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The Role of Women in Climate Change Adaptation Technologies for Community Water and Sanitation Projects in Navakholo Sub County, Kenya

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Abstract:
This research dealt with the role of women in climate adaptation technology in community water and sanitation projects in navakholo constituency, Kenya. The study used descriptive survey research design and it targeted women in the community where the technologies we being used. A sample of 234 respondents which is 10% of the universe was used to collect data and simple random sampling technique used to identify the respondents. Data was collected using questionnaire. The study used Cronbach's alpha Coefficient (0.796) to measure the internal consistency of the questionnaire. Both descriptive and inferential methods of data analysis were used in analysis of quantitative and qualitative data. Results indicate that there was a statistically significant difference between groups as determined by one-way ANOVA ($F(4,151) = 597.190$, $p = 0.000$). In addition, there was positive and significant influence of community alternative energy sourcing on the role of women in climate adaptation technologies in water and sanitation projects ($\beta = 0.0.684$; $t = 5.515$; $p < 0.05$). There was positive and significant influence of spring protection on the role of women in climate adaptable technologies in water and sanitation projects ($\beta = 0.0.111$; $t = 6.324$; $p < 0.05$). There was also positive and insignificant influence of rainwater harvesting technologies on the role of women in climate adaptation technologies in water and sanitation projects ($\beta = -0.051$; $t = 13.331$; $p < 0.05$). However, there was a negative but insignificant influence of ventilated pit latrine on the role of women in climate adaptation technologies ($\beta = -0.057$; $t = -.860$; $p > 0.05$) from the regression equation determined as $Y = -0.051+0.111X_1-0.057X_2+0.269X_3+0.684X_4$. The study findings will significantly inform Government and policy makers' in improving policies that support role of women in climate adaptation technologies to provide ecological, economic, social and cultural benefits for present and future generations in gender and climate issues.

Keywords: *Women and climate technologies, climate adaptation technologies and gender, climate technologies in western Kenya*

1. Introduction

1.1. Background of the Study

According to the gender, climate change and health report, 2010, climate change is any change in climate over time, whether due to natural variability or as a result of human activity. The United Nations Framework Convention on Climate Change (UNFCCC), defines 'climate change' as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period (IPCC, 2001). A growing body of literature discusses the connection between gender and the effects of climate change (see, for example UNDP et al, 2009; UNDP, 2008c; Brody et al, 2008). Gender were socially constructed roles, responsibilities and opportunities that were associated with men and women, as well as hidden power structures that help govern the relationships between them (UNDP, 2010). Researchers and policy analyst understanding and integration of gender-specific vulnerabilities help ensure that the implementation of gendered adaptation practices relieves some of the disproportionately high burden of the adverse effects of climate change that women bear. Globally, fresh water resources were distributed unevenly, and were as of most severe physical water scarcity were those with the highest population densities. Shifting rainfall patterns, increased rates of evaporation and melting of glaciers, and population and economic growth were expected to increase the number of people living in water-stressed water basins from about 1 5 billion in 1990 to 3–6 billion by 2050 (Arnell, 2004).

Women and girls in developing countries were often the primary collectors, users and managers of water and the points of collection. Decreases in water availability is seen to jeopardize their families' livelihoods, increase their workloads, and may have other secondary effects such as lower school enrollment figures for girls or less opportunity for

women to engage in income-generating activities in there were as. Adaptation refers to changes in 'processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate' and involves adjustments to decrease the vulnerability of communities and regions to the impacts of climate change and variability (IPCC, 2001b. Women were vulnerable not because of natural weakness (i.e., because of their sex), but rather because of the socially and culturally constructed roles ascribed to them as women (i.e., because of their gender). According to UNDP report on gender, climate change and community adaptation, 2010, women were also key active agents of adaptation, due to their often-deep understanding of their immediate environment, their experience in managing natural resources (water, climates, biodiversity and soil), and their involvement in climate sensitive work such as farming, climate and fisheries. While women face unique and sometimes inconsistent burdens as a result of climate variation, they were not merely victims. According to Georgetown Institute for Women, Peace and Security, 2015, women were also mediators with important perspectives and indigenous knowledge, which can inform and influence solutions to address climate change. In many communities around the world that were already acutely affected by climate change, women were having to adapt their lives to survive and were for their dependents.

1.1.1. Global Perspective on Climate Change Adaptation Technologies for Community Water and Sanitation Projects

Climate change is increasing temperatures and affecting weather patterns, resulting in environmental degradation and heightened competition for natural resources and arable land (Nicholas Wedeman and Tricia Petruney, 2018). The brief further states that of the 68.5 million people forcibly displaced around the world, it was estimated that an average of 21.5 million have been displaced annually because of climate related issues since 2008. Climate change negatively impacts water supplies around the world. Changes in temperature patterns, rainfall, solar radiation, and winds were increasing the desertification of land (Matthew Huelsenbeck, 2015). Prolonged periods without adequate rainfall cause droughts, which then result in a shortage of water. All over the developing world, women and girls bear the burden of fetching water for their families and spend significant amounts of time daily hauling water from distant sources. The water from distant sources is warily enough to meet the needs of the household and is often contaminated, such that women and girls also pay the heaviest price for poor sanitation (UN, 2007). Yet the same group (Women and Girls) experience barriers -social, political, and economic - that restrict their ability to take an active seat at the table in climate change negotiations and policy planning, further limiting their opportunities when it comes to mitigating, adapting, and coping with the effects of climate change. Women must be recognized as vital agents of change so that their needs and their contributions was a part of the solution.

1.1.2. Africa Perspective on Climate Change Adaptation Technologies for Community Water and Sanitation Projects

According to UNFCCC 2001, The African Region has been plagued by climate variability, and with the persistent droughts occasionally alternated by flooding. UN coordinated Intergovernmental Panel on Climate Change (IPCC) reports show evidences of climate change at global, regional and local levels from changes in various climate records including temperature, precipitation patterns, sea level rise, storm surges, as well as changes in the patterns of extreme weather and climate events such as drought, floods, among other hazards (Africa strategy on climate change report, 2014). The increasing in the concentrations of greenhouse gases in the atmosphere were mainly due to the 80 per cent increase in annual CO2 emissions since 1970. According to Gina Ziervogelon et all., 2013, most of this historical increase emanated from the industrial activities of developed countries in Europe, North America and Japan, although the burgeoning economies of Brazil, China, India and South Africa have contributed significantly in the past decade. As such, developing countries, especially those on the African continent have contributed little to the observed global warming. The lack of economic activity and poverty, render African countries, and especially the poorest communities in these countries, disproportionately vulnerable to climate change impacts.

In Navakholo and Southern Africa, this vulnerability is further heightened by the large number of households that depend on the already marginalized natural resource base for their livelihoods. It was said that Africa will face increasing water scarcity and stress with a subsequent potential increase of water conflicts as almost all of the 50 river basins in Africa were transboundary (Ashton 2002, De Wit and Jacek 2006). Given the changing climate, inadequate access to

water and poor water quality affects women, their responsibilities as primary givers, and the health of their families', it also impacted and increases the overall amount of labour that is expended to collect, store, protect and distribute water (UN Women Watch, 2009).

1.2. Statement of the Problem

Climate change is increasing temperatures and affecting weather patterns, resulting in environmental degradation and heightened competition for natural resources (Beniston Martin, 2010). Since climate change affects communities differently according to their respective vulnerabilities and adaptive capacities, adaptation must be locally specific and appropriate to the context. While climate change impacts everyone, girls and women were most vulnerable to environmental degradation (Lake Osprey Orielle, 2015), and were disproportionately affected by climate change co-powered to men for a variety of reasons (Women, Natural Resource Management, and Poverty, 2010). During periods of drought and erratic rainfall, women work harder to secure food and water for their families (How the drought affects women, 2011). This put added pressure on the girls within households, who may be forced to drop out of school to help their mothers manage the heavier burden. In some parts of Africa, girls and women spend up to eight hours per day collecting water (Women's Earth & Climate Action Network, International, 2016). This undermines productivity and fuels a cycle of poverty that limits the economic and social capital that could be generated to combat climate change (Alam,

Mayesha, Rukmani Bhatia, and Briana Mawby, 2015). Recognizing the burdens environmental challenges impose on them, women have a key role to play when it comes to climate change mitigation and adaptation. In Navakholo Sub County based in Kakamega County, women were limited in accessing technologies in adaptation for climate change limiting their coping capabilities when it comes to mitigating, adapting, and coping with the effects of climate change. This study therefore intends to investigate the role of women in climate change adaptation technologies in Navakholo sub county, Kakamega County, Kenya.

1.3. Objectives of the Study

This study was guided by both General and specific objectives as described below.

1.3.1. General Objective

The main objectives of this study are to investigate the role of women in climate change adaptation technologies in Nava Kholo Sub County.

1.3.2. Specific Objectives

This study shall be guided by the following Specific study objectives:

- To establish the role of rural women in community rain water harvesting technologies in Navakholo Sub County
- To are determine the role of rural women in improved ventilated pit latrine projects in Navakholo Sub County
- To investigate the role of rural women in community spring protection projects in Navakholo Sub- County
- To examine the role of women in alternative energy projects in Navakholo Sub County

1.4. Research Hypothesis

The stated objectives above were aligned to the following research hypothesis that shall be investigated:

- H0: There is no significant relationship between rain water harvesting technologies and climate change adaptation by women groups in Navakholo Sub County
- H0: There is no significant relationship between improved ventilated pit latrines and climate change adaptation by women groups in Navakholo Sub County
- H0: There is no significant relationship between community spring protection technologies and climate change adaptation by women groups in Navakholo Sub County
- H0: There is no significant relationship between community alternative Sub County energy technologies and climate change by women groups in Navakholo Sub County

1.5. Justification of the Study

The study is justifiable from various perspectives. First, Navakholo Sub County is selected because it has a sizeable number of community water and sanitation projects which was instrumental in the implementation of the projects. Navakholo Sub County is also a rural where women groups exist and were involved in climate change adaptation technologies. The study sought to particularly highlight such climate change adaptation technologies and bring to prominence the role of women groups in climate change adaptation technologies in navakholo Sub County.

The results of this study will assist the, advocacy groups and other stakeholders to become aware of issues that were important for climate change technologies scale up and help in incorporating the elements of adaptability right from the project identification, choice and design stage. This will assist in designing projects that were sustainable to avoid investing resources in weak projects. The findings will also be useful in formulating policies that address issues relating to the climate change adaptation technologies in navakholo Sub County.

1.6. Scope and Limitations

As far as possible, the research will remain localized within Kakamega County Kenya and Navakholo Sub County to be specific. On the other hand, the research methodology will emphasize on qualitative information. some reasonable amount of quantitative data will also be gathered and be given credence to the findings where applicable. The study was confined to community women led projects implemented by Women in WATER and Natural Resources Conservation (WWANC) a women led organization in Navakholo Sub- County through Self Help Groups (SHGs) approach. The focus was based on the role of women groups in climate change adaptation technologies for community water and sanitation projects in navakholo sub county implemented by WWANC.

2. Literature Review

2.1. Introduction

The chapter will present review of relevant literature on role of women groups in climate change adaptation technologies for community water and sanitation projects in navakholo sub county. Relevant theories and information on these skills from other researchers and scholars who have conducted studies in this field will also be reviewed. The chapter will also present the relationship between independent and dependent variables in a conceptual framework, review related empirical literature, identify knowledge gaps and give a critique on related studies.

2.2. Theoretical Review

This study is based on adoption of technology theory as was explained in the following section.

2.2.1. Diffusion of Innovation Theory

Search in diffusion can be traced back to the epic work by Everett Roger's in 1960 named as the Diffusion of Innovation Theory which has been widely applied by the researchers over the years. The main idea of the theory is that there were four elements that influence the spread of a new idea: the innovation, communication channels, time and social system. The process of diffusion consists of five stages, namely, knowledge, persuasion, decision, implementation, and confirmation. It results in six categories of users: innovators, early adopters, early majority, late majority, laggards and the leap froggers. The diffusion innovation theory provided the concept of S-shaped curve of adoption which was also called as the epidemic model of adoption. According to this curve, spread of infections among the population can be held as an analogy to the pattern of spread of a new technique or idea. According to this analogy, initially the rate of spread is slow. In the mid-range of the graph, the rate of spread accelerates and finally the rate of spread tapers off resulting in an S-shaped curve. The reasoning for such S-shape curve is that initially the innovation has to come from outside the boundaries of the social system prevalent at that time. This implies that number of people that were exposed to the innovation were few in the beginning. As these people in the social system start accepting the innovation, they bring it in contact with more and more people. Therefore, the rate of spread keeps on increasing. Eventually, the innovation is accepted by most of the members of social system and the rate of spread declines. As there were no more members left for accepting the innovation, the spread stops completely. The S-shaped curve illustrates that there is a critical 'take off point' at which the slope of the growth curve becomes positive and number of members who have adopted the innovation becomes so large that there were hardly any new members left for adopting it. According to Rogers (1960), this point occurs when nearly 10% to 20% of the members of the social system have adopted the innovation. The S-shaped adoption curve described above applies to most of the innovations that come up from time to time. However, its application is of special significance for adoption of communication technology where it was referred to as Metcalfe's law (Gilders 1993). In this case, value of the innovation is enhanced for existing users of the communication system as more and more people adopt the innovation. Each addition of user has a positive effect on existing users of the system which results in acceleration of the adoption curve. Phenomenal growth of the Internet over last one and half decade is often interpreted by this law.

2.3. Conceptual Framework

A conceptual framework is a representation of the main concepts under study and their presumed relationship with each other. The dependent variable is the climate change adaptation technologies for community water and sanitation projects while the independent variables were the role of women groups in climate change adaptation technologies uptake for community water and sanitation projects

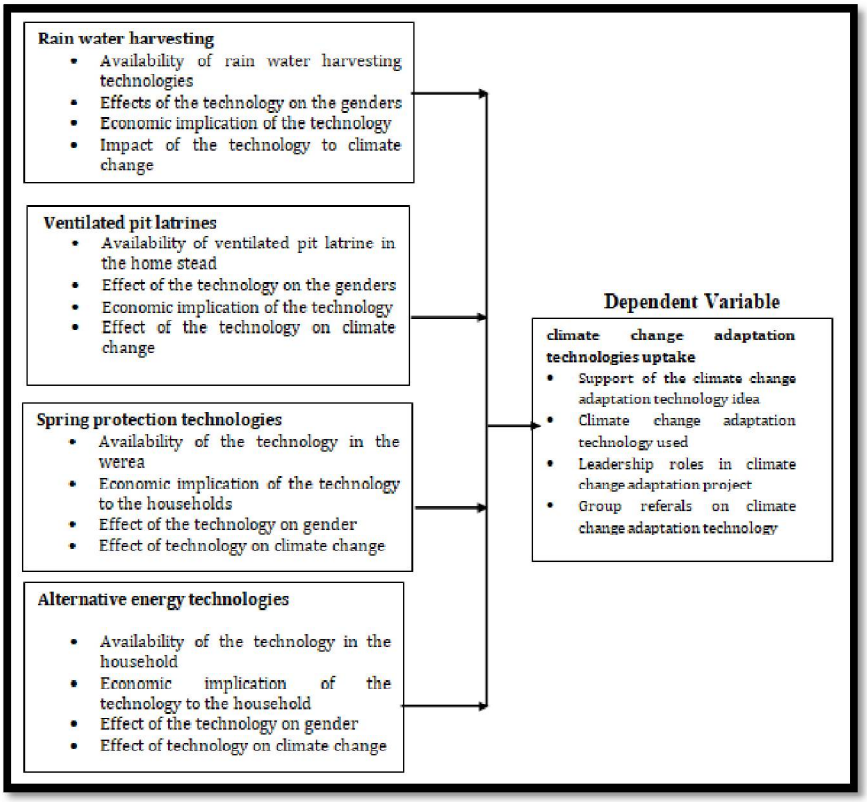

Figure 1: Conceptual Framework

2.4. Review of Variables

2.4.1. Rain Water Harvesting

As effects of climate change persist, the importance of reservoirs is likely to increase i.e., not only for the water storage purposes, but also for maximizing water use benefits and mitigating climate extremes (Ahmad, A., El-Shafie, A. and Razali, F., 2014). Optimizing storage reservoir operations takes into account a variety of objectives and variables, including cost and revenue considerations of water allocation for various socioeconomic uses (Ahmadi, M., Haddad, O.B. and Loáiciga, H.A., 2015). Ecological river restoration involves ecological, spatial and physical management practices to return a river back (or close) to its natural state, with reconnecting rivers with floodplains, reestablishment of the river's meandering form with no barriers along its banks, and stabilizing surrounding soil to reduce sedimentation and erosion being common restoration techniques (ECRR, 2014). Different rain water harvesting technologies exist around the world. This may include Roof top rain water harvesting, rain water harvesting for infiltration, water pans, water pond etc. Alternative water sources may be involved rainwater harvesting for infiltration, also known as in situ water harvesting, a practice in which rainwater uptake in soils is increased through the soil surface, rooting system and groundwater a practice that may include terracing, pitting and conservation tillage (Rainwaterharvesting.org, 2016). This technology is important in climate change adaptation due to increased unpredictability in weather patterns. Apart from improving cropland and vegetation, it also helps ensure sustainable water supplies for livestock or domestic use through improved recharge of nearby water-flows or ponds, as well as groundwater (Studer, R.M. and Liniger, H., 2013).

2.4.2. Ventilated Pit Latrines

Open defecation, which is regarded as the riskiest sanitation practice (WHO,2013) is still practised by 892 million people around the world, with Sub-Saharan Africa accounting for a quarter of this population (United Nations 2018). Question has been asked on importance of ventilated pit latrines. Who were the main users of home sanitation units? In many cases, the answer would be women and young children. As such, women should be given special attention during the planning of sanitation projects. Women should play a role during community and household level decision-making, and the projects mirror their perceptions and needs (Heli Perett, 1985). Woman holds the key to the continued sanitary operation of these units and to their benefits to the family's health. As motivators within the family and the community, women may be helpful in convincing men to undertake the construction of latrines and other sanitary improvements. Women's informal groups and communication networks can serve to create community awareness of the need to maintain clean facilities and a hygienic environment. A VIP latrine differs from a traditional latrine by having a vent pipe that is covered with a fly screen. Wind blowing across the top of the vent pipe creates a flow of air which draws out odours from the pit. As a result, fresh air is drawn into the pit through the drop hole and the superstructure is kept free of smells. According to Kazi, N.M. and Rahman, M. (1999), during flood events, overflowing of sanitary latrines poses a serious health risk to communities in flood prone were as. Improved construction design and planning of latrines reduces the contaminated water from infiltrate surface or groundwater sources, causing pollution and disease (Morshed, G. and Sobhan, A., 2010). Measures include elevating latrines or lining latrine pits to reduce waste infiltration and increase stability. The ventilated improved pit (VIP) latrine has the potential to address the challenge of access to improved sanitation in built-up low-income settings.

2.4.3. Alternative form of Energy in Rural Wares

In developing countries of Asia and Africa and especially in rural were as, 2.5 billion people rely on biomass, such as fuelwood, charcoal, agricultural wastes and animal dung, to meet their energy needs for cooking. Biomass accounts for 55% of total energy source (Kibria, G. 2015). Renewable energy is looked at to alleviate rural poverty, improve the quality of life of rural women, men and children, reduce air pollution, create local employment, and enhance food production. Most energy need in the households directly affect the daily activities of women. This is according to World Bank, 2000, that notes clearly the main energy demand in rural were as of low-income countries is for cooking and the main source of fuel for satisfying this demand comes from fuel-wood, dung, and other forms of biomass, which were highly inefficient and polluting. This type of fuel is also expensive and requires intensive labor for collecting the wood (World Health Organization, 2000). Progress has been made in recent decades to raise the level of gender equality but women were still much less likely to have access or control over productive and natural resources and have less access to modern technologies or financial project, and receive poorer education, training and technical advice (Shiva Gorjian, 2019). Women role in alternative energy is shown in different forms in their daily tasks such as energy consumers and beneficiaries, as micro-entrepreneurs, as extension workers and caretakers and as leaders, networkers and lobbyists. Energy access provides opportunities for women entrepreneurs to make an income and enhance their social status by creating and disseminating sustainable energy solutions. Barriers, such as lack of training and education, and social norms that view modern energy technology businesses as 'men's work', limit women's opportunities to engage in sustainable energy entrepreneurship. Tasks ahead include enhancing women's leadership and participation in the energy sector, developing targeted training programmes for women, and improving women's access to credit. Energy access provides opportunities for women's entrepreneurship. As mentioned, women play a critical role in energy provision and consumption within households and communities in many countries, and therefore possess valuable knowledge relevant to sustainable energy solutions (NAHEP,2019).

2.4.4. Spring Protection Technologies

Water recycling and reuse is the process of collecting, treating and using wastewater, particularly from municipalities, industry and agriculture (EPA, 2016). This makes non-potable wastewater useful, thus saving the economic and environmental costs related to establishing new water supplies. Groundwater prospecting involves various methods to locate suitable quality and quantity groundwater for extraction so as to increase supply, or respond to climate change induced water scarcity or variability. It alleviates pressures on existing surface or ground water sources, and avoids their degradation (Bisson R. A, Lehr Jay H., 2004). According to CABI (2015), boreholes and tubewells were important adaptation technology for providing a domestic water supply during times of water shortages and drought. The approach can include both creating new boreholes and tubewells or deepening or rehabilitating existing ones (UNFCCC, 2014). Managed aquifer recharge approach can be used in developing countries coping with water variability and shortages to maximize natural storage and increase water supply system resilience during periods of low flows and high seasonal variability, such as in the dry season (DEMEAU, 2017). When well managed, the conjunctive use of surface and groundwater combines the use and development of surface water and groundwater as a strategy for climate change adaptation, or sustainable resource use with the aim to increase the overall resilience of water supply by utilizing both sources of water, particularly in communities and basins with high water availability throughout the seasons (Sen, S., 2016).

2.4.5. Improve Community Water Treatment Capacity

Treating water at the point-of-use (such as the household) in places where centralized water treatment systems were not efficient or present can improve water quality and safety with a number of low-cost and effective point-of-use treatment options. These include physical filtration (e.g., using cloths, ceramics, sand or specialized filters), boiling (heat inactivates dangerous bacteria and viruses, solar disinfection (water bottled in clear plastic and placed under direct sunlight – ultraviolet rays and heat kill pathogens in still water) and the most commonly used chlorination or disinfectant powders (a chlorine solution or disinfectant added to water, killing most bacteria and viruses) (CDC, 2015). Improved efficiency of centralized wastewater treatment plants (WWTPs) is technologies and procedures that treat larger capacities of water, requiring less energy and chemical inputs, while improving its quality with staff training and capacity building for better system operation can also be part of such efforts (Hophmayer-Tokich, S., 2006). The use of constructed wetlands, a technology where there is use of natural purification processes of vegetation, soils and microbes to remove contaminants from discharge. The method is a relatively low-cost technology that improves water security and access, making it important for climate change adaptation (Kivaisi, A.K.,2001). The use of advanced domestic wastewater treatment tanks to remove solids, pathogens and other impurities to meet water quality requirements either as commercial systems for treating community wastewater, or small tanks installed in households to treat domestic wastewater on site were also available (Jhansi, S.C. and Mishra, S.K., 2013).

2.5. Empirical Review

This section reviews studies previously done on climate change and adaptation of women to climate change technologies in water and sanitation projects. regional climate models, global climate models, project an increase in precipitation over Navakholo Africa and therefore in available water resources, although large uncertainties apply. Multi-model assessment of water scarcity under global warming study found significant model consensus on an increase of annual runoff of approximately 50% in Navakholo Africa, particularly southern Somalia, Kenya and southern Ethiopia with 2.7°C warming (Schewe et al., 2013). According to Gender, and climate change Africa policy brief 2012, there is evidence that women were important players in dealing with disasters by effectively mobilizing communities in the different phases of the risk-management cycle. On the one hand, women were disproportionately vulnerable to the effects of climate change, which could, in turn, exacerbate existing gender disparities. Lack of meaningful participation by women would therefore undermine the effectiveness and adaptability of climate change projects and programmes (Y. Carvajal-Escobar, M. Quintero-Angel, and M. GarciaVargas, 2008). There is a direct relationship between gender equality, women's empowerment and climate change. women were disproportionately vulnerable to the effects of climate change, while on the other hand, women have unique knowledge and skills that can help make the response to climate change more effective and sustainable. According to UN Women watch fact sheet 2009, Climate change has significantly impacted fresh water sources, affecting the availability of water used for domestic and productive tasks. The increased frequency in floods and droughts have a far-reaching consequence, particularly for vulnerable groups, including to women who were responsible for water management at the household level (CEB,2007). All over the developing world, women and girls fetch water for their families and spend significant amounts of time daily, hauling water from sources. The water from distant sources is not enough to meet the daily needs of the household and is often contaminated, as such women and girls also pay the heaviest price for poor sanitation (UNICEF, nd). In cases where there is arsenic contamination of groundwater, increased flood levels increase the rate of exposure among rural people and other socio-economically vulnerable groups (Khan, MMH, and Et al., 2003). The Training Manual on Gender and Climate Change (2009), states that empowering and investing in women were key to combating the effects of desertification and paving the way for poverty alleviation in the world's lNavakholo developed countries. However, under the current climate change finance regime, women have no sufficient access to funds aimed at covering weather-related losses, nor do they have funds to service adaptation and mitigation technologies. The United Nations Framework Convention on Climate Change (UNFCCC) positioned clean technologies at the centre of global responses to climate change, as such technology has become increasingly relevant in adapting to and mitigating climate change, equally, inclusion of women and men in all aspects of

climate change projects, including technology, pays off; and according to Ibid (nd), is especially true in the case of technologies aimed at tasks most frequently performed by women. 52nd session of the Commission on the Status of Women (2008), reported that consultation and participation of women in climate change initiatives must be ensured, and the role of women's groups and networks strengthened as they make substantive contributions through their knowledge and experience on issues related to the management of natural resources. They should be equally represented in decision-making structures to allow them to contribute their unique and valuable perspectives and expertise on climate change as well as in the management of essential natural resources, such as fresh water. Through changes to the hydrological cycle, climate change is expected to affect the timing, distribution and quantity of water resources (Goulden, Conway, & Persechino, 2009). Finally, it was clear that for water conservation to be successful as a means of balancing supply and demand, and limiting environmental damage, public participation is required (D. Howarth and S. Butler, 2004).

2.6. Critique of the Existing Literature

According to climate challenges for Africa briefing 2012, In addition to considering the impacts of climate change, different projects have explored the complexity of water management in agriculture to all countries and the need for water resources, climate change and water scarcity may lead to a greater stress on water resources as suche bridging the gap between existing understandings of business as usual water management practises, and the potential for adaptive measures to respond to the impacts of climate change. Reducing this knowledge gap will require: expanding the scope of stakeholder engagement, increasing levels of finance, undertaking the appropriate knowledge transfer between stakeholders, strengthening the knowledge base of decision makers, and improving water metering techniques to monitor changes in water usage. In essence, it requires improving the level of adaptive capacity (Idib, nd). However, this were generalised observation as they fail to mention the parties that were to action the adaptation so mentioned, especially vulnerable groups. It further recommends that further research efforts could involve an assessment of local training and education needs required to interpret seasonal and decadal predictions, and to determine what infrastructure may be required to distribute this information to other interested stakeholders. In yet another instance, the United Nations has recently prioritized safeguarding the rights of people whose lives were most impacted by climate change, recognizing the direct role the environment plays in shaping the economic and social rights of so many individuals (CWERE International and the Center for International Environmental Law, 2015).Yet despite the steadily growing body of evidence that shows that climate change is an obstacle to sustainable development and demonstrates a link to an increase in female vulnerability and gender inequality, the United Nations Framework Convention on Climate Change (UNFCCC) largely neglected to outline any gender dimensions in its early years. These has led to marginalisation of vulnerable group in roles on adaptation on climate change, and especially the role of women in water and sanitation adaptation. As far as leadership and Rain Water harvesting is concerned, women's leadership and participation is a crucial element to any discussions and decisions on climate change and as such they must be present at the table during all stages and at all levels of decision-making that seeks to find solutions to current and future environmental realities. However, according to UN Women report (2017), at the local, regional, national, and international levels, women were still fighting for a leadership role in the climate change dialogue and a place at the negotiation tables.

2.7. Research Gap

Literature above has shown immense information on climate change adaptation, women and their participation in climate change and different technologies set up for uptake in mitigating climate change effects that seek to ensure female involvement, including indigenous women and grassroots groups, in climate change negotiations and resource management, opportunities for women's participation in climate change mitigation and adaptation processes, policies to address climate change that recognize gender-sensitive impacts, provide women with access to resources, and give them opportunities to participate in mitigation and adaptation processes, gender-responsive approaches to climate financing, level of women involvement in the creation of policies and strategies around environmental protection including building resilience. However, role of women in climate change adaptation technologies for community water and sanitation projects in navakholo sub county. It was well documented that most projects that involve household, community or region resources were managed and controlled by men, yet in cases of scarcity, the most affected or vulnerable groups consist of women. As such, this study will therefore add value to the existing literature which may be used as a guide to the development of climate change adaptation policy thus benefiting the immediate community and replicated to other parts of the country.

2.8. Summary

This chapter reviewed literature relevant to the role of women in climate change adaptation technologies for community water and sanitation projects in navakholo sub county. It also outlined the conceptual framework which showed the relationship between independent and dependent variables. The chapter further explains the empirical studies relating to the independent variable thus leading to critique of the existing literature and finally the research gap.

3. Research Methodology

3.1. Introduction

This chapter gives an explanation and justification of the methods that was used in order to answer the research hypothesis and the claims. These include the research design, target population, sample and sampling procedure, data collection instruments and data analysis techniques.

3.2. Research Design

Mark Saunders, Philip Lewis and Adrian Thornhill (2009) defined research design as a general plan of to go about answering your research question(s). It contains clear objectives, derived from research question(s), specify the sources from which to collect data, and consider the constraints that will inevitably affect (e.g., access to data, time, location and money) as well as discuss the ethical issues. This study will use descriptive research. The object of descriptive research is 'to portray an accurate profile of persons, events or situations' (Robson 2002:59). This may be an extension of, or a forerunner to, a piece of exploratory research or, more often, a piece of explanatory research.

3.3. Target Population

A target population usually has varying characteristics and it was also known as the theoretical population. This study explored each individual characteristic in the theoretical population within the 'universe'. A population is the full universe of people or things from which the sample is selected (Greener, 2008). The population consisted of all women groups involved in water and sanitation projects in Navakholo Sub County. Target population refers total collection of elements about which the study wants to make some references (Mugenda and Mugenda 2003). Target population consisted of registered women groups in Navakholo sub-County as provided by the Ministry of Labor and Social Protection, Department of Social Development from Navakholo Sub County (Statistics Section, 2019).

3.4. Sampling Frame

Cooper and Schindler (2014) define the sampling frame as a list of elements from which the sample was collected and it was closely associated to the population. From the sampling frame the required number of subjects, respondents, elements and firms were selected in order to make a sample, so it was important that the sampling frame is unbiased, current and accurate (Kothari, 2005). Sample frame was drawn from women water and natural resource conservation database (Statistics Section, 2019). For ease of field data collection, women who participate in water and sanitation activities inventory was acquired from women group inventory that contains all active registered women groups in Navakholo Constituency. According to the Inventory, there exist 15 women groups each with a population of between 25-30 women, who participate in different water projects in Navakholo constituency. See appendix for the inventory.

3.5. Sampling Technique

A sampling frame is a list of all the items in your population. It's a complete list of everyone or everything you want to study (Saunders et al. (2012). Since the target population was 600 respondents, sample of 234 respondents was used in the study based on Krejcie and Morgan formula for determination of sample size of research activity, as shown in Krejcie and Morgan table in Appendice V.

3.6. Data Collection Instruments

The researcher used close ended (structured) questionnaires to collect primary data from leaders of women who were involved in water and sanitation technology adoption in Navakholo Constituency, Kakamega County, Kenya. Data was collected by self-administered questionnaire. Self-administered method requires a person known as the interviewer asking questions generally in a face-to-face contact to the other interviewee (Kothari 2004).

3.7. Data Collection Procedure

Data was collected using questionnaires. The researcher will obtain legitimate documents like researchers' introductory letter, respondents' consent forms and a letter of identity from the university. Permission from the National Council for Science and technology will also be sought. The questionnaires were self-administered and the respondents were assured of confidentiality in that the information to be obtained was used for the proposed study only.

3.8. Pilot Study

A pilot study is a small-scale preliminary study before the main research in order to measure the validity and reliability of data collection instruments, (Kothari, 2007). This was done to examine the reliability and validity of the instruments to be used in the study. It was used to test the logistics and gather information prior to main study (Kathuri, 2005). 1 to 10% of the sample formed the pilot study (Mugenda & Mugenda 2003). The study will carry out a pilot test to validate and evaluate reliability of the instrument in gathering the data required for purposes of the study. Self-administration of questionnaire was used to administer the questionnaires to 20 respondents who were not part of the study to evaluate the survey questionnaire for flow of questions, accuracy clarity, and readability and understand ability of the research instruments to be used in this study. The reliability of the instruments was established using the Coronach Alpha Coefficient tests. In this study a coronach alpha of 0.7 and above was considered acceptable.

3.8.1. Validity of Research Instruments

Validity is the extent to which results can be interpreted accurately to represent the entire population. The use of a questionnaire having items that tested both dependent and independent variables, it was deemed valid (Kothari, 2014). Content validity is ensured by adopting statements from different researchers.

3.8.2. Reliability of Research Instruments

Reliability measures the extent to which an instrument is actually consistent in terms of measurement (Kothari, 2008). A reliable instrument is one which measures and obtains the same results over a period of time. Reliability is increased by including many similar items on a measure, by testing a diverse sample of individuals and by using uniform testing procedures. Using qualitative methods respondents were asked questions about the pilot study, how long they will take to fill questionnaire and information about cover letter and clarity of questions.

3.9. Data Processing and Analysis

The quantitative data collected was analyzed by Statistical Package for Social Sciences (SPSS 23) where descriptive statistics was computed depicting percentages, means, standard deviations and frequencies as well as describing and interpreting data in line with study objectives. For variable relationships, correlation and regression analysis will also be examined. Analyzed data was presented by use of tables, graphs and in prose form. The Analytical model for the study will take the form below:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

Where;

Y= climate change adoption technologies

α= Constant Term

β= Beta Coefficient –These measures how many standard deviations a dependent variable will change, per standard deviation increase in the independent variable.

X_1= the role of rural women in community rain water harvesting

X_2= the role of rural women in improved pit latrine construction

X_3= the role of rural women in community spring protection technologies

X_4 = the role of women in community alternative energy sourcing

ę = Error term

3.10. Regression Function Assumptions

Assumption 1: the regression model is linear in the parameter

Assumption 2: values taken by the independent variable, X, were considered fixed in repeated samples

Assumption 3: Given the values of X, the mean, or expected, value of the random disturbance term, u, is zero

Assumption 4: there is homoscedasticity or equal variance of u.

Assumption 5: No autocorrelation between the disturbances

4. Research Results and Discussion

4.1. Introduction

In this chapter, raw data from the questionnaires was analyzed and interpreted. Various tests were used to test the relationship between variables, level of significance, reliability and random distribution of data. Specifically, descriptive statistics, ANOVA and Multiple Regression analysis were used. The independent variables of the study were Rain Water harvesting, Ventilated pit latrine construction, community spring protection technologies and community alternative energy sourcing and how they influenced the dependent variable which was role of women in climate adaptable technologies in Navakholo sub-county, Kakamega.

4.2. Response Return Rate

Out of 234 questionnaires dispatched, 156 were duly filled and returned giving a response return rate of 76.1%. This response rate was considered sufficient to make inferences for this study. Mugenda and Mugenda (2003) asserted that a 50% response rate is adequate, 60% is good while 70% questionnaire return rate was rated very good. This implies that based on this criterion, the response rate of 76.1% was therefore very ideal. The current study achieved a high response rate but failure of 23.9% questionnaire return rate could be due to insensitivity of the respondents to research study and psychological problems. They could also be not interested in conservation activities.

4.3. Reliability Test

Cronbach's alpha was used to determine the internal reliability of the questionnaire used in this study. Values range between 0 and 1.0; while 1.0 indicates perfect reliability, the value 0.70 was set to be the lower level of acceptability. The reliability statistic for each of the variable is presented in Table 1.

Variable	Cronbach's Alpha Correlation	Decision
Rain Water harvesting	0.829	Accepted
Ventilated pit latrine construction	0.778	Accepted
Improved water treatment capacity in water and sanitation project	0.792	Accepted
Alternative energy sourcing	0.784	Accepted

Table 1: Cronbach's Correlation

It was evident from Table 1 that Cronbach's alpha coefficients for each of the variables was well above the lower limit of acceptability (0.70). The results indicate that Rain Water harvesting had a coefficient of 0.829, Community Ventilated pit latrine construction had a coefficient of 0.778, Community spring protection technologies had a coefficient of 0.792, community alternative energy sourcing had a coefficient of 0.784 and value addition obtained a coefficient of 0.796. The results indicate that the questionnaire used in this study had a high level of reliability.

4.4. Descriptive Statistics

This section outlines the demographic data, gender, marital status, years of existence and key players in the industry

4.4.1. Demographic Information of the Respondents

The demographic features of the respondents were of interest to the study as they provide the study with a base for in-depth information on demographic factors which affect the respondents' social and economic behavior.

4.4.2. Gender of the Respondents

The respondents were required to give their gender; this was to establish gender sensitivity and balance in community development. Findings were shown in Table 2

Gender	Frequency	Percent	Valid %	Cumulative %
Male	99	63.5	63.5	63.5
Female	57	36.5	36.5	100.0
Total	156	100.0	100.0	

Table 2: Gender of the Respondents

Result in Table 2 shows that 99 (63.5%) of the respondents were male and 57 (36.5%) were female. The result indicates that more men participated in role of women in climate adaptable technologies than females in Navakholo sub-county, Kakamega. This implies community participation in development programmes do not take gender issues into account, they become gender insensitive or gender blind in as much as they fail to recognize the different needs of women in the community. Cultural practices and traditional gender roles may make this aspect of role of women in climate adaptable technologies challenging; however, such an approach of women inclusion and empowerment could substantially improve the outcomes of conservation and development actions.

These findings were supported by Agarwal (2009) who asserted that women play critical roles in natural resource use, information transfer, and societal reinforcement of resource use practices. There is a need to ensure that they were as well integrated into community-based conservation projects as men at all levels, from micro-development projects to management and power structures. Agrawal (2001) asserted that gender-related differences were especially significant within groups because of the often 'critical role women play in the gathering and harvesting of products from common-pool resources, the simultaneous position of relative marginality to which they were relegated in terms of Rain Water harvesting, ownership of assets, and exercising political power'. In any society, the composition of decision-making bodies within the power structure is likely to reflect and reinforce development; with the weaker and underprivileged social groups being INavakholo engaged. Therefore, participation by gender is considered as the main factor in assessing adaptability of community projects.

Furthermore, a study by Pandolfelli, Meinzen-Dick and Dohrn (2007) also attributed to gender roles reporting that men and women have different opportunities, motivation and capabilities to involve themselves in collective action. Community participation demands change in attitude of its members towards women in a patriarchal society. While community members have come forward to embrace the 30% affirmative action towards women participating in development projects including climate projects, the household heads have to switch their ways from control to involvement of its members in Rain Water harvesting for its project adaptability.

4.4.3. Age of the Respondents

The study sought to establish the age distribution of respondents. This is a demographic feature that tends to influence behavior or perception of the respondents. Findings were shown in Table 3

Respondents' Age	Frequency	Percent	Valid %	Cumulative %
18-22 years	38	24.4	24.4	24.4
23-27 years	75	48.1	48.1	72.5
28-32 years	24	15.4	15.4	87.9
> 32 years	19	12.1	12.1	100.0
Total	156	100.0	100.0	

Table 3: Age of the Respondents

Findings in Table 3 show that 38 (24.4%) of the respondents were ranged between 18-22 years, 75 (48.1%) ranged between 23-27 years, 24 (15.4%) ranged between 28-32 years and 19 (12.1%) were over 32 years. The mass composition of respondents was 75 (48.1%) ranging between 23 – 27 years. This age bracket represents women who have completed school and colleges and were yet to establish their ways of generating income to sustain their livelihood thus idling in their parents' homes. This finding is supported by (GoK, Kakamega Climate Strategic Ecosystem Management Plan 2015-2040, 2015) who assert that; women in surrounding communities were mostly unemployed, thereby eking their livelihood illegally from climate. The lowest representation was higher age range over 32 years at 19 (12.1%) responses.

4.4.4. Respondents Marital Status

The study sought to determine marital status of the respondents and findings were illustrated in Table 4.4

Marital Status	Frequency	Percent	Valid %	Cumulative %
Single	67	42.9	42.9	42.9
Married	77	49.4	49.4	92.3
Widow	12	7.7	7.7	100.0
Total	156	100.0	100.0	

Table 4 Respondents' Marital Status

Findings in Table 4 show that 67 (42.9%) of the respondents were single, 77 (49.4%) were married couples and 12 (7.7%) were widow/widower. Majority 77 (49.4%) of the women were married.

4.4.5. Length of Service of the Respondents

The research sought to establish the number of years the respondents had worked since this could indicate the exposure and experience; they possess in role of women in climate adaptable technologies. Results were shown in Table 5

Length of Service	Frequency	Percent	Valid %	Cumulative %
0-3 years	65	41.7	41.7	41.7
4-6 years	34	21.8	21.8	63.5
7-9 years	32	20.5	20.5	84.0
> 10 years	25	16.0	16.0	100.0
Total	156	100.0	100.0	

Table 5: Respondents' Length of Service

Results in Table 5 show that 65 (41.7%) of the respondents had worked for 0-3 years, 34 (21.8%) had worked between 4-6 years, 32 (20.5%) had worked between 7-9 years while 25 (16.0%) having worked for over 10 years. Most of the respondents had worked between 0-3 and (41.7%) responses.

4.4.6. Academic Qualifications of the Respondents

The study sought to establish the highest academic qualifications of the respondents in order to relate skills in role of women in climate adaptable technologies in Kakamega Navakholo Sub County. The results were illustrated in Table 6.

Academic Qualifications	Frequency	Percent	Valid %	Cumulative %
Primary	48	30.8	30.8	30.8
Secondary	56	35.9	35.9	66.7
Diploma	37	23.7	23.7	90.4
Degree	12	7.7	7.7	98.1
Master's	3	1.9	1.9	100.0
Total	156	100.0	100.0	

Table 6: Respondents' Academic Qualification

Results in Table 6 shows that majority 56 (35.9%) of the respondents had secondary education while 48 (30.8%) had primary education. Another 37 (23.7%) possessed diploma education and 12 (7.7%) of the respondents were degree holders. It should be noted that only 3 (1.9%) of the respondents was master's holder who participated in this study.

4.5 Rain Water Harvesting and Role of Women in Climate Adaptable Technologies

Participation should contain elements of initiative and decisions, emanating from the community itself. The current study sought to determine the influence of Rain Water harvesting in role of women in climate adaptable technologies in Navakholo sub-county, Kakamega. To answer this objective, a five-point scale of SD (Strongly Disagree), D (Disagree), U (Undecided), A (Agree) and SA (Strongly Agree) was used.

Statements	SD		D		U		A		SA			
	F	%	F	%	F	%	F	%	F	%	M	SD
We have rain water harvesting structures in our water source points	6	3.8	9	5.8	3	1.9	56	35.9	82	52.6	4.27	1.025
The rain water harvesting structure is managed by women	0	0.0	27	17.3	2	1.3	73	46.8	54	34.6	3.98	1.028
The rain water harvesting structure was built to support climate change	0	0.0	49	31.4	71	45.5	33	21.2	3	1.9	2.93	.776
There were environmental activities that encourage rains in our ware	12	7.7	14	9.0	53	34.0	69	44.2	8	5.1	3.30	.979
The environmental activities were spearheaded by women	6	3.8	29	18.6	0	0.0	21	13.5	100	64.1	4.15	1.310
My household has a rain water harvesting structure	2	1.3	23	14.7	50	32.1	79	50.6	2	1.3	3.35	.794
The is awareness campaigns in my ware on rain harvesting technologies	0	0.0	10	6.4	0	0.0	131	84.0	15	9.6	3.96	.594
I am involved at all levels of Rain Water harvesting	10	6.4	50	32.1	1	0.6	77	49.4	18	11.5	3.27	1.210
There is inadequate gender mainstreaming policy	1	1.6	10	6.4	8	5.1	11	7.1	126	80.8	4.60	.898
I am willing to participate in the management rain water harvesting	11	7.1	21	13.5	43	27.5	50	32.1	31	19.8	3.48	1.104
Valid N (listwise)	156											

Table 7: Descriptive Statistics on Rain Water Harvesting

It was shown in Table 7 that majority 82 (52.6%) of the women who participated in this study strongly agreed that the power distribution affects women participation in rain water development projects development projects hence adaptability with a mean of 4.27. This implies that Rain Water harvesting is important in achieving organizational goals/objectives within given time and budget. It devolves the decision-making power to the community and the members of the community benefit directly from the rain water harvesting. Another 73 (46.8%) stated that by frequently participating in Rain Water harvesting process, adaptability is achieved at a mean of 3.98. However, 71 (45.5%) of the women were undecided whether they had authority to engage in rain water harvesting activities at a mean of 2.93. Perhaps this is due to the fact that they have not been given full power management and adaptability of climate adoptable technologies. This consequently reduces people's attachment value climate adoptable technologies and the need to protect them; which in turn results in their desire to decline in change in illegal activities and decreased climate cover on their farms. This results points at the influence of power in Rain Water harvesting hence the choices we make always affect someone. Regardless of the degree, someone is always affected by the choices of others. Therefore, power structure is a critical element of Rain Water harvesting process in any development agenda and it also limits illegal activities. Decision is effective or ineffective with reference to the ability of the group to initiate changes in these relationships or to compensate for changes of exogenous origin. These relationships develop in a dynamic setting characterized by changes in one or more of the elements of decision. These findings confirm that participation must contain elements of initiative and decision, emanating from the community itself (Suharti, 2001). From The Process Approach: People Centered Development by David Korten (1980), managing water harvesting is critical not only to balance competing uses in the short term but to ensure we can enjoy climate adaptability benefits for generations to come. Participation in water harvesting groups has been also shown to influence decisions to plant more trees on-farm (Emtage & Suh, 2004) and participate in rain water harvesting projects Kurten. Therefore, this study proposes that acquisitions approach in rain water harvesting process in local community participation in were sufficient elements climate adaptation technologies.

Findings further reveals that 69 (44.2%) of the respondents stated that their groups have a participatory climate management plan at a mean 3.30. In principle, community rain water harvesting plan create a source of stable income by providing incentives for local communities to keep their land climate, thus conserving biodiversity and ecosystem project and contributing to poverty reduction and economic development (Anderson, 2011). In addition, 100 (64.1%) of the

women strongly agreed that there is fair and equitable distribution of climate benefits at a mean of 4.15. This implies that fair and equitable distribution of resources motivates women participation in rain water harvesting. This aspect ultimately brings the public into the Rain Water harvesting process to create consensus, own and support the climate programs. This is in with previous studies that reported individuals have greater motivation to pursue sustainable environmental practices when resources were locally owned. Therefore, fairness is an important component of sustainable climate management especially in sharing of benefits and costs of climate use (Kiefaber, Gass, & Rickenbach, 2009). Eshun (2008) indicated that it was expected that as one owns a resource, he gains some benefit from it. Majority 131 (84.0%) of the respondents also asserted that the is awareness campaigns in my ware on rain harvesting technologies at a mean of 3.96. This result implies that distribution of climate benefits within the community influence adaptability. Thus, this affects the participation of local people in climate by limiting illegal activities hence adaptability. Macharia (2015) asserted that participatory processes through indigenous knowledge sharing increases the likelihood of success as it provide opportunities for community members to participate, receive feedback and jointly develop new ideas over a period of time thus adaptability. Similar findings were also reported by KoKu (2002) that the local farmers' knowledge must be the key element of efforts to motivate plantation of trees on farms since local people and scientists may not necessarily were the same view. Therefore, it was important to understand what the local farmers know and how it effects on their decision on conducting farming activities and climate development projects. This is also in line with Osumba (2011) who indicated the government's recognition of the critical role that can be played by the local adjacent communities in ensuring that the tree cover in the country increase to the internationally recommended 10%.

It was worth to note that majority 77 (49.4%) of the respondents stated that they were involved at all levels of Rain Water harvesting towards climate programmes at a mean of 3.27. However, 126 (80.8%) of the women asserted that there was lack of gender mainstreaming policy towards water harvesting activities at a mean of 4.60. This implies that lack of gender mainstreaming makes public interventions less effective and ensures that inequalities were perpetuated among men and women. Gender mainstreaming helps communities to identify gender gaps among professionals and the role of women in decision-making at both local and national levels in environmental management. It also ensures that policy-making and legislative work is of higher quality and has a greater relevance for society, because it makes policies respond more effectively to the needs of all citizens. This result indicates that gender issues and roles were important in fostering networks for collective action in climate conservation management. Such networks, built through trust and gender balance determine the ability of a group to solve problems successfully. This ultimately improves Rain Water harvesting capability of all members of the community including women and people living with disabilities. Earlier studies have reported have also reported a great challenge in modern water harvesting to manage a climate for multiple goals including biodiversity conservation (Trotter & Whitham, 2011). It has the co-benefits of reducing poverty, addressing social exclusion, and creating rural employment (Moss, 2012) and carbon sequestration (Gautam & Watanabe, 2009). Furthermore, only 50 (32.1%) of the women reported their willingness to participate in the management of climate. This implies that many women were reluctant to participate in conservation activities other than seeking white collar jobs in other sectors of the economy.

Therefore, social inclusion in Rain Water harvesting process takes all categories of individuals hence more realization of high levels of adaptability in management of indigenous climates. It involves the integration of a gender perspective into the preparation, design, implementation, monitoring and evaluation of policies, regulatory measures and spending programmes, with a view to promoting equality between women and men, and combating discrimination. These findings were similar to those by Holder and Chase (2011) who reported that local communities have long been excluded by the central government from participation in climate policy. Participation by gender is considered a main factor in assessing adaptability. Men and women have different opportunities, motivation and capabilities to involve themselves in collective action (Pandolfelli, Meinzen-Dick, &Dohrn, 2007). Community participation demands change in attitude of its members towards women in a patriarchal society. While community members have come forward to embrace the 30% affirmative action towards women participating in development projects including climate projects, the household heads have to switch their ways from control to involvement of its members in Rain Water harvesting for its project adaptability communities.

4.6. Community Spring Protection Technologies in Climate Adaptable Technologies

The current study examined the role of community Ventilated pit latrine construction in promoting role of women in climate adaptable technologies in Navakholo sub-county, Kakamega.

Statements	SD		D		U		A		SA			
	F	%	F	%	F	%	F	%	F	%	M	SD
I have an improve spring protection technology in my household	9	5.8	21	13.5	1	0.6	87	55.8	38	24.4	3.79	1.128
We experience no water borne diseases because of the protected spring	0	0	31	19.9	5	3.2	64	41	56	35.9	3.92	1.09
There is an inclusion of women in the management of the protected spring in my village	10	6.4	50	32.1	1	0.6	77	49.4	18	11.5	3.27	1.21
There is throughout flow of water from the protected spring The cost of maintaining the protected spring is affordable for my household	1	0.6	13	8.3	0	0	69	44.2	73	46.8	4.28	0.885
There is a awareness campaigns in my ware about importance of protected springs	25	16	57	36.5	1	0.6	20	12.8	41	34.1	2.67	1.767
I am willing to incur costs to sustain Kakamega climate	13	8.3	87	55.8	15	9.6	39	25	2	1.3	3.12	1.579
Sensitization meetings usually affects adaptability	10	6.4	51	32.7	0	0	30	19.2	65	41.7	3.57	1.459
Lack of transparency in sensitization meetings	3	1.9	32	20.5	1	0.6	71	45.3	49	31.4	3.83	1.138
Engaging women at all times affect adaptability to ventilated pit latrine	0	0	16	10.3	0	0	106	67.9	34	21.8	4.01	0.795
Valid N (listwise)	18	11.5	11	7.1	10	6.4	100	64.1	17	10.9	3.55	1.95
	156											

Table 8: Descriptive Statistics on in Community Spring Protection Technology

As presented in Table 8, 87 (55.8%) of the respondents stated that I have an improve spring protection technology in my household at a mean of 3.79 though 64 (41.0%) indicated that We experience no water borne diseases because of the protected spring at a mean of 3.92. The study also revealed that 77 (49.4%) of the women asserted that there is an inclusion of women in the management of the protected spring in my village affects climate adaptability at a mean of 3.27. This indicates that climate activities require proper coordination in order to achieve optimum participation. This ultimately does not create people's genuine interests in the climate adaptable technologies which reduce access to investment capital. Because of this the participatory role of communities in planning and budgeting enable stakeholders to identify resources among communities which can be used in projects and activities thus reduce their dependence on donors. These findings point towards earlier findings that reported volunteer activities and practices towards climate adaptability have remained uncoordinated and inadequately supported by our local communities. People were key factors in socio-ecological system and disregard for local claims and needs has resulted in failure of many climates adaptable technologies (Vanhanen, et al., 2010). People in the world over engage in Ventilated pit latrine construction for a great variety of reasons such as to eliminate poverty, to tackle environmental issues, to reduce risk of disasters or to combat social exclusion and violent conflict.

It emerged that 69 (44.2%) of the women who participated in this study asserted that participation in climate adaptable technologies is time consuming which affects adaptability at a mean of 4.28. It was further indicated that 57 (36.5%) disagreed that agreements on maintenance costs by stakeholders were based on a win-win situation thus affecting climate adaptability at a mean of 2.67. Another 87 (55.28%) disagreed that any form of payment permitted in my group would affect climate adaptability at a mean of 3.12. These findings indicate that resource mobilization is crucial determinant of role of women in climate adaptable technologies. The community plays a crucial role in mobilizing resources that significantly reduces their dependence on donors. However, long term plan for mobilizing resources requires total Ventilated pit latrine construction both in contribution of material/financial and labour support. Therefore, the potential for the resources to support climate projects for a long period of time demands total commitment from the local people. Similar findings were reported by (Suharti, 2001) that dealing with environmental problems requires solutions sensitive to local, social and ecological conditions. It also requires a community with volunteers who were able to identify people's felt needs. Similar findings were reported by (Suharti, 2001) who asserted that the costs of participatory natural resource management included time consumed in attending meetings, limited access to resources such as grazing land, water sources, game meat and agricultural land. There were also hazards involved in the participatory management for example in firefighting. It becomes imperative to involve the major groups in program, project and activity initiation outlining all factors involved to facilitate commitment to the exercise.

It was shown that majority 65 (41.7%) of the women who participated in this study strongly agreed that they were willing to incur conservation costs to sustain Kakamega climate at a mean of 3.57. This implies that all indigenous

people have in common is a deep connection to the natural environments in which they live. This is why indigenous people were on the frontline of nature conservation and preserving the balance of the ecosystem has always been the indigenous way of life. Another 71 (45.3%) stated that attending sensitization meetings affects climate adaptability at a mean of 3.83 whereas 106 (67.9%) indicated that lack of transparency in sensitization meetings would affect attendance hence decreased participation that eventually affects adaptability at a mean of 4.01. There is every indication, 100 (64.1%) of the women agreed that engaging women at all times of the project would affect climate adaptability technology at a mean of 3.55. They only require information through sensitization meetings. To ensure continuity, there should be meetings for ongoing communication throughout the project period to sensitize the community on the benefits of managing the natural climate sustainably. As reported from previous findings, provision of friendly platforms for implementation of climate programs by volunteers can increase climate participation. There is need to device more people centered approaches which stress empowerment and participation. The developing grass root Ventilated pit latrine construction can be an enclave among various organizations and may be able to work towards development of civil society in developing countries (Xu & Ngai, 2011).

4.7. Community Ventilated Pit Latrine Construction

The study sought to determine the effects of community spring protection technologies in role of women in climate adaptable technologies in Navakholo sub-county, Kakamega.

Statements	SD		D		U		A		SA			
	F	%	F	%	F	%	F	%	F	%	M	SD
I have an improve pit latrine in my household	8	5.1	3	1.9	2	1.3	110	70.5	33	21.2	4	0.876
My household has an improved pit latrine construction role was initiated by women	6	3.8	49	31.4	6	3.8	78	50	17	10.9	3.32	1.142
Improved pit latrine is accessible to all gender	10	6.4	50	32.1	1	0.6	77	49.4	18	11.5	3.27	1.21
There is a reduced bad smell production from my pit latrine There is reduced diseases associated with lack of pit latrine in my household	0	0	16	10.3	0	0	71	45.5	69	44.2	4.23	0.895
There are awareness campaigns on improved pit latrine in my ware	18	11.5	32	20.5	20	12.8	80	51.3	6	3.8	3.15	1.148
Climate groups were open for women to join and participate	4	2.6	27	17.3	3	1.9	108	69.2	14	9	3.64	0.955
Women invest in income generating activities	11	7.1	12	7.7	25	16	90	57.7	18	11.5	3.58	1.027
Women have other sources of income to support livelihood	0	0	15	9.6	22	14.1	90	57.7	29	18.6	3.85	0.833
Government funding to the women	0	0	15	9.6	0	0	90	57.7	51	32.7	4.14	0.838
Valid N (listwise)	0											
	156	0	1	0.6	37	23.7	112	71.8	6	3.8	3.78	0.588

Table 9: Descriptive Statistics on Ventilated Pit Latrine Technology

As indicated in Table 9, 110 (70.5%) of the respondents stated that they have an improve pit latrine in my household at a mean of 4.0. Half, 78 (50.0%) of the women asserted that My household has an improved pit latrine construction role was initiated by women which affects climate adaptability at a mean of 3.32. It was also indicated by 77 (49.4%) of the respondents who stated that Improved pit latrine is accessible to all gender affecting climate adaptability at a mean of 3.27. Results indicate that involving local community women in information sharing activities has a bearing to improved access to investment capital. Consequently, this improves adaptability issues of local climate by the people. Empowerment expands the capabilities of the poor to undertake future self-help programs through the concept of community participation. These findings were similar to other studies reported by Meshack (2004), that information is a key and knowledge is power and it does not necessarily entail the equal sharing of power. Informed citizens were better equipped to take advantage of opportunities. The relevance of this information is especially important if the poor were to take effective action (Narayan, 2002).

Concerning capacity building and role of women in climate adaptable technologies, majority 71(45.5%) of the respondents stated there is a reduced bad smell production from my pit latrine affecting climate adaptability at a mean of 4.23, whereas more than half, 80 (51.3%) stated that There is reduced diseases associated with lack of pit latrine in my household of the climate has a bearing on climate adaptability at a mean of 3.15. It was also reported that climate group trainings in group dynamics and team building affect adaptability climates in the long run at a mean of 3.64. These results imply that adequate trainings empower the women which eventually enhance were and conservation of climate trees. It

was important for the leaders to provide adequate training on all climate conservation and management issues to all women members in order to increase their level of participation in climate activities. This definitely increases their potential to safeguard climate trees and increased number of completed climate projects hence role of women in climate adaptable technologies. According to Macharia (2008) the government should utilize conservation activities as a way of creating income generating activities for women in the communities to enable them eke a living from the projects. Similarly, participation in development projects is a strong form of empowerment practice. It entails building capacity of the community so that they can make rational decisions and undertake meaningful input for mutual benefit (Meshack, 2004).

Regarding community ownership and role of women in climate adaptable technologies, majority of the respondents, 90 (57.7%) agreed that climate groups were open for women to join and participate in the development of climate projects which affect adaptability at a mean of 3.58. Similarly, an equal proportion 90 (57.7%) of the respondents stated that women investing in income generating activities like value addition and they have other sources of income to support livelihood which affects access to investment capital at a mean of 3.85 and 4.14 respectively. Therefore, illegal climate and poaching activities significantly reduce to very low rates since community members were frequently trained and safeguard the public resources collectively. Another 112 (71.8%) stated that Government funding to the women climate projects affect access to investment capital and completed projects around the climate. In a study by Musyoki, Mugwe, Mutundu and Manchuria (2016), training and capacity building in climate conservation and management of indigenous climates was identified as a factor contributing to high level community participation of CFA members. Moreover, majority of the CFA members who planted trees in their farms had a high level of participation in PFM and a high benefit perception. Thus, a high level of participation of CFA members in climate patrol, fire control, tree nursery activities, and tree planting was associated with training and high PFM benefit perception.

These findings were also similar to that of Brosius (2005) who asserted that there were moral reasons why communities should be allowed to manage their climates since many depend on natural resources for basic survival and livelihoods. People should rightly have control over their own destinies and this translates into secure land tenure with a reasonably long-term agreement, (Pierce Colfer & Byron, 2001). Longer-term security of land ownership and legally recognized rights and responsibilities not only creates incentives to manage resources more sustainably but also has implications for the health of local people and cultures.

4.8. Community Alternative Energy Sourcing and Role of Women in Climate Adaptable Technologies

The study sought to determine the effects of community alternative energy sourcing on role of women in climate adaptable technologies in Navakholo sub-county, Kakamega.

Statements	SD		D		U		A		SA			
	F	%	F	%	F	%	F	%	F	%	M	SD
Accounting projects affect climate adaptability	3	1.9	30	19.2	22	14.1	91	58.3	10	6.4	3.48	0.939
Women have a role in accounting for projects	3	1.9	54	34.6	46	29.5	50	32.1	3	1.9	2.97	0.908
Sharing reports with the community periodically	0	0	47	30.1	4	2.6	75	48.1	30	19.2	3.56	1.114
My group ensures strict enforcement of laws & rules	1	0.6	59	37.8	20	12.8	69	44.2	7	4.5	3.14	1.006
Conservation strategies were based on consent of women	14	9	29	18.6	12	7.7	87	55.8	14	9	3.37	1.154
Conserving the climate through climate patrols	8	5.1	27	17.3	10	6.4	109	69.9	2	1.3	3.44	0.965
Involving women in monitoring projects	0	0	0	0	0	0	121	77.6	35	22.4	4.22	0.418
Continuous monitoring of climate projects by women	9	5.8	59	37.8	42	26.9	37	23.7	9	5.8	2.85	1.031
Group has a working tool for monitoring and evaluation	6	3.8	24	15.4	70	44.9	51	32.7	5	3.2	3.16	0.861
M&E reports were submitted quarterly for sharing	23	14.7	39	25	31	19.9	50	32.1	13	8.3	2.94	1.224
Valid N (listwise)	156											

Table 10: Descriptive Statistics on Community Alternative Energy Sourcing

As revealed in Table 10, 91 (58.3%) of the respondents agreed that accounting for climate projects as a team of stakeholders affect climate adaptability at a mean of 3.48 whereas 54 (34.6%) disagreed that every woman has a role in accounting for climate adaptable technologies which determine number of completed projects at a mean of 2.97. It was also indicated by 75 (48.1%) of the respondents that to some extent, sharing accounting reports with the community periodically affects climate adaptability at a mean of 3.56. Accountability emanating from the democratic form of

governance gives the right to be accounted to and to account to others**.** The findings imply that participants of this study do not adequately involve in accounting of climate projects in Navakholo sub-county, Kakamega. Lack of accountability by managers to the community led women' unwillingness to join the conservation groups from households' hence decreased number of successfully completed climates projects. Access to investment capital also declined due to few numbers of community women hence reduced state of adaptability. These results point towards a study by Narayan (2002) who reported that adequate accountability of projects leads to expansion of assets and capabilities of poor people to participate and negotiate with, influence, control, and they hold accountable institutions that affect their lives

Regarding enforcement of existing environmental laws, findings in Table 10 also shows that 69 (44.2%) of the respondents agreed that their group ensures strict enforcement of laws, rules and regulations in place which has a bearing to adaptability at a mean of 3.14 as 87 (55.8%) agreed conservation strategies in their groups were based on the consent of surrounding community whose life it affects hence at a mean of 3.37. Pagdee, Kim and Daugherty (2006) reported that well-defined property rights, effective institutional arrangements, and community interests and incentives were critical elements of community participation in successful community climate. Without these elements, it was very difficult to secure the survival of natural climates and the wellbeing of climate-dependent communities. Additionally, another 109 (69.9%) of the women agreed that conserving the climate through climate patrols affect its adaptability at a mean of 3.44. These findings were similar to those by Clements, Ashish, Kweren, Dan, Setha and Milner-Gulland (2010) in Cambodia, which reported weak institutions and poor governance were at the root of widespread land disputes. Even land allocated for community climate is not safe from land-grabbing and commercial exploitation. Ineffective environmental law enforcement makes it almost impossible for community climate groups to assert their rights of ownership especially against powerful, self-interested adversaries. This emphasizes the need to support sustainable climate management through instituting clearly defined property rights and building the capacity of local institutions so as to strengthen enforcement and compliance unit for proper law enforcement.

Concerning Community Monitoring and Evaluation of climate projects, an overwhelming majority, 121 (77.6%) of the women agreed that involving women in monitoring community alternative energy sourcing has significance to climate adaptability at a mean of 4.22. There is need to actively involve the communities in the decision-making processes from policy formulation through to implementation and even during evaluation. In an attempt where communities were only involved only during implementation of climate programs, this led to deliberate negligence of the programs by the local communities and ultimately failure. In other terms, projects fail if the stakeholders were not fully involved in all the stages of community alternative energy sourcing. This result is in agreement to the case study of Osoam community climate which outlined the critical issues of insecure land tenure, disorganized local institutions and insufficient technical and financial support that jeopardized the overall aim of achieving sustainable climate management and poverty reduction (de Lopez, 2004). However, quite a number of women 59 37.8%) disagreed that continuous monitoring of climate projects by women affects climate adaptability at a mean of 2.85. Another 70 (44.9%) of the women were not aware whether the organization has a working tool for monitoring and evaluation at a mean of 3.16. This result implies that among the women in Navakholo sub-county, Kakamega have limited knowledge about M&E hence limited participation in community alternative energy sourcing thus affects adaptability. Even though, there was elements of group monitoring reports submitted quarterly to members for sharing and way forward, only 50 (32.1%) of the respondents agreed at a mean of 2.94. according to Sokh and Iida (2001), monitoring and evaluation of community climate activities is required to find out what has worked and what has not.

According to (World Bank, 2011) report, M&E is often overlooked but important component to community development. An M&E system provides regular flow of information on the performance of policies and highlights periodic oversight of the implementation of an activity which seeks to establish the extent to which input deliveries, work schedules, other required actions and targeted outputs were proceeding according to plan, so that timely action can be taken to correct deficiencies detected. This aspect therefore, requires time and dedicated volunteer members of the community in order to succeed the implementation of climate projects. Monitoring is an ongoing process of data capture and analysis's for primarily project control with an internally driven emphasis on efficiency of project (Crawford & Bryce, 2003). Ongoing project evaluation is viewed as a valuable tool to promote adaptability in addition to achieving alignment of the project's characteristics with the needs of its stake holders (Johnson et al., 2004).

4.9. Inferential statistics

The main objective of the study was to investigate the role of women in climate change adaptation technologies in Navakholo sub-county, Kakamega. There were four independent variables namely; Rain Water harvesting, community Ventilated pit latrine construction, community spring protection technologies and community alternative energy sourcing. The four variables were explaining the dependent variable (role of women in climate adaptable technology). A correlation analysis was done between the four explanatory variables and the response variable so as to measure the level and nature of dependence. Here Pearson's correlation was used for measurement of the relationship. Regression analysis was used to predict the role of women in climate adaptable technology using the four explanatory variables.

4.9.1. Correlation Analysis between Determinants of Community Participation in Role of Women in Climate Adaptable Technology

From the table on correlation of Rain Water harvesting, the Pearson correlation coefficient of 0.521 shows that there is a direct relationship between Rain Water harvesting and role of women in climate adaptable technology. The correlation is significant at 5% level of significance. This is indicated by the p value of 0.000.

The correlation of community Ventilated pit latrine construction and role of women in climate adaptable technology displays the Pearson's correlation coefficient as 0.533. This implies that there is a direct relationship between role of women in climate adaptable technology score and community Ventilated pit latrine construction. It further implies that an increase in one variable increase the other one and vice versa. The p value shows that the correlation coefficient is significant at 5% level of significance.

As evidenced from table on the correlation between role of women in climate adaptable technology and community alternative energy sourcing, the Pearson's correlation coefficient of 0.032 shows that there is a direct relationship between the two variables. It further implies that an increase in a unit of community alternative energy sourcing increase the role of women in climate adaptable technology score and vice versa. The correlation is significant at 5% level of significance further implying a relation between the two variables.

Correlations						
Control Variables			**RWH**	**Ventilated Pit Latrine**	**Protected Spring**	**Altn Energy**
Role of women in climate adaptable technology	RWH	Correlation	1.000	.521	.533	.032
		Significance (2-tailed)	.	.000	.000	.690
		Df	0	153	153	153
	Ventilated pit latrine	Correlation	.521	1.000	.723	.227
		Significance (2-tailed)	.000	.	.000	.005
		Df	153	0	153	153
	Protected spring	Correlation	.533	.723	1.000	.345
		Significance (2-tailed)	.000	.000	.	.000
		Df	153	153	0	153
	Alternative energy	Correlation	.032	.227	.345	1.000
		Significance (2-tailed)	.690	.005	.000	.
		Df	153	153	153	0

Table 11: Correlation Analysis between Determinants of Community Participation in Role of Women in Climate Adaptable Technology

4.9.2. Multiple Regression Analysis for Different Climate Adoptable Technologies and in Role of Women

From Table 11, it wasclear that the overall ANOVA is significant in predicting how Rain Water harvesting, community Ventilated pit latrine construction, community spring protection technologies and community alternative energy sourcing determine role of women in climate adaptable technology in Kakamega Navakholo Sub County. Findings show that there was a statistically significant difference between groups as determined by one-way ANOVA (F (4,151) = 597.190, p = .000). The p value for the F test is less than 0.05 implying that the independent variables were good in explaining the variation in role of women in climate adaptable technology score. Two independent variables were not significant in the regression analysis at 5% level of significance, this were; Rain Water harvesting and community Ventilated pit latrine construction. This is because their p values were greater than 0.05. A constant of -0.051 shows that if all the independent variables had a score of zero, the role of women in climate adaptable technologies score is reduced by 0.051. From the table, an increase in one unit of Rain Water harvesting increases the role of women in climate adaptable technology score by 0.111, an increase in one unit of community Ventilated pit latrine construction reduces the role of women in climate adaptable technology score by 0.057, an increase in one unit of community empowering increases the role of women in climate adaptable technology score by 0.269 and lastly an increase in one unit of community alternative energy sourcing increases the role of women in climate adaptable technology by 0.684.

Having achieved objective 1 on the relationship between Rain Water harvesting and role of women in climate adaptable technology in Navakholo sub-county, Kakamega, the study rejects the null hypothesis that: Ho: There is no significant relationship between Rain Water harvesting (p= 0.096) and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

Having achieved the objective 2 on the relationship between community Ventilated pit latrine construction and role of women in climate adaptable technology in Navakholo sub-county, Kakamega, the study does not reject the null hypothesis: H0: There is no significant relationship between community Ventilated pit latrine construction and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

Having achieved objective 3 on the relationship between community spring protection technologies and role of women in climate adaptable technology in Navakholo sub-county, Kakamega, the study accepts the null hypothesis that; H0: There is no significant relationship between community spring protection technologies and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

Having achieved the objective 4 on the relationship between community alternative energy sourcing and role of women in climate adaptable technology in Navakholo sub-county, Kakamega, the study accepts the null hypothesis; H1:

There is no significant relationship between community alternative energy sourcing and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

ANOVA[a]						
Model		**Sum of Squweres**	**df**	**Mean Squwere**	**F**	**Sig.**
1	Regression	163.239	4	40.810	597.190	.000[b]
	Residual	10.319	151	.068		
	Total	173.558	155			
a. Dependent Variable: role of women in climate adaptable technologies						
b. Predictors: (Constant), RWH, ventilated pit latrine, spring protection, altn energy						

Table 12: Multiple Regression Analysis for Different Climate Adoptable Technologies and in Role of Women

4.9.3. Regression Model

Furthermore, the current study determined multiple regression model based on the following formula:

$Y= \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+e$.

Table above presents the regression results on how Rain Water harvesting, Ventilated pit latrine construction, empowerment and community alternative energy sourcing determine role of women in climate adaptable technology in Navakholo sub-county, Kakamega. The multiple regression equation was that: $Y= \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+e$ and the multiple regression equation became:

$Y = -0.051+0.111X_1-0.057X_2+ 0.269X_3+0.684X_4$.

As depicted in Table 11, there was positive and insignificant influence of Rain Water harvesting on role of women in climate adaptable technology ($\beta= 0.878$; $t = 5.515$; $p > 0.05$). There was positive and insignificant influence of community Ventilated pit latrine construction on role of women in climate adaptable technology ($\beta= 0.111$; $t = 1.673$; $p > 0.05$). There was also an inverse and insignificant influence of community spring protection technologies on role of women in climate adaptable technology ($\beta= -0.057$; $t = -0.860$; $p < 0.05$). Finally, there was also a positive and significant influence of community alternative energy sourcing on role of women in climate adaptable technology ($\beta= 0.684$; $t = 13.331$; $p < 0.05$).

The new regression equation therefore is

$Y=-0.051+ 0.269X3+0.684X4$

This regression line forms the correct model as the variables Rain Water harvesting and Ventilated pit latrine construction were insignificant ($p>0.05$) hence cannot be included in the original multiple regression equation. As such they cannot be role of women in climate change adaptation technologies in Navakholo subcounty, Kakamega county.

5. Summary, Conclusions and Recommendations

5.1. Introduction

In this chapter, a summary of the findings from the study is shown together with the conclusion and recommendations. The summaries were done on the descriptive of the role of women in climate change adaptation technologies in Navakholo Sub- County. The summary on the inferential statistics has also been outlined in this section. The conclusion is in the second section on this chapter while recommendation the third section which also indicate on the further were as of study.

5.2. Summary of Findings

The main objective was to investigate the role of women in climate change adaptation technologies in Navakholo Sub- County. The response rate in this study was enough in making conclusion about the population under study using the sample statistics. Demographic findings show that 63.5% of the respondents were male while 36.5% were female hence more men participated in role of women in climate adaptable technologies in Navakholo sub-county, Kakamega. Most of the respondents involved in climate were women between 23-27 years by 48.1% responses. Moreover, almost half, 49.1% of the women had secondary education as the highest academic qualification.

5.2.1. Rain Water Harvesting and Role of Women in Climate Change Adaptation Technologies in Navakholo Sub-County, Kakamega

The finding indicated that there is insignificant relationship between Rain Water harvesting and role of women in climate adaptable technology in Navakholo sub-county, Kakamega. This relationship is insignificant meaning it does not measure satisfactorily. The regression parameter is insignificant meaning it cannot be used to make predictions. The study accepted the null hypothesis that: Ho: There is no significant relationship between Rain Water harvesting and role of women in climate adaptable technology in Navakholo sub-county, Kakamega

5.2.2. Community Ventilated Pit Latrine Construction and Role of Women in Climate Adaptable Technology in Navakholo Sub-County, Kakamega

The findings indicated that the level of relationship to be a direct relationship. The regression parameter is significant. The study concluded the findings of analysis on the community Ventilated pit latrine construction and role of women in climate adaptable technology by rejecting the null hypothesis and accepting the alternative hypothesis that: H1: There is a significant relationship between community Ventilated pit latrine construction and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

5.2.3. Community Spring Protection Technologies and Role of Women in Climate Adaptable Technology in Navakholo Sub-County, Kakamega

The analysis revealed the correlation coefficient is a fair inverse relationship between farming income and household food security. The regression parameter is significant. Having achieved the objective, the study accepts the null hypothesis that; H0: There is no significant relationship between community spring protection technologies and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

5.2.4. Community Alternative Energy Sourcing and Role of Women in Climate Adaptable Technology in Navakholo Sub-County, Kakamega

The analysis revealed a correlation coefficient is a direct relationship between community alternative energy sourcing and role of women in climate adaptable technology scores. The relationship is significant. The regression parameter is significant and can be used in prediction. Therefore, having achieved the objective, the study does not reject the null hypothesis that; H1: There is no significant relationship between community alternative energy sourcing and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

5.3 Conclusion

There were four specific objectives that were to be achieved at the end of the study period that forms conclusion of every objective:

- To determine the influence of Rain Water harvesting in role of women in climate adaptable technology in Navakholo sub-county, Kakamega. It was very clear from the analysis that there is no significant relationship between Rain Water harvesting and role of women in climate adaptable technology in Navakholo sub-county, Kakamega. Rain Water harvesting explains very small change in role of women in climate adaptable technology scores. Rain Water harvesting cannot be used in prediction.
- To assess the influence of community Ventilated pit latrine construction in role of women in climate adaptable technology in Navakholo sub-county, Kakamega. There is no significant relationship between community Ventilated pit latrine construction and role of women in climate adaptable technology in Navakholo sub-county, Kakamega. Community Ventilated pit latrine construction explains very small change in role of women in climate adaptable technology scores. Community Ventilated pit latrine construction as such cannot be used in the prediction.
- To determine how community spring protection technologies influence role of women in climate adaptable technology in Navakholo sub-county, Kakamega. The regression parameter community spring protection technologies is significant. Having achieved the objective, the study accepts the null hypothesis that; H0: There is no significant relationship between community spring protection technologies and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.
- To determine the influence of community alternative energy sourcing in role of women in climate adaptable technology in Navakholo sub-county, Kakamega. The relationship is significant. The regression parameter is significant and can be used in prediction. Therefore, having achieved the objective, the study does not reject the null hypothesis that; H1: There is no significant relationship between community alternative energy sourcing and role of women in climate adaptable technology in Navakholo sub-county, Kakamega.

5.4. Implication of the Research

The study established community spring protection technologies and community alternative energy sourcing have an impact in the role of women in climate adaptable technologies in Navakholo sub-county, Kakamega. The results indicate that an increase in the scores of community spring protection technologies and community alternative energy sourcing increases the scores in role of women in climate adaptable technology. This further implies that the climate adaptable technology and the community around the climate can continue improving the community spring protection technologies as a way to improve the interaction between community and climate activities and improve role of women in climate adaptable technologies. Community Ventilated pit latrine construction by women should also be increased with an aim of making the community women be involved in projects that contribute to role of women in climate adaptable technologies.

5.5. Recommendations

The recommendations of the research were made on foundation laid by summary of finding and conclusion. We had two roles that were significantly affecting the role of women in climate adaptable technologies; community spring protection technologies and community project management. The climate project should improve on community spring

protection technologies and vol so that more women in the community were able to have access on them. They should also advice women on how they can make use of the Ventilated pit latrine construction to tap opportunities that helped increase climate adaptability. On improved water treatment capacity in water and sanitation project, the climate project should increase the extension, capacity building and training that is offered to the community so as to help them to become knowledgeable of the importance of the climate. It can also advise them on how to use the climate so that they can improve on their livelihood.

Rain Water harvesting and community Ventilated pit latrine construction was not significant in role of women in climate adaptable technology scores. This pushes community and climate project to do something about these two variables. The climate project should offer more volunteer opportunities at the climate to the community women. Since it wasclear that majority of the women had attained secondary education. Again, the community should enable women to be involved in Rain Water harvesting on the climate resource. This helped them to be involved in adaptability initiatives in the climate.

In a nutshell the policy makers, the climate project and the government need to effectively plan on how they can improve the livelihood of the community women by improving community Ventilated pit latrine construction in the climate for the locals, increase capacity building and training, increasing the space for Rain Water harvesting for the women, generate opportunities for the women to invest in the climate and finally increase and make accessible the project initiatives for implementation by women.

5.6 Areas of Further Research

The study limited itself to the four roles of farming namely Rain Water harvesting, community Ventilated pit latrine construction, community spring protection technologies and community alternative energy sourcing on role of women in climate adaptable technology. The lead researcher recommends other were as that can be considered as a gap.

- The study recommends that further research be carried out to find the influence of public participation in management of climates resources. It was also suggested that studies should be done in other were as with climates
- The cross-section research can be extended to other parts of western Kenya so as to determine how they were affected by the variables under study

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Appendix

Questionnaire

This questionnaire is to collect data for purely academic purposes. All The Information Is To Be Treated As Confidential: Do Not Write Your Name On This Questionnaire

Section I: Background Information

a) General information

1. Age of Respondent

{ } Less than 25 years
{ } 26-35 years
{ } 36-50 years
{ } More than 50 years

2. What is your level of academic education?

{ } None
{ } Primary
{ } Secondary
{ } Tertiary
{ } University

3. Occupation of the respondent

{ } unemployed
{ } employed
{ } operating another type of Business
{ } farmer
{ } others (specify).....

4. How long have you been doing the above activity/activities on your water resource management

{ } less than 1 year
{ } 1-3 years
{ } 3-5 years
{ } 5 years and above

5. What is the size of your household?

{ } 1 – 2
{ } 2 – 3
{ } 3 –4
{ } 5 – 6
{ } 6 and above

6. what is the name of your

a) Sub-Location.....
b) Village.....

Section Ii: Questions on Theme

A) Role of rural women in community rain water harvesting projects in Navakholo Sub.

Rain Water Harvesting promoters questions

1. Please answer the following questions about rain water harvesting technology in your ware

a) How was the water situation in your local ware before you had Rain Water Harvesting methods implemented?
b) Where was water collected?
- How long did it take you to reach the water point
- How much did it cost you to reach the water point

c) Who collected the water?
d) How much water was collected (in litres)?
e) What was the general quality of the water?
f) What did you know about Rain Water Harvesting before it was implemented in your local ware? -
g) How did the local ware decide to implement RWH?
h) Before the rain water harvesting, did your household suffer from water borne diseases or lack of water, ?
i) Were there any costs connected to the RWH method? If yes
- what was the cost of implementing the rain water harveting

j) Could you tell me how the maintenance of the RWH works?
k) What is the Water quality and quantity before and after ?
l) For how long have you used this RWH method?
m) How much water were you generally collecting in a day/week?

Take a picture of the RWH technology visible in the site

B. Rain Water Harvesting Household Question

1. Please rate your level of agreement with each of the following statements about your role in community rain water harvesting projects in Navakholo Sub County using the scale described :
SD = Strongly Disagree D = Disagree NO = No Opinion A = Agree SA = Strongly Agree

Statement	SD	D	NO	A	SA
We have rain water harvesting structures in our water source points					
The rain water harvesting structure is managed by women					
The rain water harvesting structure was build to support climate change					
There were environmental activities that encourage rains in our ware					
The environmental activities were spearheaded by women					
My household has a rain water harvesting structure					
The is awareness campaigns in my ware on rain harvesting technologies					

Table 13

B. Role of rural women in improved water treatment capacity in water and Sanitation projects in Navakholo Sub County:
Improved pit latrine technology promoter questions
Ventilated pit latrines
1. please answer the following questions about ventilated pit latrine technology in your ware
- Availability of ventilated pit latrine in the home stead

a) Is there an improved pit latrine technology in your ware
b) How long ago was it constructed

- Effect of the technology on the genders

a) Who were the users of the improved pit latrine
b) Is it accessible to every member of the household

- Economic implication of the technology

a) What was the cost of constructing the pit latrine
b) How much time does it take to construct the pit latrine
c) How much doe it takes to maintained the pit latrine

- Effect of the technology on climate change

a) Does this pit latrine air quality in your ware
b) How has the situation of water borne disease been in the ware adjacent to this pit latrine improve?

1. Please rate your level of agreement with each of the following statements about improved pit latrine projects in Navakholo Sub County using the scale described:
SD = Strongly Disagree D = Disagree NO = No Opinion A = Agree SA = Strongly Agree

Statement	SD	D	NO	A	SA
I have an improve pit latrine in my household					
My household has an improved pit latrine construction role was initiated by women					
Improved pit latrine is accessible to all gender					
There is a reduced bad smell production from my pit latrine					
There is reduced diseases associated with lack of pit latrine in my household					
There are awareness campaigns on improved pit latrine in my ware					

Table 14

C: Role of rural women in community spring protection projects in Navakholo Sub- County
1. please answer the following questions about spring protection technology in your ware
- Availability of protected spring technology in the home stead

c) Is there a protected spring technology in your ware?
d) How long ago was it constructed

- Effect of the technology on the genders

c) Who were the users of the protected spring?
d) Is it accessible to every member of the community?

- Economic implication of the technology

d) What was the cost of constructing the protected spring?
e) How much time does it take to construct the protected spring?
f) How much does it take to maintained the protected spring?

- Effect of the technology on climate change

c) Does this protected spring improve the quality of water in your ware?
d) How has the situation of water borne disease been in the ware adjacent to the protected spring improved?

1. Please rate your level of agreement with each of the following statements about spring protection in water and sanitation projects using the scale described:
SD = Strongly Disagree D = Disagree NO = No Opinion A = Agree SA = Strongly Agree

Statement	SD	D	NO	A	SA
The protected spring is centrally located in my village to ensure every member has water.					
We experience no water borne diseases because of the protected spring					
There is an inclusion of women in the management of the protected spring in my village					
There is throughout flow of water from the protected spring					
The cost of maintaining the protected spring is affordable for my household					
There is an awareness campaigns in my ware about importance of protected springs					

Table 15

D. Role of women in community alternative an energy use in water and sanitation projects in Navakholo Sub County's
1. please answer the following questions about alternative energy technology in your ware
- Availability of alternative energy technology in the home stead

e) Is there a climate smart energy technology in your home stead?
(1) Yes
(2) No
f) What form of energy Technology do you have?
(1) .....*(Take A picture)*
g) How long ago was it constructed

- Effect of the technology on the genders

e) Who were the users of the alternative energy
f) Is it accessible to every member of the community

- Economic implication of the technology

g) What was the cost of putting up the alternative energy
h) How much time does it take to construct the alternative energy
i) How much does it take to maintaine the alternative energy

- Effect of the technology on climate change

e) Does this alternative energy improve the quality of life in your ware
f) How has the situation of the household improved since installation of adjacent energy

1. Please rate your level of agreement with each of the following statements about role of women in community alternative energy in water and sanitation projects in Navakholo Sub County using the scale described :

Statement	SD	D	NO	A	SA
Most of my household members benefit from alternative energy					
There is an improved quality of air because of the alternative energy source					
There is reduced declimateation because of alternative enery source					
Women played a role in the commissioning of alternative energy in the homestead					
There were public alternative energy campaigns in my village					

Table 16

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	187	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION									
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Table 17: Krejcie and Morgan Formula for Determination of Sample Size

Note: 'N' is population size
'S' is sample size

Krejcie, Robert v., Morgan, Daryle W., 'Determining sample size for Research Activities', Educational and Psychological Measurement, 1970.

Item Description	Quality Required	Unit Price (Kshs)	Total Cost
Assorted pens	1 set	20.00	240.00
Duplicating Papers	10 reams	400.00	4000.00
Photocopying Project	720 pages	3.00	2160.00
Typing project	140 pages	30.00	4200.00
Printing project	140 pages	30.00	4200.00
Proposal Binding	16 copies	100.00	1600.00
Transport costs from Mumias to Kakamega (consultations)	10 trips	200	2000.00
Photocopying of questionnaires	624	3.00	1872.00
Fweres to the sublocation and back	24 trips	1000.00	24000.00
2translators	2 weeks	5000.00	10000.00
Foolscaps	4 reams	300.00	1200.00
Hard bound thesis	6 copies	700.00	4200.00
TOTAL COST			59672.00
CONTIGENCY COSTS @ 10% of TOTAL COST			5967.20
GRAND TOTAL			65639.20

Table 18: Budget
**Source of Funding: Self*

Activity/date	March 2020	April 2020	April 2020	April 2020	Apr2 020	May 2020	May 2020	May 2020	May 2020
Proposal Writing	✓	✓							
Presentation to post graduate panel			✓						
Pretesting of the instrument				✓					
Field data collection				✓					
Data analysis interpretation and thesis write up					✓				
Thesis typing proof reading and submission						✓			
publication							✓	✓	✓

Table 19: Work Plan