

# IMPACT ANALYSIS OF HYDRO ELECTRICITY DAMS ON THE HAPPINESS OF THE HOST-COMMUNITIES IN NIGER STATE, NIGERIA

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## Abstract

In Nigeria, violence, theft and vandalism of infrastructure are common phenomenon. Some people tend to destroy them with little or no provocation not minding the fact that they are in place to address public needs. In line with this tendency, the study therefore, examined the Hydroelectricity dam host communities in Niger State to determine if they are happy or not. The study used concept of utility as theoretical framework and employed Propensity Score Matching (PSM) method using treatment and control groups as units of analysis. The findings revealed that the Hydroelectricity Dam host communities are less happy by 33 percent. The study therefore, recommends training programmes be put in place to improve human resource skills and production efficiency and concludes that policy focus should not only be targeted at production outcomes but also to consider peoples happiness.

**Keywords:** Hydroelectricity, dams, happiness, host-communities, Propensity Score Matching

## Introduction

Ancients' moral philosophy such as Aristotle, Epicurus, Seneca, Plato, Boethius etc. attached importance to the search for happiness even though the result and the concept differ among the schools of thought. The ancient philosophy generally refer to happiness as the ultimate end in life, while in economics, happiness is mostly interpreted within the framework of a means–ends relationship. The relationship between economics and happiness associates with the concept of welfare, which has to do with material prosperity and individual wellbeing. At the beginning, individual's happiness was the

prime interest, however, from the eighteenth century onwards, the goal post shifted with preference focused at attaining public welfare or happiness of all. Thus, the phrase “the greatest happiness for the greatest number” impliedly mean improvement of the highest possible living standard for everyone with no detriment to others (Vivanza, 2007).

Thomas Jefferson's message in the American Declaration of Independence in 1776 marked a major beginning of governments' realization of the values of happiness in life as a matter of policy. He said, “We hold these Truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights that among these are Life, Liberty, and the Pursuit of Happiness...” (Ho, 2005 p. 19; Nettle, 2005 p. 1). The declaration states a universal truth and not just an American dream. The pursuit of happiness is listed alongside with Life and Liberty as the final goal of all governments. This goes to mean that, it is not enough for policy makers or the government to tell individuals what is worthy, but creating an enabling environment for people to take on challenges of improving their living standards.

According to Fabian (2019) scholars with a slightly different form of opinion called a new role for the state; “not wealth creation but well-being creation”. In the past, states treats with topmost priority macroeconomic variables such as poverty, unemployment, education, physical health etcetera. Today apparently, it has become equally vital to drag along other variables such as domestic violence, alcoholism, depression and anxiety conditions, alienated youth, exam mania, and much else. These also form variables to be considered in the policy streams to keep

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pace with happiness status of the citizenry as current phenomena.

Desirable outcomes, even economic ones, are often caused by well-being or happiness. People with high well-being or happiness earn higher incomes and perform better at work than people that reports low well-being. Happy workers are better organized; they tend to help other people at work in various ways. Furthermore, people high in sense of wellbeing have better social relationships than people with low well-being. For example, they are more likely to get married, stay married, and have rewarding marriages. Happiness is also indirectly related to health and longevity. Thus, well-being/happiness is not only valuable because it makes one feel good, but also because it has beneficial consequences (Diener & Seligman, 2004, 2009).

Today, distribution of electricity truly make remarkable contributions to economic activity and happiness or quality of life all over the world. In the past several decades, people living in the industrialized world have more access to efficient electricity distribution network. The amount of energy delivered by these networks doubled in every 8 years. The advances in technology improved the reliability of electricity supply such that, in many parts of the world, the average consumer is deprived of electricity for less than 2 minutes per year (Kirschen & Strbac, 2019).

In Nigeria, the preparation toward exploration of the discovered oil in commercial quantity ignited the need for cheap hydroelectricity supply for the industry (Niworu, 2017). This fact expedited government policy to start commercial electricity generation in 1951. The structure of electricity industry began with the establishment of the Electricity Cooperation of Nigeria (ECN) and by 1962, the Niger Dam Authority (NDA) was established. The amalgamation of the two; ECN and NDA gave birth to the National Electric Power Authority (NEPA) in 1972. NEPA became the vertically integrated government utility in the value chain and was later rebranded to Power Holding Company of Nigeria (PHCN) (Adebayo, Aina, & Apata, 2020). Electricity power supply in Nigeria emanates from two sources. The five thermal stations located at Afam, Delta, Egbin, Ijora and Sapele power

stations and the three major hydropower plants located at Kainji, Jebba, and Shiroro power stations respectively. The three hydropower stations which are the focus of the study have installed capacities of 760 MW, 560 MW and 600 MW respectively that makes total output of 1900 MW.

The objective of this study therefore, is to examine happiness status of the hydroelectricity dams host communities. The motivation of the study on the other side is that, the national hydroelectricity projects researches in Nigeria are mostly concerned with the immediate environmental impacts assessment with little or no direct concern/emphasis for the happiness of the host-communities. It is in the premise of this fact that this work is out to ascertain the happiness status of the hydroelectricity dams host-communities in Nigeria.

In economics literature, the word happiness is often interchangeably used with other concepts like “wellbeing,” “subjective well-being,” “life satisfaction,” among others (Bruni, 2020; Frey, 2008; Giorgino, 2014; Graham, 2011). Although, these concepts if critically defined in other fields other than economics vary in meanings, they are often used for happiness in Economics. This study will also adopted the culture of using the words interchangeably to mean happiness.

## **Literature Review**

Human beings share certain common features, such as physical and mental characteristics that affect their pattern of behavior. Thus, all humans have basic needs, concerned mainly with survival: needs for food, shelter, safety and companionships. Humans reveal a higher range of needs that make life worthy of living and might otherwise be a meaningless world. These needs are exploratory, creative and self-fulfilling activities of many in varied forms. It is imperative and a common feature that all human behavior have the concern to satisfy these needs (Tyson, 2014).

Theoretically, the concept of utility illuminates issues of human needs. Utility as principle, approves or disapproves all human actions based on its appearance; be it private individual, community or government. Utility is that property in any object, which tends to

produce benefit, advantage, pleasure, good, or happiness against mischief, pain, evil, or unhappiness (Bentham, 2000).

Nature has not left the gratification of such crucial needs to intentional reasoning alone, but seems to have linked it to affects; pleasant and unpleasant affects. Unpleasant affect allies with inadequacies hence, threaten functioning, burdens the heart and slows down activism. Pleasant affect on the other hand, inspires happiness that triggers man's activism positively (Veenhoven, 1991). More so, "...happiness is constituted by affects based on our values, and that our values are constituted by our sentiments" (Wren-Lewis, 2010).

Conceptually, Diener(2009) reported the description of happiness to be 'young, healthy, well-educated, well-paid, extroverted, optimistic, worry-free, religious, married person with high self-esteem, high job morale and modest aspirations, of either sex and of a wide range of intelligence'. In furtherance, the Diener, said Sociologist and Anthropologies assess happiness to be societal performance in terms of meeting human needs. Thus, happiness reflects true human progress. Veenhoven in define happiness as Erkus and Findikil (2021)the positive general condition that life coincides with the expectations ofthe individual. Happiness is a combination of pleasure and life that is meaningful (Lei, 2022).

Happiness is sometimes defined as state of mind (Haybron, 2008; Tenaglia, 2007).Ho (2006) defined happiness and unhappiness as a state of mind synonymous with "subjectivewell-being" that is subject to putting together the totality of one's life experience and values into account. Happiness, could be referred to 'subjective enjoyment', meaning something that people have on their mind, which is measurable via questioning(Giorgino, 2014).

The mind continuously evaluates human endeavors from both the outside and from the inside appear favorable or not. To many well-being researchers, these evaluative processes makes up thecrux of human happiness(Vittersø, 2013).Happiness is a fact, in particular a feeling, a state of mind. Distinguishingly, the subject matter happiness and other words commonly referred to as happiness, may be called "state of mind" psychological happiness(Haybron, 2001; Haybron, 2008).

Political and economic policies (such as a dam) may create happiness or offensives result. This could include undemocratic approaches to decision-making, responses of migration of the affected, decline/improve wealth, loss of cultures and the likes. People get worried when life endeavors, beloved ones get troubled and even when personal freedoms are restricted. Hence, public policies are often enjoyed to be just at reducing such troubles or worries to increase national happiness status (Ng & Ho, 2006).

Indeed, if public policy is silent about happiness, needless for such kinds of policy (Ng & Ho, 2006; Maddux, 2018). Policies that facilitate own "pursuit of happiness" oriented, works best in promoting happiness. People are happier if have enabling platforms and institutions that allows free pursue of dreams. The best society, therefore, is "one where citizens are happiest and ... the best policy produces the greatest happiness and the most moralaction produces the most happiness for those affected" (Oman, 2021).

Modern technology in the fields of forms of energy say, electricity and solar has over the years improved human needs or global happiness status. Adequate energy that is efficiently consumed provided greater amounts of heat, power, transport and light for human happiness or quality of life. Global economic activities say, production, exchange and consumption of goods and services are facilitated by refinements in ways of capturing and harnessing energy resources. Hence, the growth and development of global economy is closely linked with the availability, extraction, distribution and use of electricity(Fouquet, 2009).

In modern society, electricity is widely used in commercial activities say, industries, agricultures, transportation, and even in daily domestic endeavors. As the global economy experiences the upsurge in information technology, various types of electronic equipment are developed with their operations driven by electricity. This goes to mean that, electricity is closely related to global economic operations and systems. Therefore, if electricity supply is in short supply, production and the likes are directly affected; the people's life

become itchy and this trickle down to retardation in happiness (Hu & Hu, 2013).

In the case of Çokal dam in Canakkale-Turkey for instance, although the villagers confronted few negative situation, no serious changes in their happiness were observed because the their needs; both objective and subjective needs were relatively met and as such experiencing improved quality of life (Kop & Kasapoglu, 2015). If there has been deaf ear on the part of government; a kind of current rejection, people are likely to react with thoughts that their future is likely hopeless by rejection and exclusion. This might have produced negative emotion (Sjåstad, Zhang, Masvie, & Baumeister, 2021).

Unlike the above scenario, hydroelectricity dam host communities in Nigeria rather suffer more of negative externalities. Several studies on hydroelectricity dams in Nigeria such as (Adamu & Emigilati, 2020; Adebola, Garba, Ahmed, Muhammed, & Kudu, 2014; Ewugi, Abd Karim, & Abdul-Hakim, 2016; Ewugi & Usman, 2016; Niworu, 2017) and host of others emphasized resultant negative socio-economic impact of the dams on the respective host communities. The communities are characterized with land resource deprivation either via concession to individuals or dam/water body colonization, little or no compensation of the aborigines, migration of families in search of alternative land for farming, downstream flood vulnerability, flood resultant displacement of people and crop devastation, cultural bastedization as result of immigrants, loss of vulnerable natural resources and host of other socio-economic impact were emphasized.

## Methodology

This study used Propensity score matching (PSM) quasi-experimental method to examine the impact of Hydroelectricity dams on the happiness of the host communities employing treatment and control groups as units of analysis. In the light of above, the variable State of Mind (sofm) was estimated to ascertain the Average Treatment effect on the Treated (ATT) of Hydroelectricity dams on the host communities in Nigeria. The standard problem of treatment evaluation involves the ‘inference of a causal’ connection between the treatment

and the intended outcome (Chirwa, 2010). Thus, a given model as:

$$(y_i, x_i, D_i) \quad i = 1 \dots N \quad (1)$$

Where  $y_i$  = outcome or Dependent variable

$x_i$  = independent variables and

$D_i$  = treatment group = 1 and control group = 0 (counterfactual)

Measurement of treatment effect requires comparing the average outcomes of the treated and untreated groups. The propensity score or the conditional probability of receiving a treatment given  $x_i$  is therefore:

$$P(x) = \text{pr}\{D=1/x = E[D/x] \quad (2)$$

To the measure of Average Treatment Effect on the Treated (ATT) thus, is:

$$\begin{aligned} \text{ATT} &= E\{y_{1i} - y_{0i}/D = 1\} \\ &= E\{E\{y_{1i} - y_{0i}/D_i = 1, p(x)\}\} \\ &= E\{E\{y_{1i}/D_i = 1, p(x)\} - E\{y_{0i}/D_i = 0, p(x)\}/D_i = 1\} \quad (3) \end{aligned}$$

Questionnaires of four-pointer likert scaled with questions (as constructs) on some of the household characteristics which were adapted from World Value Survey were specifically used for independent variables State Of Mind coded as; sofm1 sofm1, sofm2, sofm3, sofm4, sofm5, sofm6, sofm7, sofm8, sofm9, sofm10, sofm11. To achieve the measurement of happiness in the host communities, the questions are capped with dependent variable Happiness (Hap1) with World Value Survey question of Taken all together, how happy would you say you are: very happy, quite happy, not very happy, not at all happy?

The name *sofm*, is deliberately employed as variable name for happiness in this study to measure the subjective happiness of Nigeria’s hydroelectricity dam communities. In other words, *sofm* measures the community’s heartily burdens or feeling to ascertain the dominating sensation in respect of a construct (positive or negative emotion) due largely to the installed dam in the communities. The constructs or independent variables are the people’s feelings/features used to measure the predicted propensity scores.

Substitution of the variable State of Mind (sofm) in model (3), thus;

$$\text{ATT} = E\{E\{\text{sofm1}/1, p(\text{sofm1 sofm1, sofm2, sofm3, sofm4, sofm5, sofm6, sofm7, sofm8, sofm9, sofm10, sofm11})\} - E\{\text{STOM0}/0, p(\text{sofm1 sofm1, sofm2, sofm3, sofm4, sofm5,$$

$$\frac{\text{sofm6, sofm7, sofm8, sofm9, sofm10, sofm11}}{1} \quad (4)$$

Where 1 = Treatment Group, 0 = Control Group, p = probability and E = Expected.

**Questionnaire administration, population and sample size**

The administration of the questionnaire covered four Local Government Areas (LGAs) with five focal groups both in treatment and control groups. The treatment groups are the Shiroro, Jebba and New-Bussa dam communities and the catchment villages where the dam externalities are pronounced. This includes villages that surround the dams and those that were resettled as a result of the dams. Whereas, the control groups are the river Gurara gorge, in Gurara LGA in Gawu-Babangida community and the river Gwadoko in Mokwa LGA as they fall within distance requirement of 60 – 70 miles from the treatment plants or Dams (Aleseyed, Rephan, & Isserman, 1998; Frankfort-Nachmias & Nachmias, 2007).

The populations of Shiroro, Mokwa, Borgu, Muya and Gurara LGAs are 235,665, 242,858, 172,835, 103,461 and 90,879 respectively as in NPC, 2010<sup>3</sup>. To arrive at the number of questionnaire distribution for each sampling frame, percentages are sorted using population of LGAs and total number of the questionnaires available for the study. In line with Baron and Kenny in Sekaran and Bougie(2010), 380 sample sizes are adequate for the study population. However, a 50% increase (in questionnaires) against non-response (Kotrlík & Higgins, 2001) was applied to make the sum of 570 questionnaires distributed in the research areas. Out of the total sum, 432 well filled questionnaires were returned; 107 from control group and 328 from treatment group.

The study used judgment sampling technique or considered only villages within 10 kilometers from the rivers/dams. Five villages each are randomly picked as sampling units from the sample research locations. The rationale behind using judgment sampling technique is to maximize the quality of the

output as the selected units are most affected by the externalities of the Dams/rivers.

The technique of the administration of the questionnaires was double faced - filling of questionnaire and a follow up interview at the point collection for free expressions. In other words, after filling of the questionnaires, the individuals are questioned for freer expressions which is either rightly jotted by research assistants or written by the respondent.

The data generated from the field were processed using Stata software for statistical presentations and the interview part is used for discussions of the results.

**Results and Discussions**

The tables and figure are the demonstrations of the result of happiness of the hydroelectricity dam communities in Nigeria. This is followed with discussions as emanated from the interview. The study underwent the balancing property test which was satisfied, the pretest for certainty of the quality of matches in the groups and test for the average treatment effect on the treated (ATT).

**Table 1:** Balancing property for propensity score analysis

Ind. variables	I	II	III	IV	V
	P value (unmatched)	P value (matched)	Mean absolute bias (Unmatched)	Mean absolute bias (Matched)	Absolute bias (Reduction)
gender	0.000	0.001	43.1	29.4	31.9
age	0.001	0.650	-37.9	-4.3	88.7
educ	0.398	0.098	9.2	15.1	-65.4
marital	0.967	0.409	-0.5	7.4	-1377.1
nochild	0.107	0.966	-17.6	0.4	97.7
occup	0.083	0.552	18.8	5.5	70.7
religion	0.000	0.266	58.2	9.5	83.7

<sup>3</sup>NPC. (2010). *Population Distribution by Sex, States, LGAs, and Senatorial Districts.*

Abuja: Federal Republic of Nigeria.  
 file:///C:/Users/USER/Downloads/Vol%2003%20Table%20DSx%20LGAPop%20by%20SDistrict-PDF.pdf

sofm2	0.749	0.012	3.5	23.0	-548.8
sofm5	0.281	0.778	12.1	-2.6	78.5
sofm6	0.000	0.554	49.3	-5.2	89.4
sofm7	0.554	0.007	-28.7	26.5	7.7
sofm8	0.352	0.928	-10.4	0.8	92.1
sofm10	0.000	0.040	-45.8	20.6	55.1
sofm11	0.000	0.349	-63.9	-8.9	86.1

Source: Hydroelectricity dams host communities’ survey, 2022

In Table 1, columns I and II shows the joint significant probit model of Chi-square test of the covariates demonstrating before and after match. The probability values of after match are no longer jointly significant, meaning, self-selection bias issues are eliminated hence meeting the matching requirement for computation of ATT.

**Table 2: ATT**

Variab le	Sample	Treat ed	Cont rol	Differe nce	S. E	T- statist ics
Hap1	Unmatc hed	.348	.654	-.307	.053	-5.77
ATT		.325	.654	-.329**	.034	-9.60
ATU		.654	.325	-.329		
ATE				-.329		

Common Support

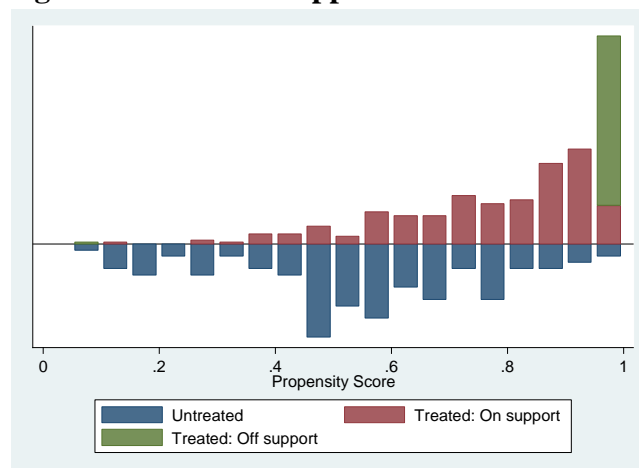
Treatm ent task	Off- support	On- support	Total
Untrea ted	0	107	107
Treate d	85	243	328
Total	85	350	435

\*\*\*represents significant levels at 1%. ATT: Average treatment effect on the treated, ATE: Average treatment effect, SE: Standard error, ATU: ATE on the untreated

Table 2 demonstrates the ATT, specifically Radius Matching Method (RMM) which happen to more robust amongst the three matching algorithms used in the study. The ethical requirement of PMS are the magnitude of the ATT result, the signs and the significant level. The ATT is -329 at 1 percent significant level which mean 33 percent of the hydroelectricity dam host communities in Nigeria are not happy. In other words, the people are less happy by 33 percent. To ascertain the validity of the estimates of the groups, the common support demonstrates positive probability both in figures in table 2 and pictorially in figure 1.

The ATE in Table 2 measures the probable effects of the hydroelectricity dams on the host communities of control groups; Gurara and Gwadoko river communities. That is, the communities would have suffered a 33 percent happiness pains if the rivers were dammed.

**Figure: 1. Common support.**



To conduct the robustness test of the ATT in radius marching method, NNM and KGM algorithms were both run as a sensitivity test (Table 3). The ATT are -275 and -243 respectively. This mean that the hydroelectricity dam host communities are less happy by 27 and 24 percent respectively. In other words, the RMM result is robust and consistent with other algorism results; that is, not exceptional different from the result of RMM.

**Table: 2. Sensitivity test**

Tech nics	Varia bles	ATT	Treate d On-	Off- sup port	Contr ol	Off- support

			support		On-support	
NNM	Hap1	-	243	85	107	0
		.275**				
		(.052)				
KGM	Hap1	-	243	85	107	0
		.243**				
		(.108)				

\*\*\*represent 1% significant level while the standard error in parenthesis. NNM: Nearest Neighbor Matching, KGM: Kernel Gaussian Matching, ATT: Average treatment effect on the treated

The magnitude of the negative happiness of the hydroelectricity dam host communities in Niger state is the registration of the people’s dissatisfaction with evolving socioeconomic characteristics due largely to contact with the dams. One of such experience is resettlement of some villages in the host communities. Some resettled villages in Jebba community are Byagi, Gbajibo, Bukka, etc, in Kainji community are New Bussa, Karabonde, Shagunu, Amboshidi, Yumu, Ujiji, etc and in Shiroro communities Zumba, Guni, Kapana etc. These resettled villages in the communities’ grumbles of inadequate provisions(that houses psychological burdens) as a result of the usual “government arm-twisting phenomena of the commoner”. That is, government/intermediaries sees the host communities as “local people” and treat them as such in provisions.

Apart from the colonized land by the water bodies, the current policy of dam and land concession to individuals has its implications that are psychologically bothersome. The reduction of the nature’s available resource provisions for the host communities is a pain that is capable of reduced happiness. Other implications include the youth’s dissatisfaction with the elders for agreeing to such phenomena without consideration for the future (youth). This is another pain of indigenes (youth) against the indigenes (elders).

The issues of migration and immigration is also part of the probable phenomena that defaced people’s happiness in the host communities. As seasoned farmers, some natives moved to other areas like Katcha, Lapai,

Mokwa, Agaie and Bida Niger State or other locations in Kwara State in search of better farmland for farming. Immigration influx to the host communities due largely for job opportunities in the hydroelectricity dams, fishing and other forms of transactions as attracted by the dams is an issue. This has also attracted the negative psychological costs that translates to frustration that lowers the state of mind or happiness of the community in different ways; loss of relations resulting from migrations, “feeling of/ non-indigene tag” experience in the new locations, cultural bastedization from influx immigrants and loss cultures form part of the pains. For instance, traditional age grade congregational farming and traditional festivals in Shiroro community such as Abwagyi and Zakwolotu festivals are no more due to distortions of the original settlements and opening up of the community to urban practices, likewise in Kainji community, traditional horse race and agricultural show provisions got wiped off due to distortions of the old settlements. All these are the ascertained probable frustrations that are capable of lowering happiness status of the electricity dam host communities Nigeria. This findings are in line with or similar to the previous research results of (Adamu & Emigilati, 2020; Adebola et al., 2014; Ewugi et al., 2016; Ewugi & Usman, 2016; Niworu, 2017).

### Conclusion and Recommendation

Policy decisions at levels of administration should ponder on issues related to well-being—people’s evaluations and their general feelings about life. Domestic policy issues in government are mostly focused on so called economic outcomes, even although they sometimes tend to omit, mislead and have many shortcomings about societal values. It is a fact that some measures of well-being point to vital conclusions that are not visible in economic indicators. The Easterlin paradox is a good experimented instance, where economic apparatuses has risen greatly over decades, but there has been little or no improved happiness over the periods.

It’s natural that all coins are two sided- a tail and head. This goes to imply that hydroelectricity dam project come a long with its advantages and negative cost. In Shiroro

community, there is a good road connecting the dam site and state capital; Minna. Likewise in Kainji and Jebba communities, the new ownership of the dams/land has put up infrastructures like schools, roads vis-à-vis resettled some villages (Amfani) with free electricity as a corporate responsibility. However, airport, industrial parks hotel and tourism are in process. These are parts of some value additions to hydroelectricity dam that are worthy of promoting happiness of the host communities in Nigeria.

The study, therefore, recommend that consumers of electricity be made to pay a mild tax as trust fund (to raise organized fund) to be used to facilitate/provide basic needs for the hydroelectricity dam host communities just like what's obtainable in the education sector of the economy.

Government and the new ownerships of hydroelectricity dams consider training of the aborigines on the basic occupations of the host communities; fish farming, crop farming, dry season farming and even marketing of farm produce as a priority. This (training) be aimed at improving human resource skills, maximum utilization of the available natural resources and efficiency in production.

This youth dissatisfaction has element of pain against not only the new owners but also native elders. The aggrieved youth is a likely or probable spark lane that deserves government/new ownership early attention to avoid associated implications.

These put in place will not only go a long way at improving employment opportunities within the available resources in the host communities but equally improve the happiness statuses of the hydroelectricity dam host communities in Nigeria.

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