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Role of Citizen Participation in Sustainability of Water Projects in Makueni County, Kenya

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Abstract:
Sustainability of community development projects is a major challenge in the African context. Some of these challenges mainly revolve around stakeholder participation. The Theory of Citizen Participation Ladder was adopted to guide the study. This study examined the role of Citizen Power in the sustainability of water projects. A mixed method approach was adopted in this study. A sample size of 121 respondents were selected using systematic sampling technique. A self-administered questionnaire and interview schedule were the main data collection tools. Descriptive and inferential statistical analysis were used to analyse data. The results show that Citizen Power and water projects sustainability was not significant (0.637). Households did not participate fully in the project cycle. The study recommends enhanced community participation in all water projects.

Keywords: *Water scarcity, water shortages, sustainability of water projects, development projects, project management life*

1. Introduction

The study examined the role of citizen participation and sustainability of water projects in Makueni County Kenya. Water as a self-replenishing natural resource is needed to satisfy all the world's water needs. UN (2015) projected by 2030 the world will be facing up to *40% global water deficit,* calling for mitigation on the current negative trends felt more in developing countries. The cost of failed water projects globally totalled to approximately 1.2 billion US dollars every year (Akvo FLOW, 2015). The world's largest economy, China was running a deficit of 37 billion tonnes of water annually (Brown, 2002). Water challenges faced in Iran and Yemen point to a dipping water table. In order to increase provision of water to supplement natural water resources, water projects had been implemented to satisfy the emerging water needs. At the close of 20th century in its report entitled, *"entering 21st century World Development Report 1999/2000"* envisaged a high increase in world population requiring a lot of water for domestic and industrial development (World Bank, 2000). According to the UN (2015) the demand for water is doubling at an alarming rate which does not commensurate with the world population growth. There has been reports on the adverse implications of environmental degradation, water scarcity exacerbated by increasing world population and uneven distribution of water (World Bank, 2000).

The African scene, water situation was shocking as over 50,000 water projects failed (Skinner, 2009). In spite of a huge expenditure Skinner (2009) showed in Africa alone a loss of US$360m was spent on building boreholes and wells that stalled and collapsed. As a result, Skinner (2009) said over 50,000 water supply points were non-functional across rural Africa exacerbating the biting water scarcity. Mitsuaki (2008) Africa boasts globally of two of the world's mightiest rivers, the Nile (6,400 KM) and the Congo River (4,370 KM), even endowed with some of the world's largest and deepest lakes, Victoria and Tanganyika and yet a huge 900 million of the continent's people have very minimal access to water. In Kenya, Miano (2011) depicted clearly that in 1974, the Kenya Government launched the National Water Master Plan, with the aim of having water supply available within walking distance of every household by the year 2000, which remained a long-gone mirage and dream objective. Makueni, Machakos and Kitui Counties in lower eastern Kenya do experience extreme water scarcity and rampant water shortages (Mutiso & Thompson, 1987). Water projects had been undertaken to alleviate water scarcity but still water scarcity and rampant water shortages have been experienced from time to time in midst of numerous water projects.

Water is an essential component for development and domestic life. Increase in world population, environmental degradation and destruction of water catchment towers including the riparian ecosystems had exacerbated scarcity of water

and rampant shortages. Participation is important in project management life cycle phases (Westland 2007) initiation, planning, implementation with aim of having sustainable development projects. It has been alluded by Davis et al. (2013) that participation enhances trust, debunks myths, improves and expedites on the development process.

Water projects have been implemented to alleviate water scarcity but still acute water scarcity has been experienced in the midst of numerous water projects. Search for water to satisfy domestic needs had become a *'daily work'* to many households. Scarcity of water is one of the major development concerns facing households in Makueni County in midst of numerous water projects. Many boreholes and other water projects that once thrived and flourished yielded little water while others stalled or failed/collapsed and left to rot and decay. Water scarcity has impacted negatively on socio-economic wellbeing of the households in Makueni County. The inadequacy of information makes it difficult to make informed choices on participation levels in water projects for sustainable development. Community participation may play an important role hence the need for this study.

Hence the aim of this study was to determine the contribution of Citizen Power (Partnership, Delegated Power, and Citizen Control) on citizen participation in water projects sustainability in Makueni County Kenya. The study was guide by the hypothesis that $H0_1$: There was no significant relationship between Citizen Power (Partnership, Delegated Power, and Citizen Control) and Sustainability Water Projects in Makueni County.

1.1. Theoretical Framework

The Ladder of Citizen Participation Theory by Arnstein (1969) was adopted to guide the study on sustainability due to its relevance on empowerment by being a ''***community-based planning process"*** in domestic projects between the project stakeholders, the ''*powerful''* (government) and *powerless* (the community. The Arnstein (1969) Ladder Theory can be interpolated into the Project management Life Cycle for community optimal benefits in successful implementation and sustainability of water projects. In the study of Project Planning and Management, Planning comes before all things since it is forward looking for determining what should be done in projects before anything actually happens. Arnstein (1969) Citizen Participation Ladder was first used as a road-map to making of a great society through comprehensive planning in the US Model Cities Domestic Programs running from (1966-1972)-the anti-poverty eradication programmes of 1960s. Moreover, Parker (2003) depicted the theory is geared towards full Citizen Participation, the final envisaged goal of Citizen Power, the hallmark of empowerment for the community own and control their projects for sustainability.

According to Arnstein (1969), *informing* in domestic projects, the theory is important in disseminating a two-way communication. Parker (2003) alludes that the theory's importance with respect to communicating project ideas, government policy support and avoidance of conflicts through the spirit of good will, cooperation and mutual trust amongst project stakeholders. The Citizen Participation Ladder Theory therefore enhances decision making in community participation by giving a favourable serene environment for utilizing community resources (Kuwait and Kweit, 1980). Hatley (2013) reported on the Ladder Theory as being collaborative in nature for setting up public policy to impact positively and directly on community needs because of its close conduct with reality. Hatley (2013) concurs on this by saying that apart from planning, the Ladder Theory is also technocratic decision-making tool for experts and democratic decision-making process for the experts and the community for active participation in development projects. Lithgow (2008) depicted that the theory also functions as a catalyst in hastening development projects planning processes by reducing isolation of project planners from the community. Parker (2003) alludes the Arnstein's theory instils a team spirit of trust and cooperation within the community when disseminating project information ideas to the community and project sponsors. Furthermore, Parker (2003) depicted on how Delegated Power in the theory mobilized a political leadership credibility angle for advocacy in order to agitate and increase public support in development projects with sole aim achieving project control as in ***Citizen Control*.**

1.2. Conceptual Framework

The conceptual framework for this study is presented in Figure 1. It shows the independent and dependent variables in the study. The study seeks to link the various dimensions of citizen participation (Citizen control, delegated power and partnership) to sustainability (continuity of water supply as measured by Quantity of flow, quality potable water and regularity/reliability while management of water systems as measured by managerial skills of operators, open communication channels and managing people, time and cost of water) from water projects. This study aimed at identifying the community participation knowledge gap.

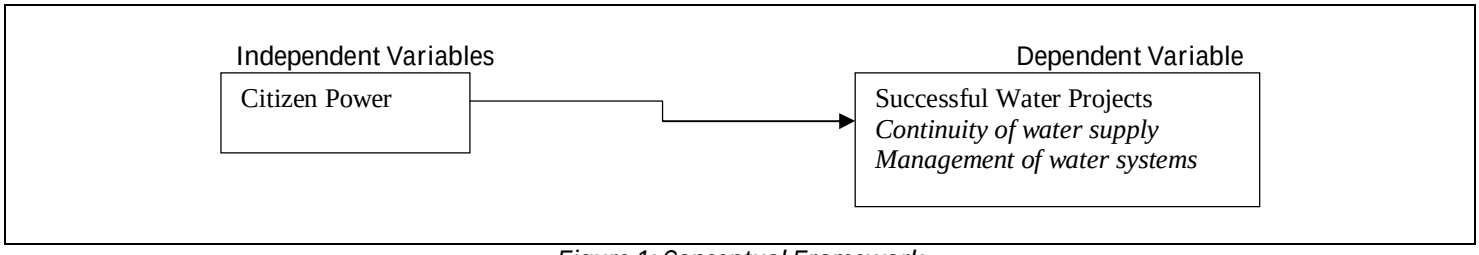

Figure 1: Conceptual Framework

2. Methodology

2.1. Design

A descriptive research design was adopted for the study. The study used mixed method- qualitative and quantitative data. The study area was Makueni County which comprises 9 sub-counties (Kilungu, Makueni, Kathonzweni, Mbooni west, Mbooni East, Kibwezi, Makindu and Nzaui).A target population of 40,423 households served by the water projects. Foursub-counties (Mukaa, Makindu, Nzaui and Kilungu) were selected for the study. A sample size of n=121 respondents was selectedusing systematic sampling technique.

2.2. Participants

The participants were households who were served by water projects in the area of the study. The study sample was 121 respondents in the study area.

2.3. Data Collection

Data was collected by use of self-administered questionnaires and an interview schedule. Questionnaires were thoroughly scrutinized to check for completeness and accuracy. A pre-test pilot study was done to determine reliability and validity of the questionnaire.

2.4. Data Analysis

Data was analysed using Statistical package for Social Sciences (SPSS) version 20 to get the results. The qualitative data was to provide more support and clarity to the study. The mixed method data was analysed quantitatively and qualitatively. Correlation and Regression descriptive and inferential statistical analyses were used in the analysing data.This research relied on descriptive statistics in order to develop a general overview of the data collected,to describe, inferand generalize information into the entire population. The model below was used to determine the relationship between the dependent variable and independent variable as: $Y = \alpha + + \beta_1 X_1 + \mu$. Where:

Y = Sustainability of Water Projects and Citizen Power (Partnership, Delegated Power, Citizen Control).

α= is the constant.

X_1 = Citizen Power (Partnership, Delegated Power, Citizen Control).

μ = is the unpredictable random element or error term and β_1, is the coefficients of X_1.

2.5. Ethical Considerations

Consent was obtained from participants willing to participate and were considered eligible for the study. The researcher promised the respondents confidentiality will be maintained at all times and no information will be divulged to third parties.

3. Results

The objective of this study was to determine the Contribution of Citizen Participation/Citizen Power (Partnership, Delegated Power and Citizen Control) on sustainability of water projects in Makueni County Kenya. It has been shown by Davis et al (2013) that participation enhances trust, debunks myths, improves and expedites on the development process. The results of the study were as follows:

3.1. Response Rate of Questionnaires

The response rate Table 1 shows the 121 respondents. The highest was in Mukaa 31 (25.6%), Kilungu 31 (25.6%) followed by Nzaui 30 (24.8%) and Makindu 29 (24.0%). The researcher waited for filling in of the questionnaires and collected immediately on completion before moving to the next household.

Sub-county	Number of Respondents
Mukaa	31 (25.6%)
Nzaui	30 (24.8%)
Makindu	29 (24.0%)
Kilungu	31 (25.5%)
TOTAL	121 (100%)

Table 1: Response Rate
Source: Researcher 2016

3.2. Level of Education and Age

The results on Figure 2 the level of education was highest in both Primary 45 (37.2%) and secondary 45 (37.2%), followed by college 16 (13.2%), University 5 (4.1%) and those who never attended school 8 (6.6%). Some 2(1.7%) did not

indicate. With most respondents having received good education, they were able to communicate community issues which were key in striking a rapport on participation in water projects.

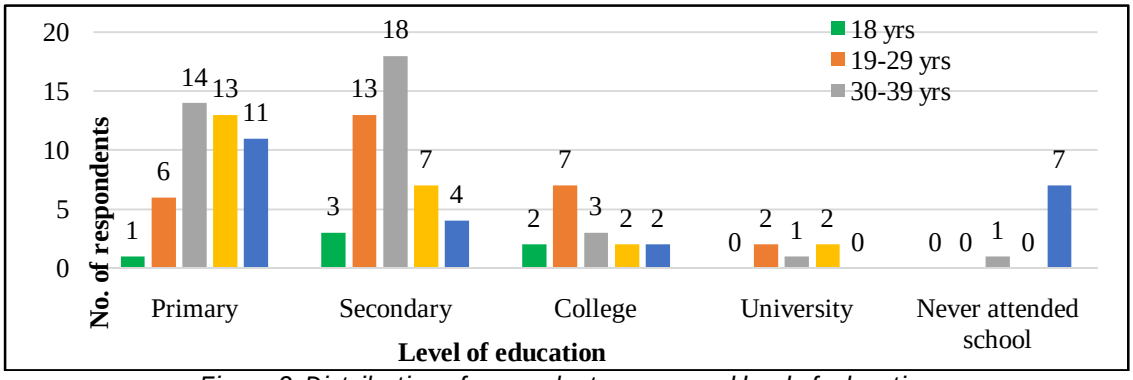

Figure 2: Distribution of respondents on age and level of education
Source: Researcher 2016

3.3. Households Water Sources in the Study Area

The households served by water projects in the four sub-counties: Mukaa, Nzaui, Makindu and Kilungu in Makueni County Kenya as shown in Table 2.

Sub-county	Boreholes		Dams		Pan	
	F	%	F	%	F	%
1. Mukaa	5	10.9	1	2.2	-	-
2. Nzaui:	8	17.4	4	8.7	-	-
3. Makindu	9	19.6	6	13.01	1	2.2
4. Kilungu:	4	8.7	8	17.4		

Table 2: Sub-counties by Types of Water Projects
Researcher (2016)

3.4. Contribution of Citizen Power in Sustainability of Water Projects

The three variables of Citizen Power in the Ladder of Citizen Participation in the sustainability of water projects were Partnership, Delegated power and Citizen Control. These three variables were important in measuring citizen participation in the sustainability of water projects in Makueni County, Kenya. Partnership, Delegated power and Citizen Control which make up the Citizen Power, is the top and final part of Citizen Participation adder. The three variables are considered as the real participation part that empowers and gives power to own and control projects. Citizen power is therefore the hallmark of full empowerment to communities to participate in development projects.

3.5. Partnership and Water Projects Sustainability

Partnership being part of real participation empowers the community by transferring technical and managerial skills to water projects stakeholders. Many authors have appreciated the value of partnership. For instance, Parker (2003) reported that partnership created more understanding of project partners and leadership credibility thus enhancing sustainability.

3.6. Partnership in Water Projects

Partnership is key in community participation. Mahamadou (2009) showed that partnership was important in building DFID's (Department for International Development) capacity development boards in communities. On Partnership, the households were asked to indicate the preferred mode of community participation in water projects. The results were, Periodic consultation 35 (28.5%), provide labour 31 (25.6%), information exchange 11 (9.1%), active management 10 (8.3%), financial contribution 10 (8.3%) and no response 24 (19. 8%).Residents prefer periodic consultations in water projects and provision of labour. When asked on level engagement in community participation, the results were, none 63 (52.1%), planning 22 (18.2%), implementation 21(17.4%), evaluation 4 (3.3%), project closure 2 (1.7%) and no response 9 (7.4%). Although half of the respondents did not participate in the projects, majority demonstrated knowledge of issues that foster sustainability. The respondents indicated their desire to be involved in partnership, in planning and implementation which works best in creating project ownership and control by the community. According Parker (2003) leadership credibility creates a sense partnership and understanding in development projects. Furthermore, Dale et al (2013) had shown the importance of promoting sustainability initiatives through partnerships and action-oriented participation to reduce negative issues experienced in projects.

3.7. Advisory Committees in Decision Making Partnerships

When asked whether there were advisory committees in all water projects, results were, No 61 (50.4%), Yes 45 (37.2%) and no response 15 (12.2%). Majority said water committees did not exist and those existed never functioned optimally to bring the required positive changes in water projects. Advisory water committees are important for shaping decision making in water projects. The results of water management practices avenues of sensitization results were, village heads 34 (28.1%), government 16 (13.2%), NGOs/CBOs 12 (9.9%), media 8 (6.6%) and other 1 (0.8%). Village heads were preferred in sensitization processes. The respondents were again asked on whether they partnered in decision making and results were, No 62 (51.2%), Yes 49 (40.5%), No response 8 (6.6%).Majority of the respondents reported that there were no active committees and there was lack of involvement in decision making. In building of community trust (Bos and Brown, 2015) reported cultural change of behaviours usually bridged the gap in community participation. Majone (2005) reported that the existence of a political community was important in enhancing credibility in policy management.

3.8. Frequency of Meetings and Committee Members

Frequency of meetings in Table 3 results in weeks on water projects shown: None 66 (54.5%), one a week 21 (17.4%), No response 21 (17.4%), 2-4 weeks 5 (4.1%), 2-7 weeks 3 (2.5%) and no response 5 (4.1%). The number of committee members in water projects the results were: No response 47 (38.8%), more than 10 members 23 (19.0%), 6-10 (17.4%), members don't know 21 (17.4%), 1-5 members 9 (7.4%). In existing water committees, meetings frequency was low and few members attended and the highest was in members more ten categories. Bilenky (2009) reported alternative strategies should be sought to be able to operate, maintain and sustain projects to meet community needs. A frequency schedule of water meetings is important for discussing conclusively water needs of the community to be able to come up with good intervention measures backed by community participation. Furthermore, Parker (2003) says that citizen participation instils a team spirit in articulation of needs and cooperation between the community and project sponsors.

Frequency of meetings	Frequency	Percent
No response	21	17.4
Once a week	21	17.4
2-4 weeks	5	4.1
5-7 weeks	3	2.5
None/ no meeting held	66	54.5
Missing	5	4.1
Total	121	100.0

Table 3: Frequency of meetings
Source Researcher (2016)

3.9. Delegated Power and Water Projects Sustainability

Delegated Power, is exercising of power bestowed by constitution or the community concerned for representation in development projects matters. Delegated power is delegated for the purpose of representation since it is impossible for everyone to be included, this way community leaders are selected to act on behalf of the community. Delegated Power concerns leadership in water projects. Mobilization of support in Community Participation is essential for long term sustainability of projects. Davie et al (2013) Reported collaboration in water projects shapes people's thinking for better participation in development projects.

3.10. Leadership Mobilization of Support and Community Confidence

The respondents were asked opinion on the ability of their community leaders to mobilize support in water projects. The results from the 121 respondents were: no 57 (47.1%), yes (54.6%) and no response 10 (8.3%). The community felt that the community leaders were not able to mobilize enough support for water projects. The community did not have confidence with the current community leaders. The results on how community leaders were chosen, it was reported that elected 56 (46.3%), 18 self-imposed 18 (14.9%), appointed institution 17 (14.0%), natural placement 12 (9.9%) and no response 18 (14.9%). Election of community leaders was preferred by the community instead of appointments by the authority.

When asked whether they were ever called for water meetings in period of time the results were: Never called 56 (46.3%), monthly 27 (22.3%), Fortnightly 17 (14.0%), 3 months 5 (4.1%), 3 (2.5%), yearly 2 (1.7%), over I year 1 (0.8%) and no response 10 (8.3%). In most times water project meetings were never called. The results on the relationship between community leaders and the residents were as follows: Bad 51 (42.1%), Good 31(25.6%), Trustworthy 6 (5.0%), Suspicious 3 (2.5%), don't know 18 (14.9%) and No response 12 (9.9%). The relationship was said to be bad. When asked whether they experienced good water results of the 121respondents said: No 78 (64.5%), No 29 (24.0%), No response 12 (9.9%). The results were not impressive. In order to enhance support and confidence in water projects Prokopy (2005) households should be involved in decision making to feel as part of the process.

3.11. Sustainability Attained and Leadership

Mutekanga et al (2013) advised that good policy interventions should be able to foster sustainability in management of water solutions and natural resources. On sustainability of water projects attained, results on Table 4 shows: Affordable water prices 26 (21.5%), Steady flow 12 (9.9%), Continuous training 11 (9.1%), good management 2 (1.7%), enough share of water and No response 68 (56.2%). Pricing of affordable was not attained although most did not respond to the question on sustainability so for gained. In another study by Earthea et al (2007) community participation is a big picture concept essential for better performances of rural water projects.

What sustainability attained	Frequency	Percent	Valid Percent	Cumulative Percent
No response	68	56.2	56.2	56.2
	1	.8	.8	57.0
Steady flow of water	12	9.9	9.9	66.9
Affordable pricing of water	26	21.5	21.5	88.4
Good management of water projects	2	1.7	1.7	90.1
Continuous training on water	11	9.1	9.1	99.2
Enough daily share of water to all residents	1	.8	.8	100.0
Total	121	100.0	100.0	

Table 4: Sustainability Attained in Water Projects
Source Research Data (2016)

When asked about the scorecard of community leaders the results were given as, Bad 84 (69.4%), Good 28 (23.1%), and No response 9 (7.4%). The scorecard was said to be in bad taste as water shortages were rampant in the study area. Results for community leaders wanting to hold on to leadership: No young people 22(18.2%), sponsors dictate choices 19 (15.7%), resident's choice 14 (11.6%), Incentives hard to forgo 12 (9.9%), power sweet 7 (5.8) and no response 47 (38.8%). Current leadership wanted to continue leading in water projects. The Future of Water Projects Leadership results were given as: Bright 33 (27.3%), right people 28 (23.1%), No young with people with managerial skills 15 (12.4%), future not bright 8 (6.6%), Project sponsors dictate choices 7 (5.8%), Not sure 3 (2.5%) and no response 27 (22.3%). The community had hope of having good projects in the future though there were rampant shortages of water in the study area. Majority of respondents gave no response.

3.12. Citizen Control and Water Projects Sustainability

The Citizen Control is the final eighth rung of Citizen Power on the ladder of Citizen Participation for achieving full empowerment in community participation in sustainability of water projects. According to (Earnhart & Lízal, 2007) an ownership structure is effective in transitory economies that alleviates pressure in community needs. (Narasimhan 2008) ownership creates a sense of control and empowerment in achieving sustainable management of ground water without infringing on the environment and development.

3.13. Water Sources and Citizen Control in the Study area

The management of water sources is very important for continued supply of water to the community. The main water source results Table 5 for households in the sub counties were: Natural sources 67 (55.4%), Community self-help projects18 (14.9%), Government projects 14 (11.6%), Private sources 9 (7.4%), NGOs water projects 6 (5.0%) and No response 7 (5.8%). Most of water used by households is from natural sources while the rest is from various water projects. The natural sources of water no longer yielded enough water due to environmental degradation and destruction of water catchment towers and riparian ecosystems. The community should be empowered to sustain and enhance the quality of projects. Levina (2005) said that inadequate community participation and tight project schedule timeframes without involving the community affected the quality of projects. In the same line of thought communities should be fully empowered to participate effectively in development projects Sultana (2009).

Main water sources	Frequency	Percent
No response	7	5.8
Natural sources	67	55.4
Private source	9	7.4
Government Projects	14	11.6
NGOs water projects	6	5.0
Community self-help	18	14.9
Total	121	100.0

Table 5: Water Sources for Households
Source Research Data (2016)

3.14. Ownership and Control of Water Projects for Sustainability

According to Reed (2008) water projects in Africa are in dire need of ownership and active participation by the residents. When asked who owns and controls the water projects, the respondents said: Residents 56 (46.3%), Government 19 (15.7%), Individuals 17 (14.0%), Faith-based organizations 4 (3.3%), NGOs 2 (1.7%) and no response 23 (19.0%). Residents seem to own most of water projects but the project implementers just drilled and left without proper ownership mechanisms in place. This may have been negatively affected the sustainability of project perhaps due to lack of empowerment coupled with limited resources.

Effective literacy programmes are very important in building community capacity as reported by Mahamadou (2009). This could enhance the quality of water sources and control of water projects by the community. On the other hand, community's full involvement in projects increases local participation in alleviating water scarcity Martin (2009). The factors that contributed to water projects failure can be controlled by participation of project stakeholders who are actually served by the water projects Rousseau et al (2011).

3.15. Major Concerns in Water Projects

A study by Martin (2009) showed that participation should be guided by the community's own terms to increase collective local participation. The results on major concern in water projects were, Poor water systems 57 (47.1%), Mismanagement of project resources 23 (19.0%), Limited skills 16 (13.2%), Leadership challenges 12 (9.9%), Political interferences 3 (2.5%), Missing 1 (0.8%) and No response 9 (7.4). When asked whether they felt owned and controlled the water projects the results were; No 57 (47.1%), Yes 50(41.3%), No response 10 (8.3%).

Poor water systems were reported as the major challenge facing water projects, whereas management and leadership challenges were cited by a minority of the respondents. Furthermore, Majority indicated they didn't feel they owned the projects. This agrees with findings by Martin (2009) who reported that participation should be guided by the community's own terms to increase collective local participation.

3.16. Households Expenditure on Water from Water Projects

Water is important to households for domestic use and other purposes. Expenditure of water should not be too expensive to outstrip the meagre income of households. The water expenditure on Table 6 shows results as, 50 (41.3%) did not pay for water they use and 13 (10.7%) did indicate expenditure on water. In the payment categories 1-100 Kshs, 14 (11.6%), 101-500 Kshs, 18 (14.9%), 1001-1500 Kshs, 6 (5.0%), 1500-2000 Kshs, 3 (2.5%) and more 2000 Kshs, 4 (3.3%). Reed (2011) had shown that lack of ownership leads to poor management of water projects. A big number of residents, ***50 (41.3%) were for free water!*** Reed (2008) blames Africa for strictly adhering to culture on water issues whereby ***communities want free water*** from water projects similar to that provided by rivers like their forefathers - whereby residents do not want to pay for the water they use.

Water Expenditure (Kshs)	Frequency	Percent	Cumulative Percent
No response	13	10.7	10.7
Free water	50	41.3	52.1
1-100	14	11.6	63.6
101- 500	18	14.9	78.5
501-1000	13	10.7	89.3
1001-1500	6	5.0	94.2
1501-2000	3	2.5	96.7
More than 2000	4	3.3	100.0
Total	121	100.0	

Table 6: Households Expenditure on Water
Source Research Data (2016)

It is important for communities to actively get involved in management and Repairs of Breakdowns in Water Projects in order to enhance sustainability. When asked state whether they were actively involved in management of water projects, the results were: No 81 (66.9%), Yes 27(22.3%) and No response 13 (10.7%). When asked who repaired breakdowns in water projects, the respondents said, none 58(47.9%), Appointed by Leaders 37(30.6%), No response 14(11.6%), Government officers 11(9.1%) and NGOs representatives 1(0.8%).

The breakdowns were not repaired in good time in most water projects. Results of Water Sustainability Conservation Measures Employed in Households were: Water carrying containers 85 (70.2%), Plastic water tanks 17 (14.0%), None 5 (4.1%) Concrete water tanks 3 (2.5%) missing 1(0.8%) and No response 10 (8.3%). Majority of households did not use permanent water storage tanks. ADROW (2013) Technical breakdowns of water systems do lead to projects failure. The fact that respondents were not involved in management of water projects may explain why participation and sustainability of projects was quite low.

3.17. Water Projects Sustainability in Makueni County

Sustainability of Water Projects is of great concern in the world today in providing a lasting solution to meet water needs in communities. Sustainability of water projects is important in enabling communities to be served by the present water projects for a long time. Sustainability checks on collapse of community water projects. Well sustained water projects wards off water scarcity and rampant water shortages experienced in the study area.

3.18. Willingness to Pay for Water to Sustain Water Projects

When asked whether they paid for water they use the results were: No 71 (58.7%), Yes 39 (32.2%), and response 11(9.1%). Most residents 58.7% did not pay for water they used. Results of the residents' willingness to pay for the water they used results were: No 55 (45.5%), Yes 38 (31.4%), and No response 8 (6.6%). Reed (2008) reported that *communities in Africa wanted free water which is quite impossible* for successful sustainability of water projects.

3.19. Stalled/Collapsed Water Projects and Sustainability

In other studies, Khwaja (2004) reported that projects failed due to lack of sustainability and refusal by the concerned to improve non-technical part of projects that influences decision making. When asked if they knew of water projects that had stalled/collapsed results were: No 61 (50.4%), Yes 47 (38.8%) and No response 13 (10.7%). A big percentage, 38.8% of water projects have stalled/collapsed in the study area while others were functioning with a lot of inherent problems making households to queue for water for a long time. In Nigeria, AWDROP (2013), studies had shown that there was a 40% failure rate of water projects. Collapsed community water projects that once flourished for years left to decay. If there was a proper community participation in the study area to sustain water projects, they would not have collapsed to the state of disrepair and decay.

In other studies, done elsewhere, it was depicted water projects failed/collapsed due to poor planning and unrealistic goals (Reed, 2008).The households were asked on what they would have done when donors withdrew from water projects after successful implementation and the results Table 7 were: Community steps in for care 63 (52.1%), No response 22 (18.2%), Community takes over 14 (11.6%) Not sure 10(8.3%), personally ensure continuity 8 (6.6%) and Ask donor for support 4 (3.3%). Most of the residents were willing to take over running of water projects once the donors and implementers withdraw. Reed (2008) Ownership of water projects participation enhances sustainability in Africa.

Donor withdrawals from projects	Frequency	Percent
No response	22	18.2
Personally, ensure the water project continues at all times	8	6.6
Ask donor to continue to manage the project	4	3.3
Community takes over for care, operation and maintenance	14	11.6
Community steps in for to care, operate and maintain	63	52.1
Not sure what to do	10	8.3
Total	121	100.0

Table 7: Direction of Sustainability after Donors Withdrawal from Water Projects
Source Research Data (2016)

Promoting community participation as reported by Wilcox (1994) is an active way of enhancing community goals of water satisfaction and sustainability of water projects. When the households were asked of the reliability of the water flow in water projects the results, were: Bad 50 (41.3%), Fair 40 (33.1%), Good 13 (10.7 %), No response 13 (10.7%), Excellent 2 (1.7%), Not sure 2 (1.7%) and Very good 1 (0.8%). Majority of the respondents reported the reliability of water was bad (41.3%) while those who said the flow of water was fair (33.1%).A failure rate of water projects 38.8% was high and this tallies with a study done elsewhere of 40% by ADROW (2013) in Nigeria.

3.20. Distances and Queuing Time Taken in Water Projects

Makueni County (2013) had shown residents covered long distances to obtain water for domestic use. The results in Table 8 of distances to water projects were, 1-2 Km 46 (38.0%), 5-6 Km 25 (20.7%), 7-9 Km 16 (13.2%), 3-4 Km 12 (9.9%), No response 11 (9.1%), 10 Km and above 9 (7.4%) and Not sure 2 (1.7%). Majority of the respondents said the water projects were spread far apart from each in the sub-counties. The residents covered long distances to get water for domestic needs.

Distances between Water Projects	Frequency	Percent
No response	11	9.1
1-2 Km	46	38.0
3-4 km	12	9.9
5-6 km	25	20.7
7-9 km	16	13.2
10 km and above	9	7.4
Not sure	2	1.7
Total	121	100.0

Table 8: Distances to Water Projects and Queuing Time
Source: Researcher (2016)

Respondents were asked on how long they queued for water in water projects and results on Table 9 were as follows, 30-60 minutes 32(26.4%), 1-5 hours 30(24.8%), 1-15 minutes 15(12.4%), Water project collapsed/failed 13(10.7%), No response 13(10.7%), 15-30minutes 15(12.4%) and 5-10 hours 6(5.0%). Filling up of water containers took a long time after covering long distance.

Length of time queueing	Frequency	Percent	Valid Percent	Cumulative Percent
No response	13	10.7	10.7	10.7
1-15 Minutes	15	12.4	12.4	23.1
15-30 Minutes	12	9.9	9.9	33.1
30-60 Minutes	32	26.4	26.4	59.5
1-5 Hours	30	24.8	24.8	84.3
5-10 hours	6	5.0	5.0	89.3
No water project has collapsed/failed	13	10.7	10.7	100.0
Total	121	100.0	100.0	

Table 9: Length of Time Queueing for Water
Source Research Data (2016)

3.21. Water Exhaustion Time and Flow in Water projects

When asked of the exhaustion time of water in the water projects they use, the results in Table 10 depicts, no water project failed/collapsed 30 (24.8%), 1-5 hours 22 (18.2%), 30-60 minutes 19 (15.7%), No response 18 (14.9%), 5-10 hours 12 (9.9%), 15-30 minutes 11 (9.1%) and 1-15 minutes 9 (7.4%). Many water projects were said to have collapsed while the functioning ones took long time to wait for water. The water exhaustion time showed long waiting queues occurred across the water projects in all sub-counties.

Water Exhaustion Time in Water Projects.	Frequency	Percent
No response	18	14.9
1-15 minutes	9	7.4
15-30 minutes	11	9.1
30-60 minutes	19	15.7
1-5 hours	22	18.2
5-10 hours	12	9.9
No water: projects failed/collapsed	30	24.8
Total	121	100.0

Table 10: Water Exhaustion Time in Projects
Source Research Data (2016)

The households were asked to state whether current water projects did address their water needs, they said: Yes 61(50.4%), No 47(38.8%) and No response 13(10.7%). It was reported the current water projects did not meet the water needs of the households.

3.22. Major Challenges of Sustaining Water Projects

In Table 11 households were asked to state the major challenges of sustaining water projects: Lack of management skills 53 (43.8%), Lack of information 19 (15.7%), Lack of enough financial resources 18 (14.9%), Community leadership conflicts 16 (13.2%), No response 13 (10.7%) and missing 2 (1.7%). The major challenge reported lack of proper management of water projects. Parker (2003) showed that the major challenge faced in water projects is project ownership and control to enhance sustainability.

Major challenge of sustaining water projects	Frequency	Percent
No response	13	10.7
Lack of enough financial resources	18	14.9
Lack of information on what to do	19	15.7
Lack of water management skills	53	43.8
Community leadership conflicts	16	13.2
Total	**121**	**100.0**

Table 11: Major Challenges Faced Sustaining Water Projects
Source Research Data (2016)

3.23. Quality of Potable Water

The quality of potable water from water projects from results Table 12: Bad 54 (44.6%), moderate 28 (23.1%), Very Bad 21 (17.4%), Good 11 (9.1%), No response 6 (5.0%) and Very good 1 (0.8%). Majority of respondents the water they use is bad. The quality of water from water projects was reported being bad (44.6%). In order to have quality water projects White et al (2005) cost sharing was a key factor in sustainability of water projects stakeholders.

Quality of potable water	Frequency	Percent
No response	6	5.0
Very Good	1	.8
Good	11	9.1
Moderate	28	23.1
Bad	54	44.6
Very bad	21	17.4
Total	**121**	**100.0**

Table 12: Quality of Potable Water from Water projects
Source Research Data (2016)

3.24. Drawbacks on Water Projects sustainability

Results in Table 13 presents drawbacks encountered in course of sustaining water projects in the study area. Poor management 51. 2% and lack of residents control and ownership (47.1%) of water projects were reported as the major drawbacks in the sustainability of water projects.

Drawbacks in Sustaining Water Projects	Respondents	Percent
Vandalism of water systems	4	3.3
Poor Management	62	51.2
Drill More Boreholes and increase other water projects	36	29.8
Lack of Support and Enforcement of Water Policy	33	27.2
Lack of enough Funding/Mobilize for Resources	55	45.5
Poor Maintenance and lack of Spares for breakdowns	31	25.6
Slow Two-way Communication for information	25	20.7
Lack of open Leadership	47	38.8
Lacks of Control and Ownership	57	47.1
Lack of Piped Water and Conservation Concrete Tanks	56	46.3
Lack of good Water Supply and poor water systems	53	43.8
Check Depth of Boreholes for water flow	15	12.3

Table 13: Drawbacks that make Water Projects unsustainable
Source: Research Data (2016)

Previous studies done by Rousseau et al (2011) cites poor management as a key area that may predispose water projects to failure due to setting unclear and unrealistic set objectives and managerial aspects. On the issue of drilling more water projects in great depths, Skinner (2009), had the same line of thought on the need for drilling more boreholes in rural community in Africa due to increasing population. The issue of drilling more boreholes and increasing water projects everywhere is not a must, Bloomthedesert (2011) shows clearly that you can have few water projects that would satisfy water needs of every resident, as a few water projects have been shown satisfy water needs in big cities. Bloomthedesert (2011) Adapting the right water prospecting technology for the right underground water aquifers before drilling has been shown as the best way forward to having successful water projects. Bloomthedesert (2011) said that Stephen Reiss had shown clearly that water drilled from hydrological water cycle may not offer enough water for a long as depths kept on shifting over time.

Bloomthedesert (2011) gave a solution in looking for 'the other water', not of hydrological water cycle, but rather from deep-seated geologic interaction within the Earth's interior, water that travels from the earth's crust. Bloomthedesert (2011) directly said that ''the Riess Institute's scientific application of petrology, mineralogy, structural geology, aerial reconnaissance and remotely sensed data, offers "new water" for a thirsty world''. Bloomthedesert (2011) said, ''Stephen Riess, through his study of mines flooding, developed a science of locating flows of Earth-generated water''. Bloomthedesert (2011) sand that *''These waters, which often deposit minerals and flood out mines occur worldwide as spectacular springs and are even more accessible by drilling into hidden rock structures''.*

3.25. Summary on Sustainability of Water Projects in the Study Area

On sustainability, the study showed water projects in the study area has not been sustained hence the existence water scarcity and rampant shortages of water in water projects. A lot is needed to sustain the water projects. The government support on water policy has not been felt much in study area as pertains to Water Act of 2002. Even at national level, the projected year 2000 for all households to be supplied with water came and went with no enough connections. The launch of public participation in mid-2016 by Makueni County Government may be a step in the right way for sustainability of water projects in the study area. Kenya Monitor Platform (2016) reported of ''*Prof. Kivutha Kibwana the Governor of Makueni County, saying that Public Participation will be the next people's Revolution after Constitution and Devolution''*. No doubt Public participation will be the next ultimate people's revolution for successful sustainability of water projects in Makueni County.

3.26. Qualitative Data Analysis on households Water Projects Sustainability

The qualitative data was collected using an interview schedule and asking questions to the households who were served by water projects in the study area. The qualitative data was important to understand clearly from household's personal descriptive narratives on how they viewed the water projects were sustained in the study area. The qualitative data was analysed through content analysis. The key water projects informants were: Water Officers (M1), Members of Community (M2), Village Headmen/Women (M3), assistant chiefs (M4).

In one household, the researcher was received with some interesting words of welcome that meant scarcity of water:

''It feels is like you have brought water in these papers(questionnaires), it is so 'sweet' to fill in these questionnaires perhaps we will have enough water some day!''...M2

When asked about the water situation in the study area, the reply was:

''We usually experience shortages of water in this area as boreholes sometimes yield little water for no known reasons. The local leaders had asked the county government to sink more boreholes''... M1.

On political leadership, a member of the community was asked how elected representatives contribute to alleviating water scarcity and shortages:

''These people (politicians) are very clever, they come here sweet talk us for votes and disappear until the next general elections''... M2

It was also asked on whether the community participated in water projects and the answer given was,

*''the governor launched his public participation in 2016 which was lauded by the World Bank being of its kind in Africa which tied every development project to community participation but has not yet reached this place''...*M2.

Apart from the county government and NGOs you said have sunk boreholes, who else has boreholes here:

*There are also boreholes belonging to Mormons and other churches, Muslims and private individuals who help the community with water''...*M2

Your community has used river water for generations, do you still use water from river:

''The nearby river is seasonal and dries up immediately after the rains but we continue to dig the riverbed deep down to get water for drinking and animals. In many rivers around here, all sand has been harvested for sale making the rivers dry early. Water from the rivers is not that safe to drink, it tastes oils and smells diesel spilt by sand excavators and sand vehicles ... M3

People in your area said water is a problem, are the boreholes and other water projects not working?

''boreholes do not yield much to satisfy water needs of the people and water problem has been made worse by sand harvesters who have scooped almost all sand from our rivers and rivulets. Donkeys are used for water transport and the distances are long making people store little for the day. We have told parents never to allow school children be part of water transport by bicycles and oxen pulled carts''....M4.

In some areas, I did not see well build houses, what do you say about that?

''Most of our educated people seem to have moved to reside elsewhere. Poverty levels are quite high and sometimes rains fail worsening food security''... M4

In the study area, water projects were found to be quite apart from each other. In Makindu Sub-county, water from boreholes was said to have excess Fluoride causing fluorosis as most households had brown coloured teeth. Generally, all the four sub-counties did not have enough water for the residents. The study found out the water projects were not satisfactorily sustained hence the rampant experiences of water shortages and scarcity reported in the study area.

3.27. Testing the Hypothesis

The hypothesis was tested using Pearson correlation and regression statistical analyses on Citizen Participation in Sustainability Water Projects in Makueni County Kenya. The hypothesis stated:

H01: There is no significant relationship between Citizen Power (Partnership, Delegated Power, and Citizen Control) and Sustainability Water Projects in Makueni County, Kenya.

The assumption of the study was guided by the outlined hypothesis to determine the relationship between the dependent variable (Water Projects Sustainability) and independent, Citizen Power (Partnership, Delegated Power, and Citizen Control). The model below was used to determine the relationship between the dependent variable and independent variables as: $Y = \alpha + \beta_1 X_1 + \mu$. Where: Y = Water Projects Sustainability and citizen power (partnership, delegated power, citizen control). α= is the constant. $\beta_{1=}$ is the coefficient of X_1, X_1 = Citizen Power (Partnership, Delegated Power, Citizen Control), μ = is the unpredictable random element or error term.

Hypothesis testing was done using linear regression statistical analysis which entailed obtaining the p values, r coefficients, F test and finally fixing a model for the study. Discussed below are results of the regression statistical measures and its application on hypothesis testing. The Pearson Correlation and Regression Analysis were used to analyse the relationship between two variables, the independent variable and one dependent variable. Pearson Correlation measured the strengths of association between the paired variables in hypothesis. Regression focused on relationships between independent variables, also known as predictors and one dependent variable. Regression Analysis is a statistical measure for ascertaining causal effects of changes and relationships between variables under a particular study. Citizen Power (Partnership, Delegated Power and Citizen Control) were each subjected to correlation and regression statistical analyses against the one dependent variable, the Sustainability Water Projects in Makueni County Kenya.

3.28. Relationship between Citizen Power and Sustainability of Water Projects

In the Ladder of Citizen Participation, Citizen Power is the final empowerment hallmark which consists of Partnership, Delegated Power and Citizen Control. Correlation test was done between Citizen Power and Sustainability of Waster Projects, Table 14 shows. A correlation test was done on citizen control, which is an important factor in community participation and water projects sustainability. It was found that there was no significant relationship between citizen control and water project sustainability. On the Citizen Power three variables correlation test run and the above results were obtained as shown in Table 16. It is evident that the three variables, partnership, delegated power and citizen control (all representing Citizen Power as the independent variable) are weakly related with 0.039, 0.47 and 0.18 as correlation coefficients. However, with delegated power having a higher positive coefficient of 0.47 it is chosen to be the independent variable to stand for the larger independent variable, Citizen Power

.

Citizen Power		**Partnership**	**Delegated power**	**Citizen Control**	**water projects Sustainability**
Partnership	Pearson Correlation	1	.028	-0.182	.039
	Sig. (2-tailed)		.786	0.082	.706
	N	100	94	93	94
Delegated power	Pearson Correlation	.028	1	-.037	.047
	Sig. (2-tailed)	.786		.719	.637
	N	94	109	99	103
Citizen Control	Pearson Correlation	-.182	-.037	1	.018
	Sig. (2-tailed)	.082	.719		.861
	N	93	99	108	99
water projects Sustainability	Pearson Correlation	.039	.047	.018	1
	Sig. (2-tailed)	.706	.637	.861	
	N	94	103	99	108

Table 14: Relationship between Citizen Power and Sustainability of Water Projects
Source: Researcher (2016)

The correlation coefficient 0.419 is a positive weak relationship. Correlation is significant at the 0.47 level (2-tailed) in Table 14. This is because, the two variables citizen power and Water Projects Sustainability are significantly correlated at 0.47. It could be seen on the ground that the water projects did not yield enough water to satisfy domestic needs.

Model	R	R	Adjusted	Std.	Change Statistics				
Citizen power		Square	R Square	Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.109[a]	.012	-.026	.907	.012	.310	3	78	.818
a. Predictors: (Constant), Citizen Power (Citizen Control, Delegated Power, Partnership)									

Table 15: Regression Analysis Model Summary
Source: Researcher (2016)

Table 15 confirms the linear regression's F-test that there is a linear relationship between the two variables (in other words R^2=0.012). With F = 0.818 and 78 degrees of freedom the test is not significant, thus we can assume that there is no linear relationship between the variables citizen power and sustainability in our model. This shows water projects in the study area had not been sustained.

Model: Water Projects Sustainability		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1Citizen Power	(Constant)	4.044	.423		9.571	.000	3.203	4.885
	Non-Participation	-.009	.080	-.012	-.107	.915	-.168	.151
	Tokenism	.076	.097	.088	.784	.435	-.117	.268
	Citizen Control	.036	.063	.064	.560	.577	-.091	.162

Table 16: Regression Coefficients and Sustainability of Water Projects at 95% Level
a. Dependent Variable: Water Projects Sustainability
Source: Researcher (2016)

Fitting the line of best fit as illustrated on Table 16, we obtain the following model: The model is Y = a + bx, where a = 4.044 b = 0.76 and X = Citizen Power. $Y = 4.044 + 0.76\ X_1$. The regression coefficients constant and Citizen Power as predictor variable and sustainability of water projects as the dependent variable are shown in Table 16 at 95% confidence level.

3.29. Hypothesis Testing on Citizen Power

$H0_1$: There is no significant relationship between Citizen Power and water projects sustainability in Makueni County, Kenya. Citizen Power consists of Partnership, Delegated Power and Citizen Control. Table 14 shows the significance level of 0.637 which is (greater 0.1). We have no evidence against the hypothesis which states there is no relationship between Citizen Power and sustainability water projects, therefore we accept the null hypothesis and conclude that there is no significant relationship between citizen power and water project sustainability. The p-value of 0.818 in Table 15 further confirms that there is no significant relationship between Citizen Power and Sustainability of water projects.

In the study area, the households do not have the water projects properly sustained. This explains the minimal community participation in water projects. Furthermore, official Public participation was launched in 2016 and it may take time to be replicated in all existing water projects serving households in the study area. On partnership in water projects, the study found minimal partnership took place making it difficult for house households to full participation. No partnership advisory committees and no significant meetings were reported in water projects. It was clear households did understand how to participate since public participation in the county was launched in 2016 and may not have been fully implemented in all water projects. There was no households' mobilization support that would give rise to a better representation in Delegated Power leadership for negotiations between the "powerful" (the County Government of Makueni) and the "powerless" (the citizens of Makueni County) as suggested in the Citizen Participation Ladder.

Community leaders were supposed to represent the households in negotiations and leadership in water projects which would have improved community participation. The study found there was no confidence with community leaders and this could be understood to mean that there being no formal public participation it was difficult to control and own for successful water projects sustainability. Hence there was no relationship between Delegated Power and water Projects Sustainability. The study showed that no meaningful sustainability of water projects has been attained. The study showed a downward trend of the regression variables meaning that the water projects were not sustainable with capacity to meet households" water needs. Hence the rampant scarcity and shortages of water experienced from time to time in the study area. The study showed the sustainability of water projects was very low. In the Citizen Control variable, it can be seen that Citizen Power to commensurate Citizen Participation has not been attained in the study area. That was why the sustainability of water projects was very low. Furthermore, since there was no official public participation, there was no formal guidance for the full participation process until 2016. Hence the scarcity and shortages of water in the midst of water projects.

4. Discussion and Conclusions

There was no significant relationship between Citizen Power (Partnership, Delegated Power, and Citizen Control) and Sustainability Water Projects in Makueni County, Kenya. The correlation coefficient is a positive weak relationship. Correlation is significant at the 0.47 level is because, the two variables citizen power and Water Projects Sustainability are significantly correlated at 0.47 meaning that the community in order to participate fully has to function properly in water projects. This could be seen on the ground the water projects did not yield enough water to satisfy domestic needs. Citizen Power consists of Partnership, Delegated Power and Citizen Control. Table 14 shows the significance level of 0.637 which is (greater than 0.1).No evidence against the hypothesis which stated there was no significant relationship between Citizen Power and sustainability water projects. And therefore, we accept the null hypothesis and conclude that there is no significant relationship between citizen power and water project sustainability. The P-value of 0.818 in Table 15 further confirms that there is no significant relationship between Citizen Power and Water Projects Sustainability.

The study showed the sustainability of water projects was very low. On the Citizen Control variable, it can be seen that Citizen Power has not been attained in the study area. Furthermore, there was no official public participation, and no formal guidance for the full participation process that would lead to sustainability of water projects in the study area. Hence the scarcity and rampant shortages of water have been experienced in midst of numerous water projects. On the basis of these findings and conclusions arrived at the researcher recommends that all the initiators and implementers of water projects should at all times involve communities to participate in water projects in their areas of residence. The collapsed water projects are a clear evidence that the water projects in the study area had not been properly sustained. This may impact positively in sustainability of water projects when communities participate in water projects that will satisfy their water needs of communities. They should seek to ensure: A study to evaluate the quality and safety water from boreholes consumed by households. It is paramount because in some boreholes water changed colour after some time. Households who used water from boreholes in Makindu Sub-county, reported of brown teeth colouration. Another study should be done to check on health implications of water from some water projects in the study area.

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