

Article

Socio-economic Impacts of Water Project on the Community Livelihood in Peri-urban of Tanzania: Case study Gairo District – Morogoro Region

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Abstract

This study analyzed the socio-economic impacts of water projects on community livelihood in peri-urban Tanzania. It employed a cross-sectional research design, and a survey questionnaire was distributed to 353 households that were randomly selected by probability sampling procedures. Data were analysed using the logistic regression model. This study was guided by theory of Peri-Urban Turbulence (PUT) which is founded on the idea of changes in the balance and magnitude of natural and caused infrastructure and local and distant established arrangements during the transition, primarily in fast-growing urban areas of the Global South. The findings suggests the respondents' year of schooling positively affect household access to water. Having one additional year of schooling may increase the chance to access to water facilities. Furthermore, the average household head's monthly income was a significant explanatory variable at a one percent level of significance. Besides, non-farm activities were significantly associated to access to water. Nevertheless, the study identified the four major economic activities that the community engaged in as a result of water accessibility; male and female hair saloon salons, petty trading in village open auctions, vegetable gardening, and motorbike riding. Among of the four major economic activities performed, petty trading in the village open auction business is the most practiced. One can conclude that, the existence of water projects promotes socio- and economic development.

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1. Introduction

Water is vital to human life,. Although abundant, it is limited and global freshwater demand has been growing rapidly due to population growth and affluence (Petersen-Perlman and Wolf, 2020). Worldwide, an estimated 768 million people remain without reliable water supply (UN, 2017). Compared to other sectors, the data shows that more than 1.3 billion people still lack access to electricity and roughly 2.6 billion use solid fuels for cooking. The report by UN (2017), shows that economic growth and sustainability in the Asia region is intimately linked with progress in access to safe water and sanitation; meeting water demands across multiple uses and mitigating the concurrent pollution loads; improving groundwater management; and increasing resilience to water-related disasters. The need for improved access to quality water supply and sanitation services is emerging as a key objective in poverty alleviation (Anwar *et al.*, 2009). Access to improved water supply and sanitation services became more prominent before it was declared in the Sustainable Development Goals (SDGs) in 2015. Since then, access to reliable, clean and safe water has remained a global challenge among public water supply utilities especially in developing countries. Furthermore, there is evidence of a close association between respiratory diseases caused by indoor air pollution, diarrhea and related waterborne diseases caused by a lack of safe drinking water and sanitation (UN, 2017).

According to study by GIZ (2019), reported that Africa is urbanising rapidly its urban population is expected to increase from 345 million in 2014 to 1.3billion people by 2050. It is the only region, where urbanisation is not accompanied by a sufficient rate of economic growth. Consequently, there is a large and growing infrastructure and financing gap. Investments will have to be increased by multiple of existing amounts to meet the Sustainable Development Goals for poverty reduction and water and sanitation in Sub-Saharan Africa (GIZ, 2019).

In Sub-Saharan Africa, 42 percent of people are without a basic water supply, and 72 percent are without basic sanitation, however, only 24 percent of the population have access to safe drinking water, and 28 percent have basic sanitation facilities that are not shared with other households (GIZ, 2019). The region suffers from chronically overburdened water systems under increasing stress from fast-growing urban areas which in turn causes infrastructure demand and financing gap (GIZ, 2019). In some cases, the pollution of water supply in urban infrastructures and rural areas has incited domestic and trans-border violence (Hoekstra *et al.*, 2012). Several research findings suggest that it is significant to link water services to economic development as done in some African countries like Egypt and South Africa. It was further reported that urban

populations are more likely to have access to infrastructural facilities such as water supply and electricity than rural populations (IEA, IRENA, UNSD, WB & WHO, 2019; UNICEF & WHO, 2019).

Water shortage is still persistent matter to the rural community in Tanzania despite the Government efforts to establish autonomous organs known as water authorities. While the issue of organisation efficiency of these authorities is drawing the attention of many scholars and practitioners (Tarizka, 2012); the efficiency of water supply utilities in Africa and Tanzania in particular, remains questionable. Most water supply utilities fail to provide consumers with adequate water supply (Nickson, 2002). Moreover, the Government of Tanzania enacted a few reforms toward improving water supply and sanitation services in the country. For example, the making of the Water Policy of 2000; National Water Sector Development Strategy of 2006; Urban and Rural Water Supply Authorities (URWSA) and Energy Water Utilities Regulatory Authority (EWURA) in 2006 with the mandate to supply water and sanitation services and regulate the provision of water supply and sanitation services respectively (URT, 2010). However, later on, the responsibility of water supply and sanitation service provision shifted from local government authorities to specific utilities called Urban and Rural Water Supply Authorities (URT, 2010). Despite government initiatives to enhance water availability, access to clean and safe water remains fairly low (URT, 2007). It is provided that apart from changes in climate condition and other socio factors which are considered to be the causes of water shortage.

Tanzania is one of the countries in the worlds endowed with enormous natural resources including water. Lakes alone are estimated to cover about 7 percent of Tanzania's land surface (Mashauri and Katko, 1993). The current water production from regional and national projects water utilities for FY 2019/20 was amounting to 315 Million m³. While water installed capacity amounts to 479 Million m³, and, total water demand amounts to 536 Million m³. For District and township water utilities in FY 2019/20, water production amounted to 28.6 Million m³ while demand stands at 86.7 Million m³ (EWURA, 2022). Water shortage is one of the most dangerous risks for the society and socioeconomic conditions that have aggravated the water scarcity problem throughout the world (Veldkamp *et al.*, 2015). Many studies have explored the correlates of access to improved drinking water (Adams, Boateng, & Amoyaw, 2015; Balasubramaniam, Chatterjee, & Mustard, 2014; Blakely *et al.*, 2005). Another study by Hameeteman (2013); Noemdoe (2006) found that the working for water

project is existing and innovative but inequalities still exist between poor and rich people and between those who live in either rural or urban areas.

As of 2020, nearly 89 percent of Tanzania's urban population used at least basic water drinking services. Among Tanzanians living in rural areas, access to drinking water was more limited, with the coverage reaching some 45 percent of the population. Compared to 2015, access to drinking water in the country improved (Karmel, 2022).

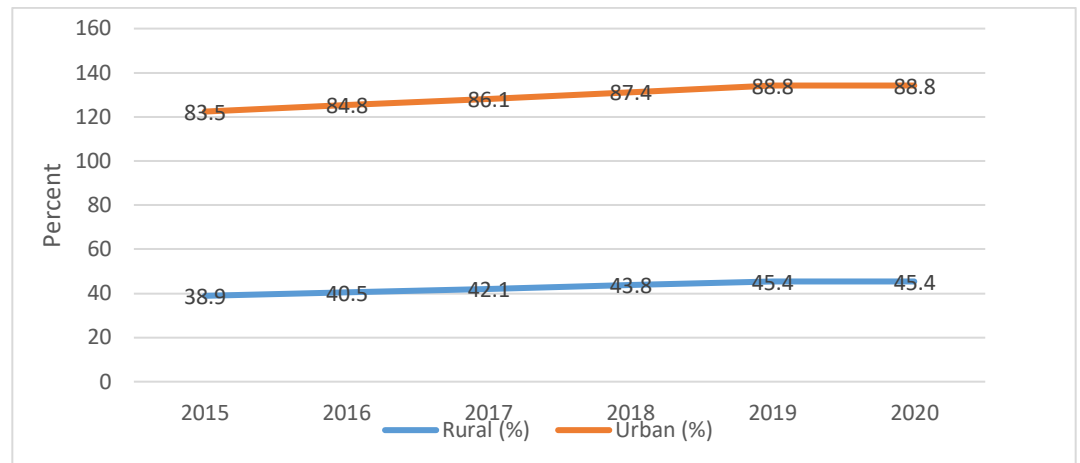


Figure 1: Share of the population with access to basic drinking water services in Tanzania from 2015 to 2020, by area of residence

The study by Ahrends *et al.* (2010) reported that the flow of system services to the community in the peri-urban area is unwell quiet. The distribution of facilities like food, energy (fuel), food, and water might be most nearby near the systems that produce them and in areas where they can be transported easily, possibly subsequent in a shortage in peri-urban areas where local ecologies are corrupted but transport systems are not fully established.

This study can be explained by theory of Peri-Urban Turbulence (PUT) which is founded on the idea of changes in the balance and magnitude of natural and caused infrastructure and local and distant established arrangements during the transition, primarily in fast-growing urban areas of the Global South. The theory shows levels of infrastructure vary across rural, peri-urban and urban areas. The peri-urban had low natural, engineered, socio and institutional infrastructures as compared to urban areas (Hutchings *et al.*, 2022).

For years inhabitants in the afresh established Gairo Township, within the Morogoro Region, have been distress because of an unalleviated water

unavailability. Inhabitants used to pay as much as 1000/- for one container of water (20 liters). One of the places from which they get this valuable liquid at a more rational price, is from a stand-by pipe next to a butchery that is close to the District Government offices. This facility comes under the supports of the local Water Authority, but only delivers daily service usually from 6.00 to 8.00 in the morning. In the Gairo Ward water shortage is a historic problem unrelenting the community. The situation makes the community not to spend much of their time to engaging in socioeconomic activities such as farming and petty business to alleviate poverty. Safe and clean water is important for socio-economic development and ecosystem services. However, this resource is gradually diminishing in most areas of Tanzania including the area of Gairo Township. Therefore, this poses paucity and situates a research problem, hence this study intends to fill the gap by examining the impacts of water project on the community livelihood in peri-urban of Tanzania.

2. Methodology

2.1 Data and sources

The survey was carried out in Gairo District in four villages namely *Luhwaji*, *Ukwamani*, *Gairo* and *Majawanga*, and a total of 353 individual households were randomly selected. The selection of the study district was based on the existence of the well de-saline water project under the World Bank.

2.2 Location

As of 2012, Gairo District was administratively divided into eight wards. The area of the District is 1,851.34 km². It borders Kongwa and Mpwapwa Districts on the west, Kilosa on the south, and on the east are Kilosa and Mvomero. In addition, on the north it borders Kongwa and Kiteto Districts (Fig 1).

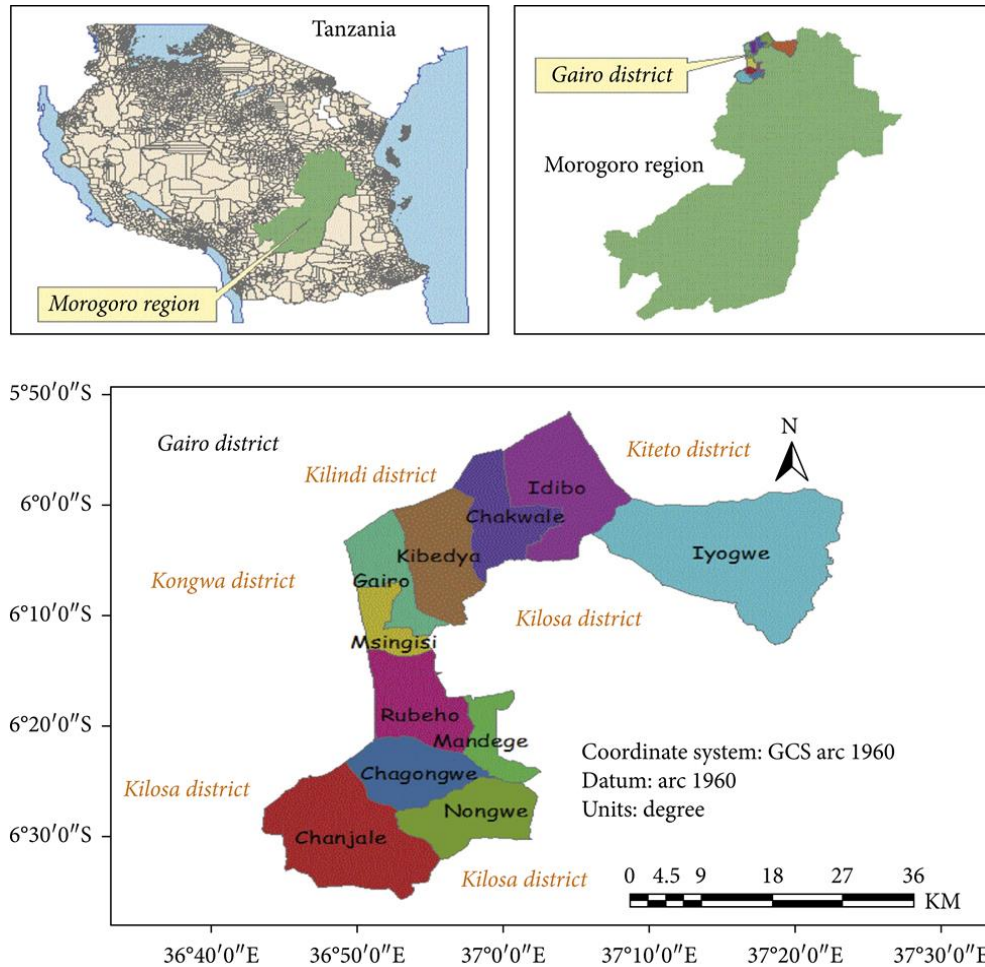


Figure 2: Wards in Gairo District

2.3 Sampling techniques

The study adopted purposive and random sampling procedures to select its sample of respondents. The proportional sampling technique was used in the selection of respondents to be included in the sample from each selected village, i.e., 10 percent of the population of each village was sampled (Table 1). The sampled respondents were exposed to respond to a semi-structured questionnaire. A semi-structured questionnaire was used to leverage the flexibility as it offers the interviewer to prompt and probe deeper into a given situation and explain or rephrase the questions if the respondent was unclear about the questions. Following the responses to questionnaires, the data were analysed to investigate the social and economic impact of water projects to households. Moreover,

secondary data for complementing the primary data, these data were obtained from the Districts Water office, Village offices and from websites.

Table 1: Sample size of surveyed villages

Village	Population(hh)	Sample size
Luhwaji	290	29
Ukwamani	688	69
Gairo	2,285	229
Majawanga	263	26
Total		353

2.4 Estimation procedure

Logistic Regression analysis was employed to link the variables socio and economic impacts and livelihood improvements. The results obtained are quantitative evidence to the influence of the impact of water accessibility on the community's livelihood. The logistic regression model was used to determine whether or not livelihoods were influenced by accessibility to water. Logistic regression model was useful for this kind of a situation where the dependent variable was generated by yes or no. The generated variable predicted the presence or absence of an outcome based on the values of a set of predictor variables (Maddala, 1983). A logistic regression model was run to analyse the influence of socio and economic of the water project. Content analysis was also used to do a qualitative analysis. Then the collected data were analyzed using Statistical Package for Social Sciences Research Software (SPSS –version 20).

The response variable (Y) can take one of two possible values denoted by 1 and 0 (Y = 1 if a household has access to water and 0 (zero) otherwise). When $X_i = (x_1, x_2, \dots, x_k)$ is a vector of explanatory variables determining access to water. The logistic regression is mathematically given as,

$$\ln\left(\frac{\Pr(Y=1|X)}{1-\Pr(Y=1|X)}\right) = \beta_0 + \beta_i X_i + \varepsilon_i$$

Where, β_0 is the intercept parameter β_i is the vector of slope parameters.

The logistic regression was adopted as previously noted that the dependent variable is a dummy, which takes a value of 1 or 0 (zero), subject on whether or not a household has access to water. The hypothesis is that the error of forecast

of access to water is generally distributed, and takes only the value of 1 and 0 for with and without access to water respectively. Nevertheless, the independent variables were both continuous and discrete. The Variance Inflation Factor (VIF) and correlation test between the various explanatory variables were used to test the existence of multicollinearity problems.

Therefore, the study is described by the model which is stated as follows.

$$WC = \beta_0 + \beta_1 Ag + \beta_2 yr + \beta_3 Sex + \beta_4 Dis + \beta_5 Inc + \beta_6 Nof + \mu$$

Where by,

WC = Water connectivity (1=connected, 0=else/ not connected).

B_0 = Constant Factor

β_{1Ag} = Age of respondents

β_{2yr} = Year of schooling

β_{3sex} = Sex of the respondents

β_{4Dis} = Distance from village center

β_{5yr} = Household income

β_{6sex} = Non-farm activities

μ = Random variable.

3.0 Results and Discussion

3.1 Respondents' socio-economic profiles

This section explains the respondents' socio-economic characteristics. Some of these characteristics are assumed to influence water projects to social and economic development. It presents information on the demographic attributes of the respondents such as age, sex, level of education of households and the main households' economic activities.

3.1.1 Age of the respondents

Table 2 shows that a big majority of the respondents are in the age group of 18 - 44 years. The finding suggests that a few household heads are aged above 60. The findings show that age may influence somebody's demand for water.

Table 2: Age of the respondents

Age group	No. of respondents (household heads)
18 – 34	125
35 – 44	121
45 – 60	65

Above 60	42
Total	353

3.1.2 Sex of the respondents

Table 3 shows that 70 percent of the respondents were male while the remaining 30 percent were female. This could be attributed to the fact that most households in economically developing countries, Tanzania in particular, are headed by males. Apparently, in some societies females are denied chances to participate in the development agenda, and are thus regarded as home workers and care or debate. In some communities, women are not allowed to speak before men (Feinstein, Feinstein & Sabrow, 2010).

Table 3: Sex of the respondents

Sex of respondents	Frequency	Percent
Male	246	70
Female	107	30
Total	353	100

3.1.3 Education level of the respondents

Table 4 shows that the majority of the respondents (43.6%) had primary education, while very few (7.1%) had attained a college education. This is true of Tanzania's educational statistics in which the majority of household heads aged (45-60) in rural areas have primary education, and very few have college or higher levels of education.

Table 4: Education level of the respondents

Education level	Frequency	Percent
Not attended to school	70	19.8
Primary education	154	43.6
Secondary education	65	18.4
Advanced secondary education	39	11.0
College	25	7.1
Total	353	100.0

3.1.4 Occupation of the respondents

As many as 57.8 percent of the respondents from the four villages were engaged in crop farming (Table 5). Another 25.8 percent are livestock keepers and the remaining 16.4 percent engage in petty trading in village open markets. The study reveals that a significant number of respondents are petty traders in Gairo District. This could be a result of water projects, household had time to engage in other income generating activities.

Table 5: Main occupation of the respondents

Main Occupation	Frequency	Percentage (%)
Crop farming	204	57.8
Livestock keeping	91	25.8
Petty trading	58	16.4
Total	535	100

3.2 The Demand and Supply of Water under Various Water Projects

In the past Gairo Districts depended on water infrastructure laid down in 1972. The water was clean but not safe. It came from spring falls nearly 70km from Gairo Town. The supply was weekly through established water points located in several *vitongoji* (neighbourhoods). Due to the rapidly growing population water became scarce, and it started to be sold at Tshs 200-Tsh 500 per 20 liter pail. The situation affected many households socially and economically due to costs created on society due to the lack of water for domestic uses. The situation lasted for more than 10- 20 years. Meanwhile, the proportion of the community with access to safe and clean water in Gairo is only 40.7 percent. This rate is 51.4 percent for rural people, and 30 percent for urban people. Plans indicate that the projects under implementation will increase the rate of water available to 66 percent for rural dwellers, and 54 percent for urban dwellers by June 2018 (Gairo District Council, 2018).

The daily water demand for the Council is 8,357,740 litres, (rural 4,675,950 and urban 3,681,790). However, only 2,133,246 litres (rural 1,028,709 and urban 1,104,537) are currently produced. Through the National Water Supply and Sanitation Programme (NWSSP) the Council is undertaking projects for drilling shallow and deep wells, as well as the development of piped water schemes (Gairo District Council, 2018). Likewise, COWSOs are formed to improve water management. As of now, there are seven (7) registered COWSOs (Ibid).

The Government through the WB announced the provision of clean water projects in eight districts urban centers, including *Ikwiriri, Majawanga, Kilosa, Turiani, Mvomero, Kibiti, Gairo and Kisarawe*. Through these WB projects the Council contracted Serengeti LTD Company. The Serengeti LTD Company constructed the Gairo Water Supply Project and at the time of research, the progress was more than 80 percent (Construction of water storage tanks, industrial buildings, pipelines and drilling of water wells) and drilled seven successful 150-meter-deep boreholes through the Gairo District project.

3.3 Factors Influencing Households' Access to Water

Various prospects could be of use to households which could be determined by access to water services. Affordable water supply services, for instance, determine the extent of income-generating opportunities and the ability to respond to such opportunities. Improved access to water can enable households develop their micro-enterprises and increase their income earning capacity.

The researcher checked both the continuous and discrete explanatory variables to find out the existence of multicollinearity problems before to running the logistic regression model. The problem arises when at least one of the explanatory variables is a linear combination of the others. Variance Inflation Factor (VIF) and contingency coefficient for continuous explanatory variables and dummy variables respectively are used to test multicollinearity (Gujarati, 2004). As a rule of thumb, if the VIF of a variable exceeds 5, there is a multi-collinearity problem. This implies that the larger the value of the VIF of the explanatory variable the more collinear the variable is.

Table 6: Collinearity diagnostics for explanatory variables

Variable	Collinearity Statistics	
	Tolerance	VIF
Age in years	.80	2.42
Year of schooling of HH head	.75	2.04
Sex of the head of the household	.68	1.01
Distance of household from village center	.54	3.54
Household monthly income (x 10,000)	.63	1.06
Contribution of nonfarm activities to income	.74	1.18

The value of the VIF and tolerance values¹ shown in Table 6 indicates that an explanatory variable used in the logistic model was not linearly related in a statistical sense. The regression results for the logistic model that was estimated following results provided in Table 7 and discussed thereafter. Dependent variable: Households' connectivity to water (1=connected, 0=else/ not connected).

Table 7: Maximum likelihood estimates for logistic regression

Explanatory variable	B	S.E.	Wald	Sig.	Exp(B)
Age (Years)	-0.10	0.04	6.85	0.02	0.76
Education (Years)	0.05	0.05	0.53	0.46	1.03
Sex (1=Female, 0=Male)	-0.13	0.64	0.14	0.81	0.76
Income (x 10,000)	1.23	0.30	20.98	0.00	3.80
Nonfarm activities to income (%)	0.06	0.01	7.83	0.04	1.05
Constant	0.83	1.35	0.29	0.56	2.08

Dependent variable: Households' connectivity to water (1=connected, 0=else/ not connected)

Table 6 shows that a household's access to water is positively affected by the respondent's number of years of schooling. Having one additional year of schooling may increase the chances to have access to water services by 0.05 holding other explanatory variables constant. This was expected as it has been established that education is more likely to increase the information base and decision making abilities of the households including the ability to utilize different opportunities such as the use of clean water. The average household head's monthly income was a significant explanatory variable at 1 percent level of significance. This implies that the household's head's monthly income has influence on his or her house's getting connected to public water supply services. Household income is not only used as part of investment capital and making ability to generate own investment capital, but it is also used as an indicator of the household's ability to repay water bills. Financial constraints were among the factors limiting households' connectivity to the water supply network in Gairo District. Moreover, households with more income from non-farm activities had a high chance of accessing water. Non-farm activities were significantly related to

¹ A tolerance value close to 1 means multicollinearity is not severe, whereas a value close to 0 suggests that multicollinearity may be a threat to the model.

access to water at the significance level of 1 percent probability. The coefficient of non-farm activities shows that chances of accessing water are increased by 0.06 for each additional percentage of income from non-farm activities to the total household income.

3.4 Benefits of rural water project to rural livelihoods

The benefits of rural water projects to rural livelihoods are assessed based on the economic activities resulting from the water projects and various opportunities which have resulted from the time saved in the search for water. Diverse economic activities are established as a result of water projects.

Table 8 shows four major economic activities that were established in Luhwaji, Ukwamani, Gairo and Majawanga villages after the completion of the water project. These activities include; businesses (male and female hair salons, petty trading in village open market, vegetables, bodaboda and agriculture (gardening). Among the four major economic activities, petty trading in open village auction businesses is the most practiced activity in the villages (53.5%). This could be attributed to the increase in the number of people who are jobless because the majority of youth had lost jobs selling water. Several types of livelihood models have been put forward over the years. As noted by ODI (2000), the core of livelihoods models going back to Sen (1981) and currently, Barrett and Reardon (2000), has been the relationship between assets (also capitals, factors, activities (also strategies, production, exchange etc.) and outcomes (also entitlements, consumption bundles, well-being, utility, income) within a mediating environment.

Thus, the current study is in line with Amponsah's (2005) study in the dissertation about Local Economic Development projects in the Lehurutse District of Northwest Province, which also highlights that water plays a pivotal role in the success of Local Economic Development projects. The findings of the study showed that the life span of projects depends on the availability of water for success. This means that for as much as the life span of a project depends on water, households deserve the priority on the side of the municipality on the provision of this basic need. Furthermore, globally, water scarcity and its societal consequences are recognized as one of the most important factors to facilitate socio-economic development (Howell, 2013). The findings show a significant

number of people (28.3%) engaged in vegetable gardening in the four villages. The availability of water made it possible for people especially the youth to engage in vegetable cultivation as it has a lot of demand in the District and neighboring regions like Dodoma and Dar es Salaam. However, a big majority also engage in farming activities especially maize.

During interview one Respondent (RP -1) said:

“Reported to have his vegetable garden in the village and sell the product even outside the District mainly in Morogoro and Dar es Salam”.

The findings show that a significant number of people owned hair salons in the four villages (7.1%). The availability of water made it possible for people especially women and youth to open hair salons. This finding is in line with what other studies found (e.g. Hameeteman, 2013; Noemdoe, 2006; Binns, Ilgner and Nel, 2001) that the working for water projects is existing and innovative but inequalities exist between poor and rich people and between those who live in either rural or urban areas.

The study finding agrees with one study into child health in East Africa found that it was lowest in the peri-urban interface between the city and rural areas, and a study in South Africa found that around two-thirds of urban and rural inhabitants report that their quality of life had improved over the last five years, but only half of the respondents reported such improvement in peri-urban zones. Hence, the literature is clear that peri-urban environments can amplify health inequalities (Weiss & McMichael, 2004; Hotez, 2007; Burchardt & Gordon, 2008).

Another Respondent (RP -2) said:

“I have established a barbershop here in the village and people come to cut their hair. This is my second source of income after crop farming”.

Other respondents (RP -3) commented that access to water has helped them establish the *bodaboda* business (11%). During the study, one *bodaboda* rider from Gairo village stressed.

During interview one Respondent (RP -4) also said:

“I have a motorcycle here in the village. Before the project, I used to stay idle, but, after the water project, the village has become busy, and I am now able to get income for survival”.

Table 8: Economic generating activities resulted from access to water

Activity	Frequency	Percentage
Male and female hair saloons	25	7.1
Petty trading in village open auction	189	53.5
Vegetable gardening	100	28.3
Bodaboda	39	11.0
Total	353	100

4.0 Conclusion and Policy Implication

The data revealed that water projects are appropriate projects for rural and urban social and economic development. Factors such as age, education, sex, income, and non-farm activities have been seen to affect access to water services. Furthermore, four major economic activities were established: male and female hair salons, petty trading in the village open market, vegetable gardening and bodaboda. Among the four major economic activities, petty trading in the village open auction business is the most practiced activity in all the villages. This could be due to the increased number of people who are jobless because the majority of youth had lost their job in selling water. Water projects facilitate the availability of various prospects in the study area. This can be achieved through the provision of business skills, hence improving their livelihood.

REFERENCES

- Adams, E. A., Boateng, G. O., & Amoyaw, J. A. (2015). Socioeconomic and demographic predictors of potable water and sanitation access in Ghana. *Social Indicators Research*, 1–15. doi: 10.1007/s11205-015-0912.
- Ahrends, A., Burgessc, N, Milledgef, S., Bullingg, M., Fisherh, B., Smarti, J., Clarkej, P., Mhorok, B and Lewisl, S (2010). Predictable waves of sequential forest degradation and biodiversity loss spreading from an African city. *Proc. Natl Acad. Sci. USA* 107, 14556–14561 (2010).
- Amponsah, A. (2005). Socio-economic Projects in the Lehurutse District of the Northwest Province, South Africa, Master's. Admin. Dissertation, University of Limpopo.
- Anwar, K., Haider, M. A., Waseem, A., Zahra, S., and Murtaza, G. (2011). Qualitative and quantitative analysis of drinking water samples of different localities in Abbottabad district, Pakistan. Vol. 6(33), pp. 7480 - 7489, Doi: 10.5897/IJPS11.1353.
- Balasubramaniam, D., Chatterjee, S., & Mustard, D. B. (2014). Got water? Social divisions and access to public goods in rural India. *Economica*, 81, 140–160. doi:10.1111/ ecca.12056.
- Barrett, C., & Reardon, T., 2000. Asset, activity and income diversification among African Agriculturists, Paris: Info Publishers.
- Binns, J, A. Ilgner, P. M and Nel, E. L., (2001). Water shortage, deforestation and development: South Africa's working for water programme. *Land and Degradation Development*. Volume 12, Issue 4 July/August 2001 Pages 341-355 <https://doi.org/10.1002/ldr.455>.
- Blakely, T., Hales, S., Kieft, C., Wilson, N., & Woodward, A. (2005). The global distribution of risk factors by poverty level. Bulletin of the World Health Organization (WHO).
- Bradley, J. (2009). The technology acceptance model and other user acceptance theories. *In Handbook of research on contemporary theoretical models in information systems* (277-294). IGI Global.
- Craig, G., Burchardt, T. & Gordon, D (2008). Social Justice and Public Policy: Seeking Fairness in Diverse Societies (Policy Press, 2008).

- Davis, J. B. (2014). Die Konzeption des sozial eingebetteten Individuums“ in R. Hedtke (ed.) Was ist und wozu Sozioökonomie?, *Wiesbaden: Springer VS*, pp.209-222.
- EWURA (2022). General information <https://www.ewura.go.tz/water-and-sanitation-2/>. [Accessed 31st December. 2022].
- Falkenmark M, Lundqvist J and Widstrand C (1989). Macro-scale water scarcity requires micro-scale approaches *Nat. Resour. Forum* 13 258–67.
- Feinstein, S., Feinstein, R., & Sabrow, S. (2010). Gender inequality in the division of household labour in Tanzania. *African Sociological Review*, 14(2), 98–109.
- Gairo District Council (2018). Gairo District Council: Strategic Plan- 2018/2019-2022/2023 [Accessed 13 April. 2022].
- GIZ (2019). Access to Water and Sanitation in Sub-Saharan Africa: Review of Sector Reforms and Investments, Key Findings to Inform Future Support to Sector Development. : Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). New York: The McGraw-Hill Iwrin.
- Hoekstra, A.Y., Mekonnen, M.M., Chapagain, A.K., Mathews, R.E., Richter, B.D. (2012). Global monthly water scarcity: Blue water footprints versus blue water availability *International Trade of Water. Ecological Economics*, vol. 94 78-85pp.
- Hotez, P. J (2017). Global urbanization and the neglected tropical diseases. *PLoS Negl. Trop. Dis.* 11, e0005308 (2017).
- Howell, L. (Ed.), (2013). *Global Risks 2013*. 8th ed. World Economic Forum.
- Hutchings,P., Willcock,S., ,Lynch,K., Bundhoo., D., Brewer,T., Cooper, S., Keech,D.,, Mekala,S.,, Mishra,P.,Parker,A., Shackleton,C., Venkatesh,K., Vicario,D., & Welivita,I., (2022). Understanding rural–urban transitions in the Global South through peri-urban turbulence.Nature Sustainability. <https://doi.org/10.1038/s41893-022-00920-w>.

- IEA, IRENA, UNSD, World Bank & World Health Organization (2019). Tracking SDG 7: The Energy Progress Report 2019.
- Karmel, L (2022). Access to drinking water in Tanzania 2015-2020, by residence [https://www.statista.com/statistics/1266634/access-to-drinking-water-in-tanzania-by residence](https://www.statista.com/statistics/1266634/access-to-drinking-water-in-tanzania-by-residence) [Accessed 30 December 2022].
- Kothari, C. R. (2004). Research Methodology Methods & Techniques. New Delhi: New Age International, 8-55.
- Maddala, G.S. (1983). Limited-Dependent and Qualitative Variables in Econometrics. Cambridge University Press, Cambridge.
- Mashauri, D & Katko, T (1993). Water supply development and tariffs in Tanzania: From free water policy towards cost recovery. *Environmental Management* (1993) 17, pages 31–39..
- Nickson, A. (2002). The limitations of water regulation: the failure of the cochabamba concession in Bolivia. *Bulletin of Latin America Research*, 21(1), pp.1128-1149. <https://doi.org/10.1111/1470-9856.00034>.
- Noemdoes S. (2006). Perceptions of water scarcity: The case of Genadendal and outstations. A thesis submitted in fulfilment of the requirements for the degree of Magister of Scientiae, Integrated Water Resources Management in the Faculty of Natural Science, and University of the Western Cape.
- ODI, G., & Partners, W., 2000. Livelihood diversification and the rural poor in Asia, Brighton: Brighton Institute of Development Studies.
- Petersen-Perlman, J,D and Wolf, A,T (2020). Water conflicts. The International Encyclopedia of Geography. Edited by Douglas Richardson, Noel Castree, Michael F. Goodchild, Audrey Kobayashi, Weidong Liu, and Richard A. Marston. © 2020 John Wiley & Sons, Ltd. Published 2020 by John Wiley & Sons, Ltd. DOI: 10.1002/9781118786352.wbieg0788.pub2.
- Rijsberman, F. R. (2006). Water Scarcity: Fact or Fiction? *Agricultural Water Management*, 80, 5-22. <https://doi.org/10.1016/j.agwat.2005.07.001>.
- Sen, A., 1981. Poverty and famines. An essay on entitlement & deprivation., Oxford: Clarendon Press.

- Tarizka, E. (2012). Organizational internal communication as the means of improving efficiency. Thesis for award of Master Degree, Guttman Community College, New York. 182pp.
- Trochim, W (2006) Research Methods: Knowledge Base. Atomic Dog publishing, Ohio, U.S.A.
- United Nations (2017). Water in a Changing World, U. N. World Water Dev. Rep. 3, U. N. Educ., Sci. and Cultural Organ., Paris.
- Tanzania Human Development Report (THDR) (2017). Social Policy in the Context of Economic Transformation. Published by Economic and Social Research Foundation.
- UNICEF & World Health Organization (2019). Progress on Household Drinking Water, Sanitation and Hygiene 2000–2017
- United Nations System Task Team on the Post–2015 UN Development Agenda (2012). Realizing the future we want for all: report to the secretary-general.
- United Republic of Tanzania (URT) (2007). Poverty and Human Development Report 2007. Available: http://www.repoa.or.tz/documents_storage/PHDR%202007%20Complete.pdf [Accessed 18 April 2020].
- United Republic of Tanzania (URT) (2010). Water Sector Status Report 2009, Ministry of Water and Irrigation. Available at: <https://www.kfw-entwicklungsbank.de/migration/Entwicklungsbank> Development. [Accessed 22 March 2020].
- Van Vuuren, L. (2009). “The State of Water in South Africa – Are we heading for a Crisis?” The Water Wheel, Sept/Oct. pp.31-33.
- Veldkamp T I, Wada Y, De Moel H, Kummu M, Eisner S, Aerts J C and Ward P J (2015). Changing mechanism of global water scarcity events: Impact of socio-economic changes and inter annual hydro-climate variability. *Global Environmental Change*, vol. 32 pp 18-29.
- Weiss, R. A. & McMichael, A. J (2004). Social and environmental risk factors in the emergence of infectious diseases. *Nat. Med.* 10, S70–S76.