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Influence of Training and Technology Adoption on Sustainability of Donor Funded Water Projects in Kenya; A Case of Turkwel Ward, Turkana County

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Abstract: **The study focused on two solar powered boreholes that meant to serve residents of Lorugum Location, its institutions and surrounding locality. The study was anchored on Outcome and Systems Theory. The study adopted descriptive survey research design that was convenient based on the its nature. The target population was 188, that is 179 local households, Ministry of water officer's hydrologist, engineer, Hydrologist, Water Users Association Member, NGO representative, WASH officer, County Government of Turkana representative and a representative from the Catholic Dioceses of Lodwar. The sample size of this study was determined by applying Yammane formula, which was 128. According to this formula 119 households were sampled using stratified sampling while the rest were purposively sampled. The research instruments used for data collection is questionnaires, and Interviews guide for local households and others respectively. A pilot study was conducted in the same area, but on other respondents and it tested the validity and reliability of research instruments. Qualitative data was collected by holding face-to-face interviews with Data was collected respondents' others than local households while quantitative data was collected by administering questionnaires. SPSS version 22 software was used to analyse data while thematic analysis was used to analyse qualitative data. From the findings, 71.5% of respondents indicated that training had less influence on the sustainability of donor funded water projects. Further, 84.9% of the respondents stated that it takes over two years for the technology adopted to influence sustainability of DFWP. Based on the findings, it was recommended that community sensitization and education should be conducted to change the attitude of locals, the level of education, knowledge and skills relevant to DFWP should be improved. The community should fully own and participate in project activities.**

Keywords: **Training, Technology Adoption, donor, Projects, Sustainability.**

1. INTRODUCTION

Globally, Donors play a critical role in social and economic roles to alleviate human suffering and reduce poverty in underdeveloped countries. Despite access to water, sanitation and hygiene being a human right, billions of people across the world still suffer daily challenges accessing even the most needed services [9] Around 1.8 billion globally use a source of water that is facially contaminated [2]. Lack of water affects more than 40% of the global population and this figure is expected to increase as the grips of global warming tightens by the day. By managing our water sustainable resources, we are also able to improve and manage food and energy productivity [10]. Kenya is considered a water -scarce nation, it contains renewable freshwater resources of 647m2 per capita, yet the UN standards require a nation to have 1000m3 (USAID, 2018). Almost 80% of the country consist of arid and semi-arid land, rainfall in this most ASAL areas are unreliable and unpredictable due to climate change effects. The Kenyan government has tried to achieve millennium development goals MDGs and Kenya Vision 2030 by halving population without access to safe drinking water by 2015 and ensuring water availability and access to all by 2030 respectively.

In Kenya [13] noted that nature of technology to be used in DFPs is determined by the amount of information the beneficiary group have. This is largely dependent on attitudes, perceptions and the culture indoctrinated in the community regarding that technology. Although some donors have their own international standards of technological practice to be adopted, the community sometimes deem some technology as not helpful, wasteful, or destructive, which makes them change their views towards its. Stakeholders participation was valued in terms of time taken, ability to make decisions, and commitment of their own resources towards the development and sustainability of DFPs.

Accessibility to safe and clean water in Turkana County remains a challenge based on the report released by Turkana County in 2018. Accordingly, Turkana South has 56% of the household are connected to pipped water from the Water Users Association compared to residents of Turkana North who accessibility to water is almost one quarter that of its counterpart in the southern part of the county. Loima Sub-County in the northern parts leads other parts in registering low numbers of people with access to clean and safe water. Despite that, continued established of DFWPs and the enhanced roles of Water Users Association, challenges related to distribution and accessibility of safe and clean water continue looming. Most water projects in Kenya funded by donors have been performing as expected with most requiring rehabilitation or non-functional after the donor halts funds. In Kenya, it's quite common to encounter non-functional water projects in most parts of the country [11]. In case the current trend continues, rural water facilities will be completely non-functional limiting access and might enhance the spread of communicable and water borne ailments.

Community water projects funded by donors are critical components in the water provision especially in rural areas and ASALs where government owned companies do not offer services [6]. However, while these projects are relied upon by rural and other communities in ASALs, they often fail to provide clean, safe and reliable water to targeted beneficiaries. Majority of these projects are initiated by donors and handed over to the communities to manage after project end life, but they fail to be sustainable. Lorugum is one of the areas that fall within Arid areas in Kenya that faces perennial drought and limited water resources with a region receiving mean annual rainfall of 500mm. Lorugum Lodete and Locherekalio water projects was initiated by Practical Action East Africa in 2013 and signed an agreement with County Government of Turkana to extend pipeline and increase storage facilities to serve residents. However, lack of sustainability and poor performance of these two boreholes of the water projects initiated demonstrated annual serious and persistent water shortages in this area despite more than 6 years of the existence, the DFP has failed to expand beyond the original area of operation and targeted beneficiaries still experience prolonged water shortages and maintenance challenges. To the best of my knowledge, no study has been conducted in the area to determine some of the factors influencing sustainability of DFPs.

Therefore, the purpose of the study was to investigate the effect of training of water technicians and technology adoption on the sustainability of donor funded water projects in Turkwel Ward, Lorugum Location, Loima Sub County of Turkana County in Kenya. It was based on the hypotheses that training of water technicians does not influence sustainability of donor water funded projects and that adoption of technology has no influence on the sustainability of donor water funded projects.

2. EMPIRICAL REVIEW

[8] conducted a study in Michigan State, North America and in their research, the researchers sought to determine factors influencing sustainability of DFPs. The researchers used case study research method and considered an urban population. In their findings, the researchers established that training water users on management and conservation helped in sustaining the sustainability of some DFWPs. Further, the researcher established that training of water users helped in reducing operational costs and lessened the burden of repair and maintenance. Relative to the study [8], this study used survey research design and focused on a population in ASAL and considered training of technicians as a factor influencing sustainability of donor funder projects, but also use of technology, governance structures and community participation as variables influencing sustainability of DFPs. [5] conducted a study in Tsiekuru Ward, Kitui County with an aim of determining the influence of training water users' committees on community water projects. The researcher used a descriptive research design and used means and standards deviations as tools of statistics to establish relationship between variables. In the findings, [5] indicated that acquisition of technical and operational skills, which was linked cost, repair and maintenance largely influenced sustainability of donor funded community projects.

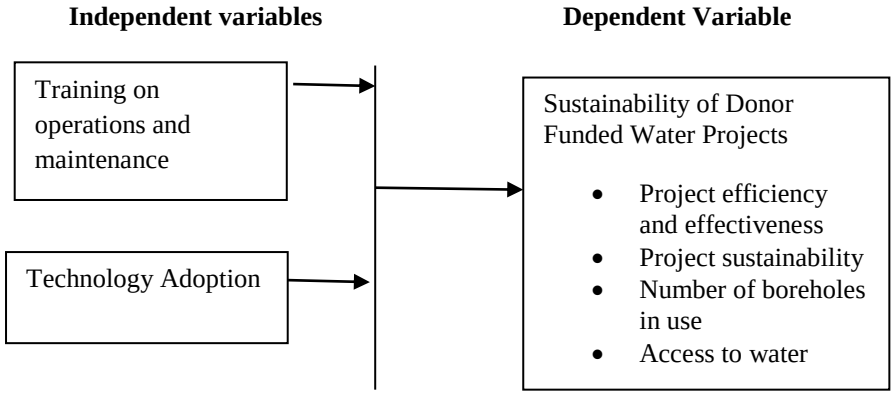
A study carried out in Tanzania by [4] established that only about 3100 boreholes and wells of 7000 owned and operated by local communities were operational. In the findings, in both cases, beneficiary communities failed to own the project and maintain them after the donor had pulled out. As expected, wear, tear and lack of repairs and replacement took toll on

the water projects to the point of total collapse. The scenario was also partly attributed to failure to empower beneficiary communities with knowledge and skills to own the water projects and maintain and operate them in perpetuality. Relative to the findings given by [4] this study focused on two completed boreholes, but were not operational. Besides, this study not only considered training of technical experts, but also on repair and maintenance of DFPs. This study outlined and reviewed other factors that included use of technology, governance structure, and community participation

In a study carried out in Ghana [1], it was established that boreholes in Afram plains and Atebubu districts were repaired promptly after breaking down, thus averting the use of unsafe surface water. Further, the study established that community members understood and appreciates their roles of sustaining projects through O&M. The study by Ghana by [1] only considered the influence repairing and maintaining on enhancing the sustainability of DFWPs. [4] conducted a study in Germany and focussed on inclusivity, community project ownership and use of technology as key components towards the sustainability of any DFP. The researcher used case study research design, which helped him establish that use of technology comes hand-in-hand with level of skills and knowledge of the beneficiary community. The researcher considered two populations, rural and urban, which he noted that a technologically empowered population helped in reducing operational and maintenance cost and inculcated a spirit of innovativeness where members improved service delivery through their technologically improvised ways. Relative to the study by [4] conducted a study in Germany, this study was focussed in Kenya and specifically in Lorugum Ward, Loima sub-county, one of the regions where access to clean and safe water was a problem. This study adopted survey research design where the population was interviewed and responded to questionnaires after which descriptive and inferential analysis were conducted and later results presented.

[7] focussed on the factors influencing sustainability of DFPs in Embu County. The researchers considered rural population, adopted survey research design, collected data using questionnaires and used only descriptive statistics in analysis. In their findings, the determined that nature of technology used was important and largely influenced performance; however, the type of technology adopted in-house in most cases was not compatible with the acquired technology making it difficult to derive benefits of the newly acquired technology. Relative to the study by [7], this study considered a population from ASAL, adopted survey research design, but used both questionnaires and interviews as research instruments. In analysis, this study adopted both descriptive and inferential statistics, which was detailed in giving in-depth analysis of variables and exhibited their relationship accordingly

3. CONCEPTUAL FRAMEWORK



4. SUMMARY

In The reviewed literature reveals that performances of community projects is interictally linked to the participation of beneficiary community, the reviewed establishes that when community members participate actively in financial management, governance, operations &maintenances and monitoring and evaluation projects are more likely to deliver predetermined outcomes. In ASALs counties most of projects have been mainly feeding the hungry, water, health and sanitations where this activity are minimal. The donor agencies give little attention to the root cause of the problems affecting sustainability of this water projects especially in ASALs areas. The donor agencies help in filling the gap in government work, but the sustainability of this projects is poor after completion and handover of projects to community. Therefore, this situation poses a gap hence needs research. Therefore, there is need to look for ways and means of maintaining and continued sustainability of DFWPs to help alleviate poverty and improve the living standards of these communities.

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5. RESEARCH METHODOLOGY

Quantitative research design was used to allow researcher to gather, summarize, present and interpret information for the purpose of clarification. It is mainstreamed to fact finding and may result in the formulation of important principles of knowledge and solution to significant problems. The target population 188. The study population consisted of local community in the area, Water Users Associations (WUAs), NGOs representative working on WASH and Sub County Water officers operating in Loima Sub County. A sample population of 128 was arrived at by calculating the target population of 188 with 95% confidence level and an error of 0.5% using below simplified formula taken from Taro Yamane 1967 (Yamane, 2012).

Yamane (1967) provides a simplified formula for sample size

n=N/(1+(N×e^2))

Where: n= is the size of the sample

N=Population

e= is the error of margin

n=128

6. RESULTS AND DISCUSSION

6.1 Training water officials and sustainability of DFWP

The majority of respondents 47.1% indicated that there was a moderate extent to which training of water technicians influence sustainability of DFWPs as indicated in Table 3. In another case, 28.6% stated that there was a great extent to which training of water technicians influence sustainability of DFWPs. 21.0%) and 3.4% respondents stated that there was little extent and no extent at all respectively to which training of water technicians influence sustainability of DFWPs. Majority of the respondents (63%) stated that there was presence of trained water technicians in the area of study. Contrary to that 37% indicated that there was no presence of trained water technicians in the area of study. This meant that trained water technicians were present in some sections of the study area, but absent in some sections of the study area.

Upon being asked regarding how repair and maintenance is conducted, 55.5% of respondents indicated that the community took part in repairing indirectly through monthly subscription fee by community and maintaining DFWPs. This was followed by 28.6% of the respondents who indicated that water technicians were hired to repair and maintain donor funded water products. Also, 10.1%, 3.4% and 2.5% of the respondents stated that volunteers, Dioceses of Lodwar and County Government conducted repair and maintenance respectively. training had less significance influence on the sustainability of DFWPs, this is evident where 71.5% of respondents supported the idea. Repair and maintenance of DFPs is a key component towards sustainability of such an initiative; however, findings suggest, less emphasis has been put on it. Evidently, 55.5% and 10.1% of the respondents stated that the community and volunteer took part in repairs and maintenance respectively, but according to the findings This fact has been further supported in the same where 2.5% and 3.4% are respondents who indicated that the county government of Turkana and the Dioceses of Lodwar undertook repairs and maintenance; the two institutions are capable of doing more than that to influence sustainability of DFWPs.

In a study carried out in Ghana [1], it was established that boreholes in Afram plains and Atebubu districts were repaired promptly after breaking down, thus averting the use of unsafe surface water. Further the study established that community members understood and appreciate their roles of sustaining projects through Operational repairs and maintenance.

6.2 Adoption of technology and sustainability of DFWP

Majority of respondents (64.7%) indicated that the adoption of technology influences sustainability of DFWPs. Notably, 55.5% respondents agreed while 9.2% strongly agreed that the adoption of new technology influenced the sustainability of DFWPs. 30.3% of the respondents were impartial regarding the adoption of technology and its influence on sustainability of DFWPs. In another case 4.2% and 0.8% respondents disagreed and strongly disagreed that the adoption of technology and its influence on sustainability of DFWPs. From the findings, it was evident that a significant number of respondents were not aware of the impact adoption of technology had on sustainability of DFWPs. Further, the majority

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were aware that the adoption of technology would influence sustainability of DFWPs. Slightly less than half (44.5%) of the respondents indicated that there was inadequate information on water technologies. Contrary to that, 29.4% and 16.8% respondents stated that there was adequate and very adequate information on water technologies respectively. On the other hand, 9.2% of the respondents stated that there was very inadequate information on water technologies.

According to the findings, 64.7% of the respondents observed that adoption of technology influenced sustainability of DFWPs. However, the absorption of technology among the beneficiary community suffers setbacks. Firstly, 84.9% of the respondents stated that it takes over two years for the technology adopted to influence sustainability of DFWPs. Secondly, 53.7% of the respondents indicated that information on water technologies was not adequate. The two cases make it difficult for the adoption of technology to influence sustainability of DFWPs and hence the sustainability of the problem facing water users in the study area.

6.3 Analysis of variance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.753	2	1.876	3.472	.004[b]
	Residual	62.684	116	.540		
	Total	66.437	118			

a. Dependent Variable: Sustainability of Donor Funded Water Project

b. Predictors: (Constant), training of water technicians, adoption of technology

In the findings highlighted in Table 11, it is clear that F (2, 116) = 3.472 and the p-value, which was 0.004, was less than the level of significance adopted for the study (0.05 or 5%). This meant that the null hypotheses were rejected and the alternative hypotheses accepted such that there existed a statistically significant relationship between adoption of technology, training of water technicians, community participation, governance and management.

Table 12: Regression Analysis between training of water technicians, adoption of technology and Sustainability of Donor Funded Water Project

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.758[a]	.656	.540	.035

a. Predictors: (Constant), training of water technicians, adoption of technology

The results of the regression analysis shown in Table 12 shows that adoption of technology and training of water technicians has strong and significant ($p < 0.05$) effect on the sustainability of donor funded projects as evident by a strong degree of correlation, 0.758. The value of R squared measured the variation in the sustainability of DFWP as explained by adoption of technology and training of water technicians.

Table 13: Simple linear regression between adoption of technology, training of water technicians, and sustainability of DFWP

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.761	.277		13.578	.000
	adoption of new technology	.581	.269	.538	2.638	.021
	training of water technicians	.479	.392	.421	2.740	.009

Dependent Variable: Sustainability of Donor Funded Water Project

The regression model (ignoring the error term) can be expressed as;

Y=3.761+0.581A+0.479T

Where Y = sustainability of donor funded water projects

A = Adoption of technology

T = Training of water technicians

From the linear relationship, it is true that a unit increase in adoption of technology and training of water technicians leads to a 0.581 and 0.479 increase in sustainability of donor funded water project respectively.

7. CONCLUSION

There is little or no training at all conducted at the community level to enhance or improve DFWPs. The perception, and attitude of the community towards training of water technicians is negative that is why they feel it has a less significance on the level of sustainability of DFWPs. The level of education for DFWPs is low and this explains the slow adoption of water technology. There is little or no survey conducted before the adoption of a given form of water technology, a survey prior to adoption could have influenced the sustainability of DFPs. Information regarding water technology is limited and few people who lack interest access it. The National Government in collaboration with the County Government should employ and train water technical officers who should be deployed in every sub-county to help in the management of community water projects especially in ASAL areas.

The county government should enact laws that require all donor community projects should be registered to ensure that they are supervised and regulated effectively to avoid closure especially after donor withdrawal of funds. These organizations should also train members to reduce the amount spent on hiring technical expertise. There is the need to have management of water associations and other community projects to further their studies in order to increase their skills not only to be used in the adoption of new technology, but also to manage finances and other operations of the associations under them.

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