadi Gadin	10,223	20,145	66
	Total	**59,273**	**116,798**	**383**

Table 1:

The Sample size is determined by the formula: (A ÷ TP) SS (from table)

Where: A=Population of community A. TP=Total population of the selected communities. And SS= sample size given by the Krejcie and Morgan's table. (For instance, Mgbye; (14,623 ÷ 116,798) 383 = 48.)

Therefore, a total of 383 questionnaires were administered across the six communities of the study area using systematic random sampling techniques.

2.3 Results

2.3.1 Socioeconomic Characteristics of Respondents

Table 2 illustrates the socio-economic profile of the study participants. It has shown that a significant proportion of respondents, specifically 48.0%, fall within the age range of 26 to 35 years. This demographic primarily represents the working class, suggesting that their insights and experiences regarding local conditions and events are particularly relevant.

Table 2: Socioeconomic status of Respondents

Characteristics	Category	Frequency	Percentage (%)
Age	16 – 25	31	8.0
	26 – 35	183	48.0
	36 – 45	96	25.0
	46 – 55	46	12.0
	56+	27	7.0
	Total	383	100
Education Level	Primary	142	37.0
	Secondary	157	41.0
	Tertiary	54	14.0
	Non-formal education	30	8.0
	Total	383	100
Occupation	Farming	161	42.0
	Fishing	119	31.0
	Trading	57	15.0
	Civil servant	38	10.0
	Others	8	2.0
	Total	383	100

Source: Field Survey, 2023.

Regarding educational background, most respondents have completed secondary education, accounting for 41.0% of the sample. This is closely followed by those with primary education, which makes up 37.0% of respondents. Tertiary education is held by 14.0% of the respondents, while only 8.0% have received non-formal education. These statistics indicate that most respondents possess a sufficient level of education, which is likely to enhance their comprehension of the questionnaire items and contribute to the quality of the data collected.

Regarding occupations, a notable portion of respondents are engaged in farming, representing 42.0% of the community. Fishing is the next most common occupation, comprising 31.0% of respondents. Traders account for 15.0%, while civil servants make up 10.0% of the sample. This occupational distribution indicates that the data is sourced from individuals who are directly affected by the impacts of the dam, further strengthening the relevance of their responses.

2.3.2 Socio-economic Impact of Kashimbila Dam on Adjoining Communities

Table 3: Uses of the Dam

Benefits of the Dam	Frequency	Percentage (%)
Agriculture	268	70.0
Industrial Uses	0	0.0
Domestic Uses	77	20.0
Other	38	10.0

Source: Field Survey, (2024)

The responses regarding the impact of the dam on the socio-economic activities of the community indicate that the dam plays a crucial role in agricultural development (Tab.3)t. A noteworthy 70.0% of respondents believe that the primary benefit of the dam is its provision of water for farming, which supports agricultural activities during both the rainy and dry seasons. Additionally, 20.0% of respondents emphasized that the dam also serves domestic purposes, while 10.0% identified various other benefits. These findings highlight the dam's significant contributions to enhancing the livelihoods and overall well-being of the community.

The analysis of the types of crops cultivated by respondents before and after the construction of the dam reveals significant changes in crop production patterns (Table 4) Before the dam construction, 36.0% of respondents reported growing maize, making it the dominant crop, followed by guinea corn at 24.0%, rice at 20.0%, cassava at 12.0%, and other crops at 8.0%. After the dam was constructed, maize remained the most widely cultivated crop, with 43.0% of respondents growing it. Rice saw a notable increase, with 32.0% of respondents cultivating it after the dam, while the percentage of those growing guinea corn dropped to 12.0%. Cassava production slightly decreased to 8.0%, and the percentage of respondents growing other crops fell to 5.0%. This analysis indicates that, while maize continues to be the primary crop for both periods, there has been a shift in relative production levels, particularly with the increase in rice cultivation after the dam's construction.

Table 4 Types of Crops grown in the communities before and after dam construction

Types of Crops	Crop Production Before the Dam	Percentage (%)	Crop Production After the Dam	Percentage (%)
Maize	138	36.0	165	43.0
Guinea Corn	92	24.0	46	12.0
Rice	77	20.0	123	32.0
Cassava	46	12.0	30	8.0

The data presented in Table 5 illustrates a significant shift in farming systems following the construction of the dam. There is a notable decrease in reliance on rain-fed agriculture, dropping from 83.0% before the dam to 68.0% afterwards. This change likely reflects improved water management and farming options made possible by the dam's construction.

The percentage of respondents using irrigation increased from 7.0% before the dam to 15.0% afterward, indicating a shift toward more sustainable and controlled farming practices. Additionally, the proportion of respondents utilizing both rain-fed and irrigation systems rose from 10.0% to 17.0%. This suggests that farmers are beginning to adopt more diversified approaches to mitigate risks associated with changing weather patterns and to maximize crop yields.

Overall, the data on farming systems before and after the dam's construction reveals that, while a significant majority continued to rely on rain-fed agriculture, there has been a meaningful increase in the adoption of irrigation practices. Despite the dam's introduction of new irrigation opportunities, a substantial portion of respondents remains engaged in traditional rain-fed agriculture, demonstrating resilience in established farming methods alongside the adoption of more modern techniques.

Table 5 System of Farming

Systems	Farming Practices Before the Dam	Percentage (%)	Farming Practices Before the Dam	Percentage (%)
Rain-fed	317	83.0	260	68.0
Irrigation	28	7.0	58	15.0
Both	38	10.0	65	17.0
TOTAL	383	100.0	383	100.0

Source: Field Survey, (2023).

2.3.2 Impacts on the Livelihood of the Communities

Regarding the livelihood impacts of the dam on local communities, 70.0% of respondents reported that their lives had improved as a result of the dam, while 30.0% felt that their lives had not improved following its construction. This indicates that the majority of people living near the dam have experienced positive changes in their livelihoods due to the dam's presence.

Table 6: Impact of Kashimbilla Dam on Communities

Impact	Frequency	Percentage (%)
Increase in income	149	39.0
Better access roads	138	36.0
Increase in agricultural yield	73	19.0
Others	23	6.0
Total	**383**	**100**

Source: Field Survey, (2023).

The improvements brought about by the dam are reflected in the responses of the local communities (Table 6). According to the survey, 39.0% of respondents reported an increase in their incomes due to the dam, 36.0% stated that the dam has led to better access roads in their communities, and 19.0% observed an increase in agricultural yields. Meanwhile, 6.0% mentioned other impacts. These findings suggest that the dam has significantly contributed to increased income and improved infrastructure, particularly road access, in the affected communities. Supporting this, Oruonye E.D. (2015) noted in his study that the Federal Government provided funds to the construction company to build alternative access roads for the local communities. Additionally, the affected communities were slated to receive several proposed developmental facilities, including access roads with drainage systems, boreholes, and a boat channel (Oruonye, 2015).

Table 7: Sources of Water Before and After the Dam Construction

Source of Water	Before Dam (Frequency)	Before Dam (%)	After Dam (Frequency)	After Dam (%)
Borehole	8	2.0	153	40.0
Well	38	10.0	96	25.0
River/Dam	268	70.0	38	10.0
Stream	50	13.0	77	20.0
Others	19	5.0	19	5.0
Total	**383**	**100**	**383**	**100**

Source: Field Survey, (2023).

When asked about the sources of water for their communities before and after the dam's construction (Table 7), respondents provided the following insights: Before the dam, 2.0% of respondents relied on boreholes, 10.0% used wells, 70.0% depended on rivers, 13.0% utilized streams, and 5.0% sourced water from other means. After the dam's construction, there was a notable shift: 40.0% of respondents reported using boreholes as their main water source, 25.0% continued to use wells, 10.0% still relied on the river (now the dam), 20.0% used streams, and 5.0% had other sources. This shift indicates that while the river was the predominant water source before the dam, boreholes became the primary source after its construction.

According to Oruonye E.D. (2015), the Federal Government funded the construction of alternative access roads and other developmental facilities, including boreholes, for the affected communities. Additionally, the dam construction led to a significant increase in fishing activities, with 100% of respondents confirming that fish production had surged after the dam was built.

Regarding the dam's impact on local trading activities, 60.0% of respondents observed an increase in trading, while 40.0% felt that trading activities remained unchanged. This suggests that the dam has had a positive effect on commercial activities in the area.

The construction of the Kashimbilla Dam also created employment opportunities for the local population. Oruonye (2015) noted that the project initially provided jobs for 1,500 people, with this number expected to rise to 2,000 upon completion. The Project Manager highlighted that before the project began, motorbikes were a rare sight in the area, but the community has since experienced rapid development, with numerous construction projects emerging around the dam. The dam was also designed to accommodate tourism, with special sections allocated for this purpose, although they were still under construction at the time of the report.

In terms of flooding, 60.0% of respondents reported experiencing flooding before the dam's construction, while 40.0% did not. After the dam was built, 40.0% of respondents still experienced flooding, but only 6.0% did not. This suggests that while flooding persisted after the dam's construction, it was less severe than before.

Table: 8 Impact on Farmland and Livestock Before and After the Dam

Response	Before the Dam (Frequency)	Before the Dam (%)	After the Dam (Frequency)	After the Dam (%)
Loss of Farmland	287	75.0	306	80.0
Loss of Livestock	96	25.0	77	20.0
Total	383	100	383	100

Source: Field Survey, (2023).

Table 8 illustrates that 75.0% of respondents lost their farmlands due to flooding before the dam's construction, and this increased to 80.0% after the dam was built. Additionally, 25.0% of respondents reported losing livestock before the dam, while 20.0% experienced livestock loss after its construction. Notably, there was no reported loss of buildings in the communities.

These findings indicate that the primary environmental hazards associated with flooding in the area, both before and after the dam's construction, are the loss of farmlands and livestock. It was also gathered from the field that 72.0% of the respondents were resettled after the dam was completed. Most of these resettled individuals mentioned receiving some compensation from the government, but they felt the amount was insufficient to start a new life. Two communities in the study area—Birama and Ngadi Gadin—were resettled. Ngabea et al. (2013) and Oruonye (2015) observed that more than 200 communities were impacted by the construction of the Kashimbilla multipurpose dam, leading to the relocation of a significant number of people from Birama. Many of these displaced individuals moved to nearby villages such as Hanki, Mango, Alahu, and Tandun. The creation of large dams in Africa has historically led to the relocation of large populations. For instance, the Kossou Dam in the Ivory Coast displaced 85,000 people, the Akosombo Dam displaced 84,000, the Kariba Dam in Zimbabwe displaced 57,000, the Kainji Dam displaced 55,000, and the Lagdo Dam displaced 35,000 people (Mudzengi, 2012). The Aswan High Dam on the Nile displaced 120,000 Nubians in both Egypt and Sudan (Adams, 1992).

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