



ASSESSMENT OF THE SOCIO-ECONOMIC BENEFITS OF WATER TRANSFER FROM THE GURARA DAM TO USUMA DAM, NIGERIA

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ABSTRACT

The Lower Usuma Dam, commissioned in 1982, could not cope anymore with the water needs of Abuja's spiraling population, whose daily demand for water was expected to hit the high mark of one million cubic meters in 2030, up from 210,000 cubic meters in 2002. The study examined the socio-economic benefits of inter-basin water transfer from the Gurara dam to Usuma dam in Nigeria. It examined the nature of the EIA's predicted impacts of the project and compared with the actual social and economic impact of the project on the residents. Secondary data was obtained from the compendium of the Gurara transfer project by the Federal Ministry of Water Resources Abuja while primary data were acquired through questionnaire survey. Data were analyzed using descriptive and inferential statistics. The study simply conducted a monitoring and post auditing of the predicted socio-economic impacts of the inter-basin water transfer from Gurara to Usuma Dam project. Findings from the actual field survey revealed that among the eight socio-economic variables considered, only two has a significant mean which are educational Status .448 (1st) and Monthly Income .412 (2nd) which mean that there is a significant improvement in the educational qualification and monthly income level of residents in the study area as predicted, however, other variables such as occupational status .297, infrastructural development .226, health condition .201, indirect jobs .186, loss of farmland .182 and direct jobs .120 all returned a negative relationship.

Keywords: Gurara dam, Usuma dam, Social variable, Economic variable, Inter-basin water transfer

INTRODUCTION

Freshwater is not evenly distributed throughout the world, thus, leading to water scarcity in many areas. It is estimated that over four billion people are currently affected by severe water scarcity (Liu *et al.*, 2017), driven by an increasing demand caused by population growth and economic development (Best, 2019). Inter-basin water transfer is the concept of supplying water to the scarce region by the construction of reservoirs to store water and interlinking them to areas of surplus supply. Inter-basin water transfer is the moving of water from a watershed with a surplus (donor basin) to a watershed suffering from a shortage (recipient basin). The water is transferred primarily to alleviate water scarcity in the recipient basin and travels long distances through complex pipeline and canal systems. Other reasons include recipient basin hydropower generation and the navigation route expansion. Inter-basin transfers are often considered a controversial practice, as the environmental and socio-economic consequences for the donor basin can be high, and difficult to predict. Therefore, it is strictly regulated in many areas and completely prohibited in others (Mekonnen and Hoekstra, 2011).

The application of this statement 'Water is Life' has been demonstrated by the continual development of the water supply system in Abuja, shiny new capital of Nigeria and Africa's most populous nation, which was created in 1976. The major rivers are the Gurara, Usuma, Jabi and Uke; some of the rivers have been tapped and others are under development as water supply sources for the capital. Although there are pockets of underground water, aquifers are severely limited and cannot provide the volume necessary to meet Abuja's water supply needs, groundwater is therefore insignificant in terms of overall supply within the territory.

The Lower Usuma Dam, commissioned in 1982, could not cope anymore with the water needs of Abuja's spiraling population, whose daily demand for water was expected to hit

the high mark of one million cubic meters in 2030, up from 210,000 cubic meters in 2002 (Compendium of the Gurara transfer project by the Federal Ministry of Water Resources Abuja, FCT 2014). Environmental Impact Assessment (EIA) was done by the Federal Ministry of Water resources before the project was executed, and it forecasted the social impacts it would have in the community as outlined as follows; Construction of the dam necessitated the relocation of the local communities especially those living directly on the Gurara dam site and the pipeline conveyance route, The Gurara Project will likely have a positive impact on the socio-economic life of the host environment, as it will provide employment opportunities for many young men and women of the settlements, many will be trained to become skilled laborers, the project will likely occasion the emergence of small-scale enterprises, owing to the presence of the construction workers as well as a significant influx of outsiders to the locality which together have led to an increase in commercial activities.

The project has been completed since 2012 and no research has been done with possible (actual) impact of the project on the socio-economic life of the people. This research work is important because the Gurara dam has been productive in the last eleven years and it is imperative that a correlation is made as to the predicted social impacts drawing inferences from previous research work and the actual social impacts with a view to critically examine the socio-economic conditions of the people and making recommendations as an independent researcher on the sustainability of such laudable projects and the need to replicate it across the country to alleviate the sufferings of the people and ensure water security through water transfer.

MATERIALS AND METHODS

The case study is located between Latitude 9°04'45"N to 9°28'30"N of the Equator and Longitude 7°20'05"E to

7°40'00"E of the Greenwich Meridian. The study covers an area of approximately 2,150 km². The diversion route covers a distance of 75km from the Gurara Reservoir in Kaduna State to the existing lower Usman Reservoir in the FCT, Abuja as illustrated in Figure 1. Four hundred (400) copies of questionnaire were administered to the respondents in sets at selected locations in the Usuma dam which is the beneficiary of the Gurara water transfer project. However, a total of three Hundred and Ninety (390) Questionnaire's was retrieved and analyzed. The study had four objectives and they analysis was done based on the socio-economic considerations and they need to produce the right results. The first objective was to Examine the nature of the EIA's predicted impacts of the project on socio-economic lives of the people. This was achieved by carrying out an examination of the compendium report on the EIA's predicted impacts of the project on socio-economic lives of the people, results were presented using descriptive statistics (cross tabulation and Bar-Graphs). The second objective was to Assess the actual impact of the project on the social conditions of the people in the study area. This was achieved by using the research instrument in evaluating the actual impact of the project on the social conditions of the people in the study area, results were presented using descriptive statistics (percentage Bar-Graph and Cross Tabulation). The third objective was to Assess the actual impact of the project on the economic conditions of the people in the study area. This was achieved by using the research instrument in evaluating the degree of the impact of the project on the economic conditions of the people in the

study area, results were presented using descriptive statistical methods (Percentage Bar-Graph and Cross Tabulation). The fourth objective was to Compare the EIA's predicted impacts with observed impacts of the project on the socio- economic conditions of the people in the study area. This was achieved by comparing the mean of the predicted impacts and that of the observed Impacts. Results were analyzed and presented using inferential statistical method (Correlation Analysis). This buttressed the relationship between the EIA's predicted impact and the actual impact of the project and the comparative analysis justified the study as the eight critical variables established such as educational status, monthly income, occupational status, infrastructural development, health condition, job creation (Direct and Indirect), Loss of arable land and resettlement scheme was juxtaposed to reflect the true position and economic realities on ground. A Similar statistical technique was used by Bhattari, Pant and Molden to assess the socio-economic and hydrological impacts of the Melamchi inter-sectoral and inter-basin water transfer project, Nepal. The Study illustrated the complexities in planning and implementing inter-basin water transfer project and the socio-economic and hydrological implications of the project in the basin of water supply. The research also discovered a negative economic benefit of the project which was mostly accrued to the urban supply of water. This enabled the researcher to draw inferences and correlations in the assessment of the socio-economic benefits of the inter-basin water transfer from Gurara to Usuma dam Nigeria.

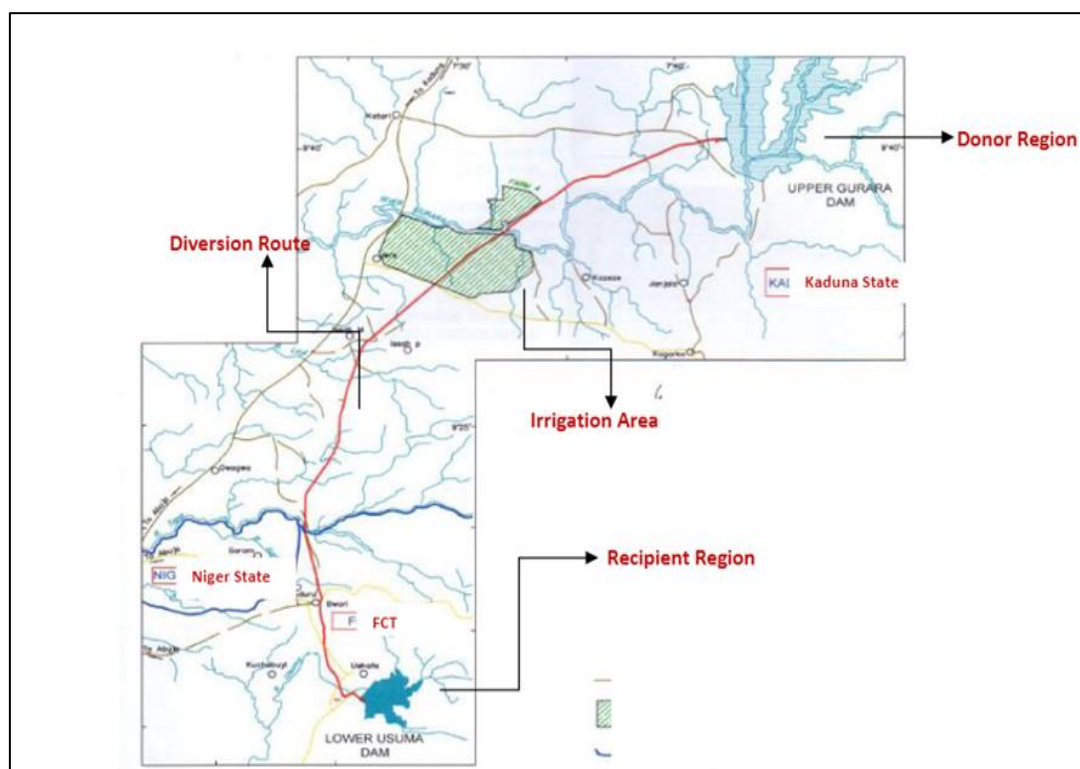


Figure 1: Gurara Water Diversion System Layout in Nigeria
Source: Federal Ministry of Agriculture and Water Resources (2008)

RESULTS AND DISCUSSION

Socio Demographic Characteristics of Respondents

The actual social and demographic characteristics of respondents obtained field survey by the researcher also included sex, age, marital status of respondents, while the Socio-economic characteristics of the respondents includes

educational qualification, occupation and income of respondents. Table 1 presents a summary of the present situation in the study area.

From the analysis of the responses gotten from the field by the researcher as presented in Table 1, it was reveals that 64.3% of the respondents were males while 35.7% were

females. This agrees with the finding in the EIA's report that both men and women are affected by the impact of the Gurara – Usuma water transfer project in the study area. For the age distribution of the respondents, the actual findings by the researcher revealed that the highest age group in the area at present is between the age 41 – 50 which is 37% of the total. Also, 24.5% of the respondents are aged between 31 to 40 years, 18% are aged 51 years and above, 13.5% are aged between 21 to 30 and 7% of the respondents were aged between 15 to 20 years. This actual finding indicates that the area is now occupied by an active and reproductive population group and the demographic and cultural heritage of the area has been distorted. The actual marital status of respondents revealed that 49% of respondents are married as against the 68.3% reported in the EIA report. Also, the rate of divorce increased from 15.7% to over 22.7% in the study area which can be attributed to the negative impact of the project on the economic welfare of the residents. This indicates the huge economic burden the project has on the residents along the route many families were broken and separated as a result of the project.

There is a significant improvement in the educational status of the resident as over 47% has acquired a tertiary education. This can be as a result of change in demographic composition taking place in the area whereby, different people are being attracted to the area as a result of opportunities coming up in the area. About 32.5% of the respondents only attended secondary school, 10.75% attended primary school, while 5.2% and 4.25% had informal and no educational background respectively in the study area. Bwari ward have some notable public institutions such as Nigerian Law School, Joint Admission and Matriculation Board and Federal Government

Girls College, which were all established before the commencement of the Gurara water transfer Project. This result suggest that the residents are beginning to acquire education in order to defend themselves and protect their right to justice, equity and fairness as well as demand for fair compensation. According to the field report residents are mostly farmers 46.7%, Civil servants increased to about 24.25%, traders 23.2% while other occupation such as artisans, herders, self-employed make up the remaining 5.75% of the respondents. According to this report, the predominant economic activity in the area at present is still farming which means that the economic life of residents has not improved since the inception of the project till date. makes the impact more severe because a lot of farmers were separated from their farmland and their sources of livelihood without adequate provision for alternative source or compensation.

It can be observed from the actual field survey that the monthly income of respondents has not improved from what was reported in the EIA report. Majority of the respondent 34.5% still earn below 100000 naira per month. This is followed by 29.7% who earn between 100000 to 150000 naira. About 10.75% of the respondents have a monthly income of 151000-200000 and lower than that, 8.75% earn 201000 – 250000 naira monthly, 10.5% earn 251000 – 300000 naira monthly while only 5.72% of the respondents earn above 300000 naira per month. The discrepancies in income between the EIA's report and the actual field survey can be attributed to the temporal variation method of assessment employed and is no doubt unconnected with the fact that the nature of employment and livelihood options predominant in the area presently

Table 1: Demographic Characteristics of Respondents in the Study Area

	Actual	%
Gender		
Male	256	64.3
Female	144	35.7
Total	400	100
Age		
15 - 20	28	7
21 - 30	54	13.5
31 - 40	98	24.5
41 - 50	148	37
51 and above	72	18
Total	400	100
Marital Status		
Single	64	16
Married	196	49
Divorced	91	22.75
Widowed	49	12.25
Total	400	100
Educational Qualification		
Primary	43	10.7
Secondary	130	32.5
Tertiary	189	47.2
Informal	21	5.2
No Education	17	4.25
Total	400	100
Occupation		
Farming	187	46.7
Civil Service	97	24.2
Trader	93	23.25
Others	23	5.75
Total	400	100

Average Monthly Income (₦)		
Below 100000	138	34.5
100000 - 150000	119	29.75
151000 - 200000	43	10.75
201000 - 250000	35	8.75
251000 - 300000	42	10.5
Above 300000	23	5.75
Total	400	100

EIA's Predicted Social Impacts of the Project

This section reviews the EIA's predicted social impact of the project in the study area as a result of the Gurara-Usuma water transfer project. According to the compendium report, 61.75% of the populace predicted that the project will have a very positive impact in the area on social lives of the residents in terms of water supply, infrastructural development, health and education of the residents in the study area. The entire wards in Bwari area council and the entire area council in Abuja, FCT to alleviate the declining water resources available to the residents and indigenes domicile in the Federal Capital for their daily survival and economic development and sustainability. The availability of water through inter basin transfer can stimulate economic growth in

the receiving basin. It can attract investments in industries such as agriculture, manufacturing, and energy production, leading to job creation, increased production, and higher income levels. This can contribute to overall economic development and the diversification of the local economy. Inter-basin water transfer projects can provide additional water resources to support agricultural activities. This can increase crop yields, expand agricultural land, and improve overall agricultural productivity in the receiving basin. This, in turn, can lead to higher food production, food security, and reduced reliance on food imports. Figure 1 shows the graphical representation of the project on proposed direct jobs creation in the area as predicted in the EIA's Report in the Compendium by Federal Ministry of Water Resources.

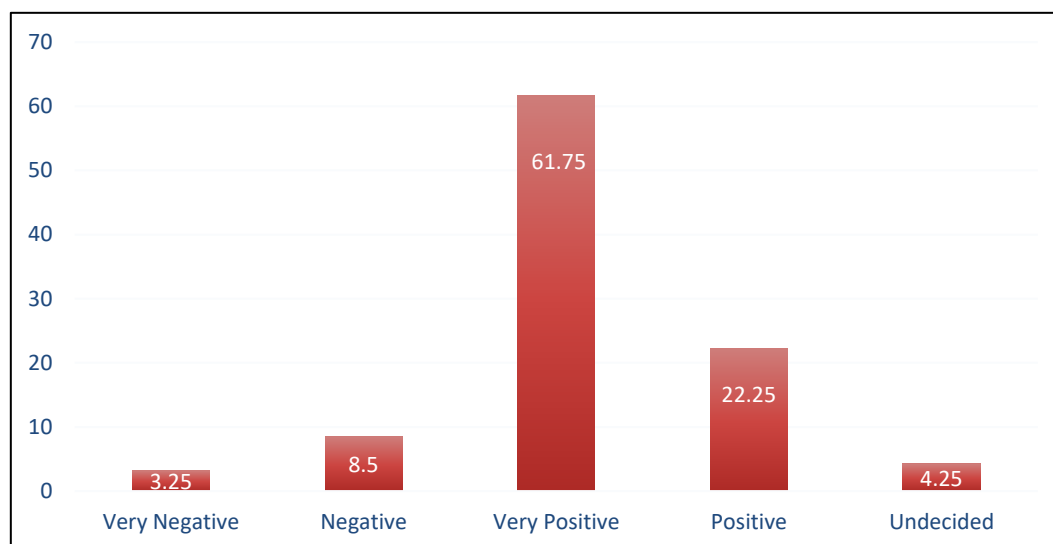


Figure 2: EIA's Predicted Social Impact of the Project in the Study Area
Source: EIA's Report in the Compendium by FMWR (2012)

The researcher can draw inferences from the results below that the socio-economic conditions in the lower Usuma dam which is a beneficiary of the Gurara water transfer project is stable and in tandem with the Environmental Impact Assessment Report which forecasted that the Gurara water transfer project will have a positive impact on the socio-economic life in the lower Usuma dam and Environs as it provided employment opportunities for many young men and women of the settlements, many trained to become skilled laborers, the project has occasioned the emergence of small-scale enterprises, owing to the presence of construction

workers as well as a significant influx of outsiders to the locality which together have led to an increase in commercial activities.

EIA's Predicted Economic Impacts of the Project

The report also proposed that residents in study area will be engaged indirectly through the creation of other source of income indirectly linked to inter basin water transfer project. Figure 2 present results of the predicted impact of the project on indirect job creation according to EIA's report in the compendium by FMWR in 2012.

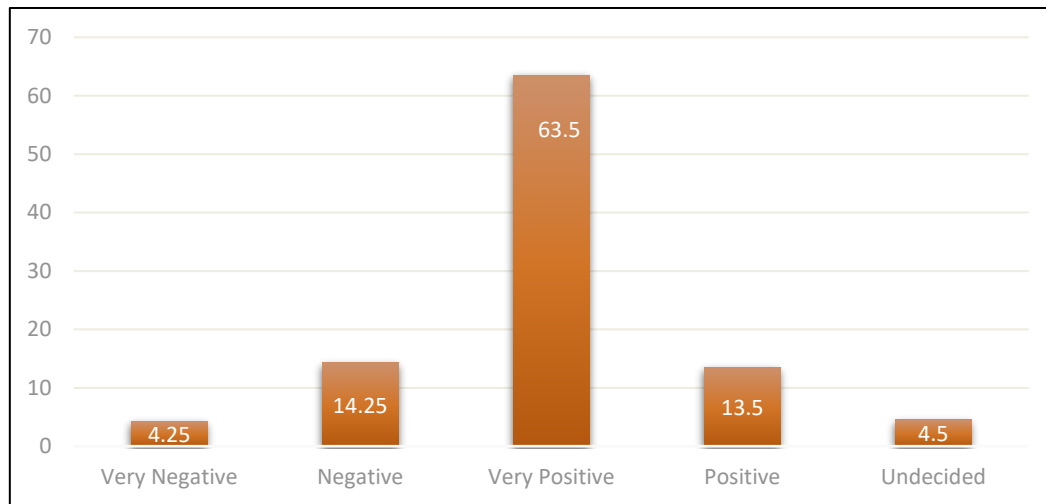


Figure 3: EIA's Predicted Economic Impact of the Project in the Study Area
Source: EIA's Report in the Compendium by FMWR (2012)

Similar to the result of the social impact, the EIA report also forecast that, 63.5% strongly agree with the fact that the project will provide ample opportunities with respect to employment opportunities, rise in income level and improved livelihood of the people to residents in the lower Usuma dan project. A similar statistical technique was employed by Ujoh *et al.*, (2012) in analyzing the Socio-Environmental considerations of the Usuma reservoir part of the study and the results were presented using cross tabulation and bar-graph and study discovered that there has been no significant improvement in infrastructural provision by Government, it also discovered that cases of water-borne diseases are high, the communities lost land for cultivation, and the communities believe that the resettlement scheme is not commensurate with their losses and the relocation scheme for the four communities be reviewed with a view to improving the living conditions of the four communities in terms of

providing infrastructure (water and roads, educational and health).

Observed Impact of the Project on the Social Lives of the People

This analysis was carried out to determine the social conditions of the actual beneficiaries of the project. The study was conducted with the administration of a total of 400 questionnaires to households in the study area. Data was primarily collected using questionnaire and analyzed using SPSS. Results and discussion after the social characteristics of are presented using tables and figures as stipulated in the previous chapter. The result from the actual field survey conducted by the researcher identified the level of impact of the Gurara – Usuma inter basin water transfer project on the social life of respondents such as water supply, health, infrastructures and education in the study area. Finding from the analysis is presented in Figure 3.

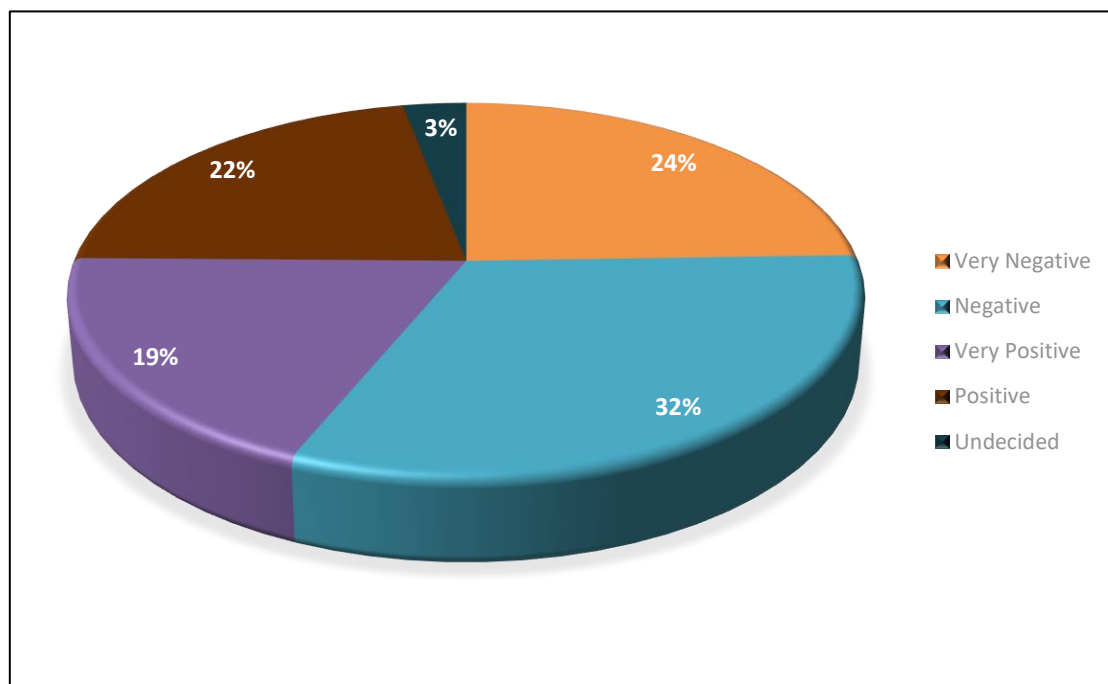


Figure 4: Actual Variable of the Social Impact of the Project
Source: Field Survey (2023)

The field report of the social impact of the Gurara-Usuma water transfer project in terms of water supply, health, infrastructures and education for residents in the study area as a result of the project has been discussed. According to the report, 22% are of the opinion that the projects impact on social welfare in the area is positive and 19% claim that it is very positive result. This is due to the fact that inter basin water transfer project often involve the development of water management infrastructure, which can enhance the overall efficiency and effectiveness of water allocation and distribution. This can lead to optimized water resource utilization, reduced water wastage, and improved water management practices. On the other hand, the highest proportion of respondents 32.07% indicated that the project had a negative social impact in the area while 24% opined that the impact is very negative. This is because the project failed to impact the social welfare of residents in terms of health and education. The project implementation has not addressed health concerns of residents induced as a result of change in the micro-climatic conditions and water related illness in the study area. Only 3% of the respondents are undecided.

It is important to note that social impact can vary based on specific project characteristics, regional conditions, and the overall social context. In the context of water supply, the findings agree with Tian *et al.*, (2019) and Obaje *et al.*, (2023)

who noted that the reliability and resilience of the water donor system will be gradually reduced while the vulnerability will be increased with the expansion of water transfer projects and the increase of water demand while this findings negates Ekpo and Ekpenyong (2011) whose results showed that variations in the weather and climate of the region have significantly impacted on water yields in surface reservoirs, with over 80 per cent of the yearly variations in water yield in the Sokoto-Rima Basin being explained by variations in the weather and climate. The highest age population are those between thirty-one (31) to forty (40) years who are literate enough to understand the tremendous benefits the Gurara project will have to the entire wards in Bwari area council and the entire area council in Abuja, FCT to alleviate the declining water resources available to the residents and indigenes domicile in the Federal Capital for their daily survival and economic development and sustainability.

Observed Impact of the Project on the Economic Lives of the People

Figure 5 presents the respondents opinion on the economic impact of the Gurara to Usuma dam inter basin water development project on the creation of indirect job opportunities in the study area.

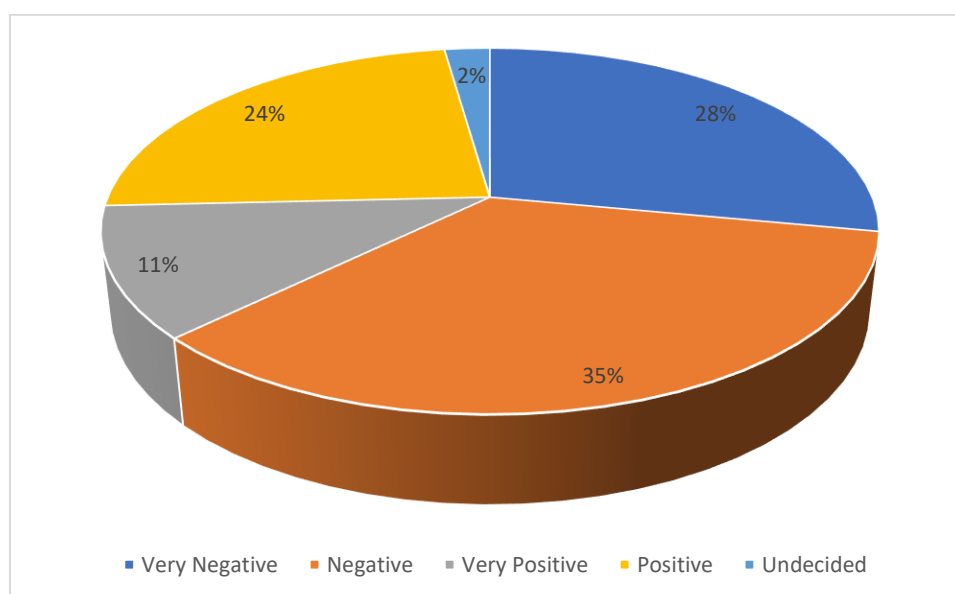


Figure 5: Actual Variable of the Economic Impact of the Project
Source: Field Survey (2023)

It is obvious that the respondents in the study area do not believe that the Gurara to Usuma dam project has a significant impact on the economic activities of the residents in terms of creating more direct and indirect employment opportunities, income and alternative sources of revenue in the study area. It was revealed that about 35.06% of the respondents opined that there is a negative relationship between the project implementation and economic impact in the area. Another 28% of the respondents completely disagree as the indicated that the possibility of economic opportunities through the implementation of the project is unlikely. This might be in terms of employment opportunities, economic growth and development, the availability of water through inter basin water transfer is expected to stimulated economic growth in the receiving basin and attract investment in industries such as agriculture, manufacturing and energy production leading

to job creation increase production and raise in income levels. However, this has not been achieved in the study area as most respondents indicated that the project has not created employment opportunities for them. This was corroborated by the findings of Annys *et al.*, (2019) who noted that the establishment of large-scale commercial farms increased the pressure on land and led to the impoverishment of displaced communities (4310 households). The project was implemented top-down, without any transparency, benefit sharing or compensation for external costs. However, about 24% and 11% opined that there is positive and very positive relationship between the project implementation and the economic impact respectively. This might be in terms of enhanced resilience to drought and climate change and well as in terms of tourism and recreational opportunities. Also, the project can positively improve energy generation and reduce

fossil fuel combustion in the study area. This is in line with the findings of Jimoh and Ayodeji (2003) who stated that the inter-basin water transfer into the Shiroro Reservoir would enhance power generation. Matete (2007) also maintained that compensating the ecological losses would greatly improve the welfare of directly affected populations and the rest of Lesotho economy. This result indicates that the residents are not satisfied with the level of resettlement and compensation they received in their package which was arranged for them by the FCDA. The empirical analysis and policy simulations results showed relatively small impacts in general, but were significant for groups of people directly

affected by the project in the study area, there would be an increase in the frequency and severity of annual flooding downstream of the dam.

Comparison of EIA's Predicted and Observed Impacts of the Project

The predicted and actual impact of the Gurara - Usuma dam project on the social and economic condition of residents in the neighborhood were compared using regression analysis on SPSS tool. The results are presented in the figures 6, 7 and table 2 below.

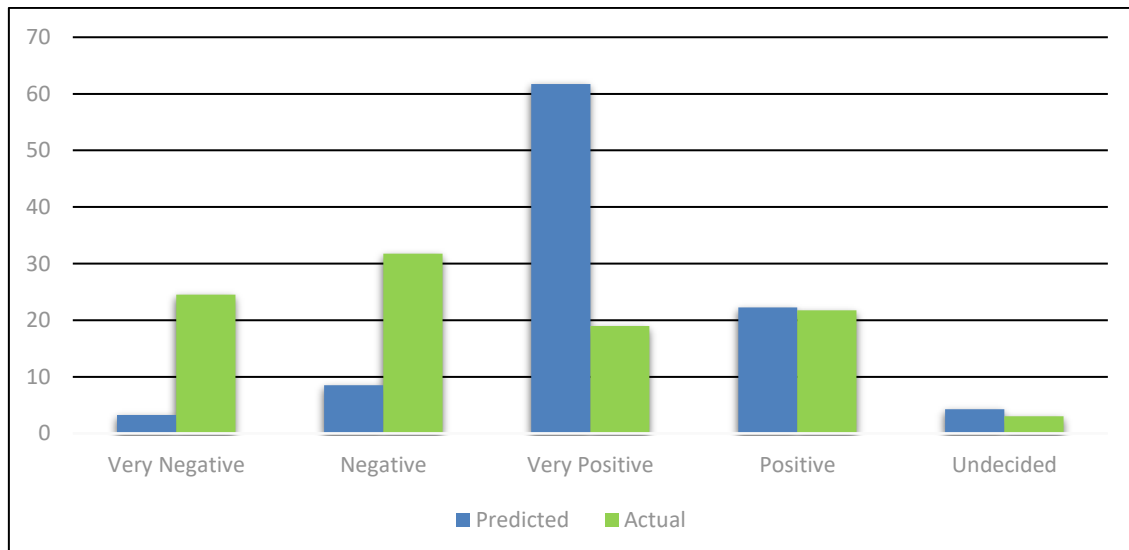


Figure 6: Comparison Between Predicted and Actual Social Condition of Respondents
Source: Field Survey (2023)

It is evident from the information presented in Figure 4.5 that the EIA's report on the Socio-economic impacts of the Usuma reservoir differs from the current situation in the area. The findings were presented using cross tabulation and bar graphs, revealing that there has not been a significant improvement in infrastructural development by the government. Additionally, there is a high prevalence of water-borne diseases, loss of land

for cultivation, and dissatisfaction with the resettlement scheme among the affected communities. Therefore, it is recommended that the relocation plan for the four communities be revisited in order to enhance their living conditions, particularly in terms of infrastructure provision such as water, roads, and healthcare.

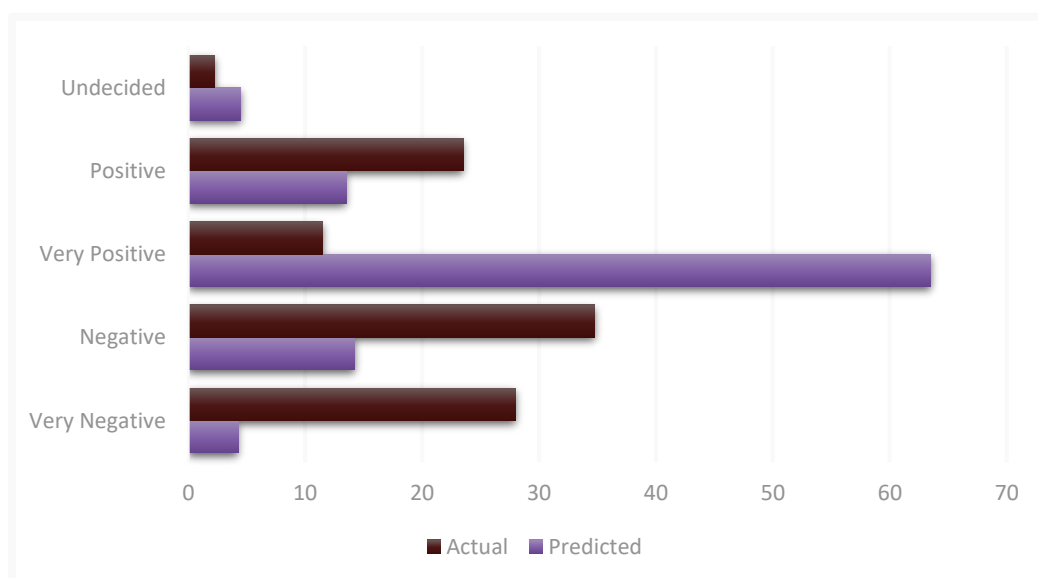


Figure 7: Comparison Between Predicted and Actual Economic Condition of Respondents
Source: Field Survey (2023)

The predicted and actual impact of the project on the income level and job opportunities in terms of direct and indirect jobs for residents were compared as shown in Figure 4.6, it was revealed that the predicted impact of the project does not meet up with the actual situation in the area. The observed impact of the project in the study area in the area of access to education, income distribution, direct and indirect job opportunities and infrastructural development in the study area shows a negative response which indicates that the project has economic impact on the residents in the study area. This result is also corroborated by Ujoh *et al.*, (2012) whose findings revealed that there is a negative relationship between

the past and present economic condition of respondents around the project.

Comparative Analysis of EIA's Predicted and Observed Social and Economic Impact of the Project

The perceived impact of the Gurara – Usuma water project on variables of socioeconomic and environmental conditions of residents are presented in Table 4.6 and discussed in this section. A total of eight (8) variables were examined and the results were ranked in order of their significance to determine the relative importance of each variable based on the responses from field survey conducted and the EIA's report in the compendium of the FMWR.

Table 2: Relationship Between Observed Variable and the Predicted Variable on the Socio-Economic Impact of the Project

Socio-Economic Conditions	SD	CV (%)	χ
Educational Status	0.53	29.7	.448*
Monthly Income	1.26	17.4	.412*
Occupational Status	0.32	30.3	.297
Infrastructural Development	1.50	14.9	.226
Health condition	0.70	21.3	.201
Job creation (Direct and indirect)	1.73	14.8	.186
Loss of arable land	1.17	38.2	.182
Resettlement scheme	0.53	43.6	.120

χ = Mean, SD = Standard Deviation, CV = Coefficient of Variation, * Correlation is significant at the 0.01 level (2-tailed)

Source: Author's Analysis (2023)

Among the eight socio-economic variables considered, only two has a significant mean which are educational Status .448 (1st) and Monthly Income .412 (2nd). This means that as predicted, there is a significant improvement in the educational qualification of residents in the study area and there is also an improvement in their monthly income level, however, this can be due to the rising inflation in the country whereby farmers are able to sell their products at a more expensive rate. Other variables such as occupational status .297, infrastructural development .226, health condition .201, indirect jobs .186, loss of farmland .182 and direct jobs .120 all returned a negative relationship. This shows that for the observed variable of the socio-economic and environmental impact on (occupation) the Pearson correlation result is negative which indicates that the major occupation of residents in the area is still farming and the project failed to provide employment opportunities to the residents. Infrastructural development also received a negative response and was ranked 4th because there has been no meaningful improvement of basic amenities such as roads, pipe borne water, schools, hospital and electricity in the study area as a result of the project. It was also revealed that there is negative relationship between the proposed resettlement and compensation exercise meaning that respondents who lost their land due to the implementation of the program were not properly resettled and adequately compensated. A Similar Statistical technique was used by Bhattarai, *et al* (2005) to assess the socio-economic and hydrological impacts of the Melamchi inter-sectoral and IBWT project, Nepal. The study illustrated the complexities involved in planning and implementing the intersectoral (inter-basin) water transfer project and the socio-economic and hydrological implications of the project in the basin of water supply. the research also discovered a negative economic benefit of the project which was mostly accrued to the Urban supply of water.

CONCLUSION

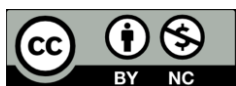
The study found that only two variables showed a significant improvement in residents' educational status and monthly

income, indicating a positive impact of the project. However, other variables, such as occupational status, infrastructural development, health condition, indirect jobs, loss of farmland, and direct jobs, showed negative relationships. The major occupation of residents was still farming, and the project failed to provide employment opportunities. Infrastructural development also showed a negative response, with no significant improvement in basic amenities. The study also found a negative economic benefit, mainly affecting urban water supply. Hence, the Gurara-Usuma water transfer project though was successful in some aspect has failed to improve the lives of residents around the project directly or indirectly. Some of the challenges are adequate water supply across some wards such as Bwari, Ushafa and Dutse, inferences can be drawn from the other wards such as Kubwa, Bhyazhin and Usuma wards with high rate of water supply and consequential benefits on direct jobs and indirect jobs to affirm the Environmental Impact Assessment Report which said there will be a significant socio-economic benefit of the Gurara water transfer project to entire population of Abuja, Federal Capital Territory. Based on the findings of this study, the following recommendation can be made; Measures should be taken for equitable distribution of rural infrastructural facilities in the study area such as power supply, education and healthcare facilities to improve productivity, ensure even development, reduce regional imbalance, and improve quality of life by government agents, policy stakeholders and relevant agencies. Evaluation and monitoring team should also not be left out for sustainability processes. The role of host communities in the implementation of water transfer projects infrastructure on social development of rural areas by laying emphasis on the quality of the infrastructure rather than quantity, so as to be able to figure out the true dimension of the rural development.

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