RENEWABLE ENERGY PROJECTS AND COMMUNITY LIVELIHOODS IN MARSABIT COUNTY: A CASE OF LAKE TURKANA WIND POWER PROJECT IN MARSABIT COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Arts in Monitoring and Evaluation in the Department of Monitoring and Evaluation;
School of Business

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DECLARATION

Student's Declaration

I affirm that this research project is my own original work. The Research Work has not been presented in any other university for academic purposes.

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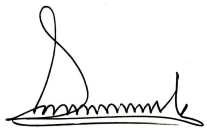
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Supervisor's Declaration

This Research was conducted under my supervision and is submitted with my approval as university supervisor.

Supervisor name: Professor Charles M. Rambo



08/06/2022

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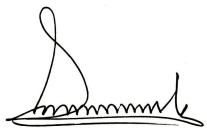
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EXAMINERS SIGNATURES

We have examined this document and the research has met or exceeded the requirement for the degree sought, in addition, the candidate has sufficiently defended the material presented to merit the awarding of the degree of Master of Arts in Monitoring and Evaluation.

Professor Charles M. Rambo, PhD

Internal/External examiner



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Internal/External examiner signature Date

Notes: (Pass, Pass with Distinction)

DEDICATION

This research project is dedicated to my mother Ntimit Lengarite, father Mejeyeon Leokoe and wife Lydia Mulah Leparsanti.

ACKNOWLEDGEMNET

I convey my appreciation to my parents; My Mother Ntimit Lenangarite and my Dad Mejeyon Leokoe. These two supported and gave me the opportunity to attend school and the means to have progressed to the level I am now. That opportunity and support are the reasons I am now progressing well in the journey towards completing my second degree. I therefore owe them all the credit for my academic achievements so far. The Monitoring and Evaluation coordinator, Dr. Wanjiru Nderitu has been instrumental in inspiring me to press on, supported me walk the research journey and helped me secure the best supervisor I could ever imagine. My supervisor Professor Charles M. Rambo's support has been phenomenal. Through him I was inspired to believe that it is possible to complete my Master's Degree in Monitoring and Evaluation.

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ABSTRACT

Kenya's quest to accelerate transition to renewable energy has led to development of the largest Wind Farm in Africa; Lake Turkana Wind Power project. Renewable energy projects (REPs) are known to contribute to sustainable development goals. REPs contribute to clean, affordable energy and slow climate change. REPs are also associated with economic, social, environmental and institutional influence to community livelihoods. Despite the full operation, its potential social, economic, environmental and institutional influences on community livelihoods were not clearly understood. Therefore, this study was inspired by the need to understand the influence of REPs on community livelihoods in Marsabit county; the case of Lake Turkana Wind Power project, Kenya. The research had four objectives; to establish how economic, social, environmental, institution and their combination influence community livelihoods. The study deployed a Cross-Sectional descriptive survey and correlation research design targeting 3,159 persons in 568 households. A simple random sampling technique generated a sample of 235 households within 30km radius of the Project site. Each village was assigned households proportionate to its population size. Semi-structured questionnaires were used. Data was analyzed and described using descriptive and inferential statistics. Linear regression analysis was applied to test the null hypothesis. A Likert scales of 1-5 was used to test the strength of responses. A pre-test conducted established a Cronbach's Alpha of 0.826 indicating a high level of internal consistency. The study had four null hypothesis specifically there is no significant relationship between economic dimension, social dimension environmental dimension, institutional and dimension and community livelihood in Marsabit County, Kenya. The findings confirm that influence of social ($p=0.001<0.05$) and environmental dimension ($p=0.003<0.05$) significantly influence community livelihoods. Economic ($p=0.489>0.05$) and institution dimensions ($p=0.508>0.05$) were not significant in influencing community livelihoods.

The findings demonstrate that social dimension had not adverse effects on local cultures however had negligible influence on job creation, income increase, business growth, failed to deliver social responsibility projects and clean energy. The social dimension was attributed to displacement without commensurate compensation, increased insecurity and conflict related to resource competition and limited unfair sharing and access to project related resources. Besides, the emergence of new settlements amid population influx, increased disease incidences and deteriorating social norms as exemplified by increased alcoholism, HIV AIDs and prostitution were established. LTWP had negligible environmental effects; negligible turbine noise, shadow flicker effects except for adverse increased incidences of road injuries and fatalities, dust and physical land damages. On the institutional aspects, the community does not support future expansion of the LTWP attributable to existing unresolved land ownership issues, lack of community involvement in land acquisition and the growing significance of land. The study concludes that the renewable energy dimension overall has a significance influence on community livelihoods however the influence of economic and institutional dimension was minimal. The social and environmental dimensions significantly contribute about 31% and 43.2% influence on community livelihoods respectively. The study recommends for a robust, need driven investment in socio-economic initiatives through robust policy and strategies for ensuring transparent and fair sharing of opportunities, managing community expectations, tackling insecurity, and mitigating environmental and social concerns. Further research on influence of wind turbines on flying birds and on individuals working and living on a daily basis in the turbine installations is proposed.

OPERATIONAL DEFINITION OF TERMS

Community livelihoods: The means by which communities, households or individuals obtain and access to essential resources for living that include but not limit to access to food, shelter, education, access to health services and employment opportunities which can potentially be directly or indirectly influenced by various investment such as renewable energy projects that may cause negative or positive change.

Dimension – A part of a whole system that contribute to community livelihoods such as social, environmental, economic and institutional aspect of community livelihoods

Social Dimension: The intentional or unintentional negative and or positive impacts of a project on communities, their cultures and their overall way of life and living. The indicators under this variable include social amenities, community displacements, settlement and in migrations, cultural Changes, water resource adequacy, conflict status and their causes.

Economic Dimension: The monetary and income aspects of the community livelihoods that can adversely or positively be affected by the presence and effects of the renewable energy projects resulting into an influence on community livelihoods. The indicators targeted include direct benefits such as jobs, business/Entrepreneurial growth, CSR Projects and implementation, economic felt effects and development/empowerment Interventions.

Environmental Dimension: As used in this context, the environmental Dimension refers to positive or negative impacts of the Lake Turkana Wind Power project to communities, their livelihoods, human health and perceptions, air, sound, water, vegetation among others.

Institutional Dimension: The overall institutional actions, strategies, systems, plans and policies that can adversely or positively affect community livelihoods, way of life and opportunities. The indicators under this variable include land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and wind Power installed capacity.

Renewable Energy – The type of energy that is generated from natural sources and or processes such as wind and sunlight (solar) and are usually continuously replenished (Shinn, 2018).

Gigawatt per hour (GWH) A measure of energy consumption equivalent to 1 Million kilowatts per hour (1 million kilowatts hours).

Watt (W) – Standard international (SI) unit of measuring energy for describing the rate of consumption of energy in an electric circuit.

Renewable energy projects – This is an individual or collaborative enterprise investing its capital on renewable energy sources with the objectives and goals of producing renewable energy for commercial purposes.

Renewable energy sources – The point of origin/supply of a given type of renewable energy such as wind energy being sourced from wind.

Food poverty – A condition on which individuals and household food consumption expenditure per month is below Kenya shillings 1,954 in rural and peri-urban areas and less than Kenya Shillings 2,551 per month for urban areas (KNBS, 2018)

Overall Poverty - A condition in which individuals and household whose adult household food consumption expenditure per month is below Kenya shillings 3,252 in rural and pre-urban areas and less than Kenya Shillings 5,995 per month for urban areas (KNBS, 2018)

Sub-County: Devolved administrative units under the County through which the county provides its services to the communities. Several such units make up the county.

Household – A person or groups of persons residing in the same homestead however not necessarily in the same house, share the same food preparation and cooking arrangement and are responsible to one household head (KPHC, 2019).

Household Head – The Male member of a household or households in case of polygamous family and is the authority and responsible for providing the needs of the household/s.

Caregiver – The person in charge of the household in place of an absent family head e.g a single mother, mother in the absence of the family head or an elderly person say grandmother or grandfather or any other responsible person in charge of a household/s.

Shadow Flicker - Rhythmic shadows cast on the ground by wind turbines plates as they spin around as a result of the force wind.

Particular Matter – A mixture of solid particles and liquid droplets found in the air such as dust, smoke, soot but others are microscopic as defined by United States Environmental protection Agency.

Metric Tonnes - A unit of measuring that is equivalent to 1,000 kilograms

tCO2eq – A measure of pollution in the atmospheric equal to one tonne (1000 kilograms) of carbon dioxide

ABBREVIATIONS/ACRONYMS

LTWP – Lake Turkana Wind Power

ToC – Theory of Change

CSR – Corporate Social Responsibility

REP – Renewable Energy Projects

RES – Renewable Energy Sources

RE – Renewable Energy

REPs – Renewable Energy Projects

GDP - Gross Domestic Product

SC - Sub-County

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This study was designed to assess influence of renewable energy projects on community livelihoods in Marsabit County: a case of Lake Turkana Wind Power project in Marsabit County, Kenya. In this study, community livelihood is the dependent variable. The community livelihoods were defined by influences related to access to food, shelter, health, education and employment opportunities since the project inception in 2014. The independent variables were the social, economic, environmental and institutional dimension of community livelihoods. Each Dimension will be characterized by social, economic, environmental and institutional influences of REPs with a focus on Lake Turkana Wind Power (LTWP) project in Marsabit County, Kenya.

1.2 Background of the study

Kenya's quest to develop renewable energy to meet the Country demand has led to investment in several renewable energy projects across the Country. In East Africa, energy demand was expected to grow by 5.3% overall and a growth of 96.4% in energy generation was required to meet demand in Kenya (REN21, 2016. Another key driver of Kenya's renewable energy development drive is need for Kenya to contribute 2030 sustainable development goals (SDGs). Kenya had a target of 2036 megawatts of wind power generation by 2030 (Kazimierczuk, 2019). This race against time to meet the SDGs and the contribute to the Country's demand, means that Kenya as a government and with partnership with the private sector have invested heavily in the development of REPs development. Lake Turkana Wind Power project is one of those investments. This like other large investments world over are expected

to come with both positive and negative influences to communities and their livelihoods.

1.2.1: Community Livelihoods

Community livelihoods is described as people's capacities, resources, money, possessions and their activities that support acquisition of basic community and household needs for living (The International Federation of the Red Cross and Red Crescent Societies, 2021).

1.2.2: Renewable Energy Project

The type of energy generated from natural sources and or processes such as wind and sunlight (solar) and are usually continuously replenished (Shinn, 2018). In this study, the focus was on Lake Turkana Wind Power project, Marsabit County and how it's various dimensions; social, economic, environmental and institutional influences community livelihoods.

1.2.2.1 Economic dimension

The monetary and income aspects of the community livelihoods that include but not limited to jobs, job opportunities, business and entrepreneurial business opportunities, development projects and other empowerment Interventions. Finding from several studies in Kenya point to both positive and negative effects of renewable energy projects (REPs). In additional to other dimensions, this study assessed the economic influence on community livelihoods associated with Lake Turkana Wind Power, Marsabit County, Kenya.

1.2.2.2: Social dimension

The social Dimension encompasses the intentional or unintentional negative and or positive impacts of a project on communities, their cultures, overall way of life and living. The indicators under this variable include social amenities, community

displacements, settlement and migrations, cultural Changes, water resource adequacy, conflict status and their causes. Studies in Kenya focusing on REPs point to various social positive and negative influences of REPs projects. These effects include conflicts, forceful displacements, culturally degradation, inappropriate resettlement, limited community support, resettlement in a culturally unsuitable land and limited community involvement. Others influences affected social fabric such as increased prostitution and alcoholism (Koissaba, 2017; Renkens, 2019).

1.2.2.3: Environmental dimension

Environmental Dimension involves the positive and negative impacts of emanating from projects and institutional interventions such as LTWP project that have the potential to affect community livelihoods. The parameters under this variable include household/work stations proximity to Turbines, levels of noise, dust and light and mitigation, attitudes to noise, dust and light, status and causes of harm, injuries and death, landscape physical changes, community project perceptions, and source and forms of energy in use and their access. Research agrees the potential of renewable energy projects to have effects on the environment; including reduced emissions of greenhouse gases that might positively influence climate change and promoted environmental health. In a social-economic impact study Geothermal power stations in Kenya, the REPs were associated with the release of hydrogen sulfide gases, toxic heavy metal wastes that polluted water and soil and the increased incidences of eye and skin ailments (Renkens, 2019).

1.2.2.4: Institutional dimension

Institutional dimension comprises of overall institutional project management mechanism including relations with the stakeholders, actions, strategies, systems, plans and policies that can adversely or positively affect community livelihoods. The

indicators under this variable included land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and wind Power installed capacity. The bad news was that Kenya's revenue sharing bill of 2019 have not been fully implemented (Renkens, 2019) therefore limiting the extent to which the REPs may positively influence community livelihoods.

1.3: Statement of the Problem

This study sought to understand the influences of Lake Turkana Wind Power (LTWP) project on community livelihoods. The LTWP is the newest renewable energy project in Kenya commissioned in 2019 and the Largest in Africa.

REP energy projects are expected to bring about positive social and economic influences to communities and their livelihoods. A Cormack and Kurewa study agrees with this assertion as he found that the changing value of the land on which LTWP project lies had generated new feelings of entitlement and raised expectations of positive impacts (Cormack and Kurewa, 2018). The communities should benefit from social benefits including improved social amenities such as water, clean energy, and schools among others. Moreover, the communities in the project areas expect to enjoy peace, have free and fair access to jobs and other opportunities. A good example was illustrated in a case study documenting the current and expected benefits of LTWP study by Cookson et al., (2017). The study established that the project aimed at increasing job opportunities, promoting local economic growth through improved infrastructure, increasing electricity and health access to local communities, overall energy price reliability, stability and reduced atmospheric pollution. Their social norms and cultures should be protected there is expectation that those should remain intact despite the project's presence. The reality is this is not always the case. Studies

in Kenya found increased conflicts, forceful displacements, culturally degradation, inappropriate resettlement, limited community support, resettlement in a culturally unsuitable land and degradation of social norms such as increased prostitution and alcoholism (Koissaba, 2017; Renkens, 2019). Despite these negative influences, there were established positive effects that include; improved job opportunities and road infrastructure (Koissaba, 2017; Renkens, 2019). Contrary to expectations of fair sharing of opportunities, a study by Cormack and Kurewa (2018), found that different local communities with historical ties and exclusive claims to the project land who seek to access opportunities from the project experience new forms of exclusion. It is clear that an ideal expectation of communities would be that their land is not privatized as has been seen in the case of LTWP project. Another reality is that communities belief they should have exclusive rights to the opportunities that arise from their land (Cormack and Kurewa, 2018). In many cases, there has been negative consequences of this project failing to meet community expectations. Cormack and Kurewa, (2018) report one such consequences as the existing disputes between communities living in LTWP project area and the project over lack of fair sharing of employment and corporate social responsibility opportunities. In fact, there is a court case still in progress in Kenya's High Court over the questionable acquisition of community land by LTWP project. By the time of conducting this study, Lake Turkana Wind power project had begun full evacuation of power to the national greed. In addition, Koissaba, (2017) reported increased erosion of local cultures among the communities living within the vicinity of REPs areas. It will be interesting to assess the communities' perception of their expectation of the project. Most studies on REP and particularly on LTWP project were done before the full

operationalization of the project; therefore, this study seeks to find out the most current realities, expectation and influences of the project on community livelihoods.

On the environmental dimension, communities expect that REP do not interfere with their environment, do not cause harm, death or injuries of any form however, this may not always be the case. A study by Ata Teneler et al, (2018), found that sleep difficulties, annoyance and shadow flicker effect were associated with wind turbines (Ata Teneler, 2018). The actual experience and consequences of these realities are varied. Annoyance by direct visibility, shadow flicker, and blinking lights was significantly associated with an increased risk for sleep disorders (Freiberg et al., 2019). Related findings from other studies by Olsen and Westergaard-kabelmann, (2018), found increased incidences of death and accidents along project access roads within LTWP project site. Renkens (2019) through his study on Geothermal Power stations in Kenya established adverse air and soil pollution leading to eye and diarrhea diseases. These consequences were not expected. This study will assess the unique influences; negative and positive of the environmental dimension of LTWP on community livelihoods. How communities living LTWP's project area respond to potential noise emissions, flicker and light reflections by turbines once turbines start operating is a grey area as identified by Schilling et,. (2018), that this study seeks to understand.

On the institutional dimension of LTWP, communities expect that there exists collaborations, community engagement, benefits sharing and land use frameworks and policies that favor community livelihoods. Moreover, the aspects of accountability in benefits sharing, adequate community representation, community engagement, management of community expectations and compensation for use of community resources and any displacement that may arise to pave way for project

implementation. Despite these expectations, research found that rural renewable energy programs were characterized by bureaucratic systems, leadership structures controlled from the top, lack devolved structures and inter-organizational collaboration. Consequently, these impediments were found to have obstructed potential work place innovations, information dissemination, skill development and sustainability of the projects (Njoh et al., 2017). In addition, contrary to several of the mentioned expectations, Schilling et al, (2018) established that communities currently living around or those who once lived in the project area now claim ownership of the project land because of the improved value of land. The claims are attributed to a new value of land associated with the project presence in the area. Conflicts between communities and the project emanate from the failure of the LTWP to meet anticipations for increased job opportunities, income as well as perceived unfair distribution of resources among communities. Communities in the project area feel they have not been compensated amid questionable land acquisition modality as evidenced by an existing court case on land ownership. Koissaba, (2017) in his study on Geothermal Energy and Indigenous Communities, examined as case study of Olkaria Geothermal Power Projects in Kenya. In this study, it was found that communities felt that there was inadequate compensation for the land acquired by Kenya Electricity Generation Company (KenGen), inappropriate land for relocation and that the social-economic livelihoods of the communities were not restored to the level equal or above their livelihoods before relocation. This is against the guidance provided in the policies on voluntary resettlement by international lenders (Koissaba, 2017). These diverging and often potentially important influences of institutional dimension strengthen the need to understand how this dimension plays out in the communities living in the project area of Africa's largest Windfarm.

Apart from the rational around the institutional, economic, social and environmental dimension, various studies conducted used varied methodologies. Some utilized secondary and grey literature as a source on information (Renkens, 2019). In Addition, Karytsas et al., (2020) highlight key challenges facing the evidence generation on renewable projects at local and regional levels. The key gaps include the limited analytical research and empirical evidence on the impacts of such projects. In addition to assessing the current realities, expectations, consequences of REPs, and the influence of their social, economic, institutional and environmental dimensions of REPs on community livelihoods, this study will aim to expand the knowledge and available evidence on the influence of REPs on community livelihoods.

1.4 Purpose of the study

The purpose of this study was to establish the extent to which Renewable Energy Projects influence Community Livelihoods in Masabit County: A Case of Lake Turkana Wind Power Project in Masabit County, Kenya.

1.5 Objectives of the study

The study was guided by the following objectives:

i) To establish how economic dimension influence community livelihoods in Marsabit County, Kenya

ii) To determine how social dimension influence community livelihoods in Marsabit County, Kenya

iii) To assess how environmental dimension influence community livelihoods in Marsabit County, Kenya

iv) To examine how institutional dimension influence community livelihoods in Marsabit County, Kenya.

v) To establish the extent to which the joint renewable energy project dimensions influence community livelihoods in Marsabit County, Kenya

1.7: Hypothesis (Null)

The study examined the following research hypotheses:

1. Ho: There is no significant relationship between economic dimension and community livelihood in Masabit County, Kenya
2. Ho: There is no significant relationship between social dimension and community livelihood in Marsabit County, Kenya
3. Ho: There is no significant relationship between environmental dimension and community livelihood in Masabit County, Kenya
4. Ho: There is no significant relationship between institutional dimension and community livelihood in Marsabit County, Kenya
5. Ho: There is no significant relationship between joint renewable energy projects dimensions and community livelihoods in Marsabit County, Kenya

1.8: Significance of the study

It is anticipated that the study findings will benefit Lake Turkana Wind power project, the communities, government and other researchers. For the case of LTWP project, it could help gauge its progress towards contributing to clean, cheap and sustainable energy to the national grid. The research will give forth to evidence based decision-making information for Lake Turkana Wind Power and stakeholders. Furthermore, the potential findings of this study may provide evidence based decision-making information for addressing potential community concerns concerning the project.

On the part of the government; both national and the county, it is hoped that the research findings may inform on its progress towards the promotion of clean and

sustainable energy solutions through partnerships. The research findings may also provide more evidence-based information concerning the projects contribution to vision 2030, sustainable development goals and its influence to community livelihoods. The study findings showed the social, economic, institutional, and environment influence on community livelihoods so far.

Research may help boost the available literature on the influence of renewable energy projects to community livelihoods in Kenya and Africa. The research was also aimed identifying and recommending that may require further research especially on the local projects as there has been limited empirical and analytical evidence of socio-economic impacts (Karytsas, Mendrinos and Karytsas, 2020).

1.9: Scope of the study

The study was conducted in Marsabit County particularly among the communities living in Loyangalani and the neighboring wards. The study was conducted in Sarima, Civicon both of Loyangalani ward (Marsabit County) and part of Ntaletiani villages straddling between Kargi ward Marsabit County and Nyiro ward of Samburu County. The study targeted the communities that will most likely have felt and or experienced the impacts of the project due to their proximity to the project site and its auxiliary ventures. The areas and communities that may be left out have similar in characteristics to the ones that will be assessed however they may be less knowledge and experienced of the project influence hence may only give less valuable information. Therefore, it is anticipated that target areas and communities may provide sufficient information to cater for the information of even those that will be outside of the study targeted area. The study will be restricted to four (4) proposed components of community livelihoods; social, economic, environmental and institutional dimensions

1.10: Delimitations of the Study

Delimitations are the boundaries deliberately introduced by the researchers to make it possible to achieve the research objectives (Theofanidis and Fountouki, 2018). The study was delimited to Sarima, Civicon both of Loyangalani ward (Marsabit County) and part of Ntaletiani villages straddling between Kargi ward Marsabit County and Nyiro ward of Samburu County. These villages are all within the 30km radius from the project site and habited by communities that will most likely have felt and or experienced the impacts of the project due to their proximity to the project site and its auxiliary ventures. The study was restricted to social, economic, environmental and institutional dimensional influences of the LTWP on community livelihoods. These boundaries are adequate to provide information on the key dimensions REP could influence livelihoods. Under Environmental dimension, the study will not measure the influences on bird population while under economic dimension; the study will not utilize economic modelling methodologies to measure income as they are beyond the scope of this study. These aspects require different methodological considerations. Therefore, this study will only assess the perceptions of communities on these aspects.

1.11: Limitations of the study

Limitations concern potential restrictions closely related to factors such as study designs, costs among other factors that are beyond the researcher's control (Theofanidis and Fountouki, 2018). It was expected that there will be unavailability of some respondents who may not be present during the study however mobilization was done after respondent identification through sampling. On the household data collection exercise, the researcher put in place proper coordination plans with local authorities and community leaders to ensure that the community and potential respondents were available and willing to participate in the research.

Good planning ensured that insecurity did not interfere with data collection exercise. There were no hostilities experienced due to good planning and consultation with the local community leaders and security agencies. The use of local guides and research assistants ensured a smooth data collection process.

Loyangalani ward is one of the most expansive in the County of Marsabit. The distance between two from one village to the furthest is over 300kms two way. This scenario would have made the study potentially expensive. The use of local research assistants and local resources however made it attainable within the resources provided by the researcher. This was also made possible by targeting communities and villages in the proximity of the project site who were more acquainted of the project and its influences to the community livelihoods providing more accurate and relevant information to the study.

The researcher utilized Research Assistants who understood local languages and context to ensure smooth communication with the respondents. The research assistants were trained on the context specific understanding of the data collection instruments, the questions and how to communicate questions to respondents.

1.12: Assumptions of the Study

Assumptions are unproven beliefs about a given research and are important for a study to take place (Simon and Goes, 2013)**.** The study assumes that the minimum required number of respondents would be available to answer the research questions. The research also assumed that it would incur unforeseen costs due to unpredictable nature of field.

1.13: Theoretical Review of Literature

To explain why a research problem needs investigation, a theory of change becomes important. Therefore, for this research, the theoretical framework is underpinned by theory of change explained below.

1.13.1: Theory of Change

The Theory of Change (ToC) anchored this research as hypothesized by Carol Weiss in 1995. The assumption of the ToC as stipulated by Weiss include the following. One can make impact with limited funds, an effective program requires the involvement of citizens, urban neighborhoods are appropriate units to focus program attention, comprehensive services will lead to success, and that social service interventions will succeed irrespective of employment conditions and services for adults confer benefits on children (Weiss, Connell, Kubisch, and Schorr, 1995). ToC emerged as a new way of analyzing interventions, generating knowledge about the efficacy of programs for promoting change and the mechanism applied to guarantee success (Weiss et al., 1995).

The relationship of the theory to the study is seen in the aspects of measuring change through periodic assessments. As already mentioned, ToC contemplates assessing whether a program intervention produce the desired results and outcomes. In addition, it clarifies what approaches it employs for it to be effective (Weiss et al., 1995). LTWP project may have the ambitions of promoting affordable and clean energy, job creation and contribute to national and global sustainable goals. Just as ToC contemplates efficiency of programs, this study anticipates to examine the efficiency of the LTWP project in achieving the major project goals. ToC through research informed actions, shapes programming with an aim of ensuring desired change is produced. In the same way, studying the project influence on community livelihoods

may help examine the extent of the project's influence if any, on community livelihoods and hence promote further actions that ensure success of the LTWP project in that aspect. In same breath, the project under study would benefit from information measuring the progress towards the achievement of its long term goals such as providing affordable and clean energy, job creation and contribute to national and global sustainable goals.

Theory of Change (ToC) also emphasizes on the process put in place to ensure mid-terms and long-term outcomes are achieved (Connell et al., 1995). The processes that are employed to realize anticipated project goals may be linked to program inputs, activities, outputs and indicators. The indicators may help to continuously monitor the progress towards the realization of the anticipated outcomes. Therefore, this study is related to this aspect of the ToC as it is anticipated that the research will examine the activities, inputs, outputs and the immediate outcomes of LTWP. The activities of the project may include CSR projects such as building access roads and schools. Inputs for the project may consist of the financial capital, machinery and personnel among others. The potential project outputs may comprise of clean energy evacuated to the national grid and employment opportunities. Potential outcomes could possibly include affordable energy and improved livelihood outcomes such as improved access to health services and employment opportunities. These aspects were evaluated in the study. In addition, just as the adherence to ToC may help the projects and stakeholders with important decision-making information, the potential findings of this research may provide concrete basis for informing the improvement of existing projects. Moreover, findings provide valuation wisdom on the best way to conceive similar future investments by governments, private investors and civil society organizations based on the lessons learnt on what works and what does not. Just as the

ToC contemplates, the findings may help the organization, government and stakeholders to determine in good time whether existing conditions are good enough to lead to the desired long term outcomes of the LTWP.

Some research already indicates that much of the available literature on the impacts of renewable energy projects was based on studies focusing on high income economies (Olsen and Westergaard-Kabelmann, 2018). Based on, the findings study should provide more literature on the influence of renewable energy investments in developing countries. Therefore, the ToC was best placed to anchor the statement of the problem, objectives, significance, methodology and findings under the study.

1.14 Conceptual Framework

A conceptual framework is a researcher's description of how a research problem would be deliberated and stipulates the relationships between the main concepts being studied (Adom, Hussein and Agyem, 2018). The conceptual Framework is illustrated the diagram below and explained in the paragraphs that follow in figure 2.1

The independent variables include social, economic, environmental and institutional dimensions of the project that can influence the community livelihoods. The independent variable was the community livelihoods. It was measured by access to food, shelter, education, health services and employment opportunities. Under the social dimension, the study assessed direct benefits, displacements, resettlements, settlements and migrations, cultural changes if any, commons form of energy, access and costs, water resource adequacy, conflict status and possible causes.

The economic influences dimension assessed aspects of direct benefits, business/entrepreneurial growth, CSR projects and implementation, economic felt effects and development and empowerment interventions. The environmental dimension examined proximity to Turbines, levels of noise, dust and light, attitudes to

noise, dust and light, status and causes of harm, injuries and death, landscape/physical changes and project perceptions/attitudes. The institutional dimension measured traits on collaborations and partnership, land ownership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and Wind Power installed capacity.

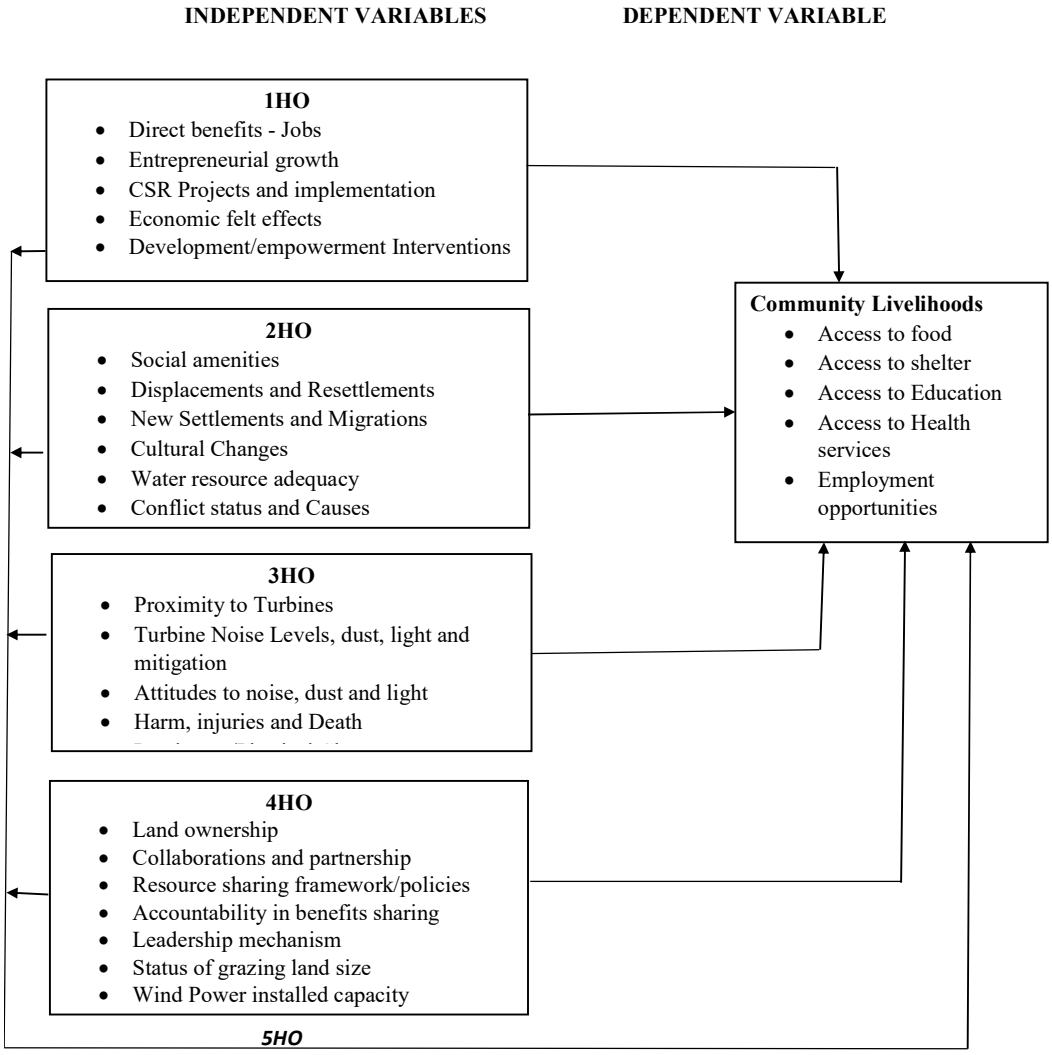


Figure 2. 1: Conceptual Framework of independent and dependent variables

CHAPTER TWO

LITERATURE REVIEW

2.1: Introduction

This chapter covers broader sub-sections that include the theoretical review and theory that anchors this study, the empirical review of literature, a summary of reviewed literature and knowledge gaps based on the reviewed literature. The empirical review focusses on literature describing the influence of renewable energy project on community livelihoods. Furthermore, empirical review also encompasses social dimension and the influence renewable energy projects on community livelihoods, economic dimension and the influence renewable energy projects on community livelihoods, environmental dimension and the influence renewable energy projects on community livelihoods and institutional dimension and the influence renewable energy projects on community livelihoods. In addition, a review of literature on renewable energy and community livelihoods is deliberated.

2.2: Empirical Review of Literature

The empirical review narrates and explains the concepts, dependent and independent variables as used in this study. Moreover, the section describes the different perspectives and findings on these variables and concepts by various studies worldwide. This section reviews the findings and relationships between community livelihoods and renewable energy projects. In addition, it also examines the relationship between community livelihoods and social dimension and the influence of renewable energy Projects on Community livelihoods, economic dimension and the influence of renewable energy projects on community livelihoods, environmental dimension and the influence of renewable energy projects on community livelihoods,

institutional dimension and the influence of renewable energy projects on community livelihoods,

2.2.1: Community livelihoods

Community livelihoods refers to people's capacities, resources, money, possessions and their activities that support acquisition of basic community and household needs for living (The International Federation of the Red Cross and Red Crescent Societies, 2021). For the purpose of this study, the community livelihoods focus on access to food, shelter, education, health services and employment opportunities related to renewable energy projects.

The role of government and development agencies may be critical in influencing the access of health services, shelter, employment opportunities, education and food. Besides the work of governments all over the world, development agencies have particularly influential to community livelihoods. Research has it that renewable energy projects (REPs) have contributed to influences seen on community livelihoods. In Kenya, despite many years of government and development agencies supported strategies to improve community livelihoods to acceptable levels, available information indicates that there is still a long way to go. Country based data showed that Marsabit County, the host of LTWP project, continued to struggle in various community livelihoods aspects. In Loyangalani Sub-county (SC), the epicenter of the LTWP project, only 1.7% and 1% households practiced maize and beans farming respectively (Kenya National Bureau of Statistics [KNBS], 2018). These were the only crops grown. Livestock remained the strongest farming activity with sheep farming practiced by at 85%, followed by goats (86%), camels (49%) and fishing (10%). (KPHC, 2019). The others were indigenous cattle and chicken in 28% and 7% of the households. Food by own production was only 13.4% with a majority

contributed from food purchases (67.3%). In fact, Food poverty incidences in Marsabit County affects more than half of the population (55.6%) (KNBS, 2018). Marsabit County had one of the highest overall poverty rates of 63.7% in the Country compared to national average of 36.1% (KNBS, 2018). The study area is often been affected by unreliable rainfall, water and pasture in arid and semi-arid Kenya (Olsen and Westergaard-Kabelmann, 2018). Therefore, given that livestock may be the largest economic activities for the local people, unfavorable climate affects the access to quality and adequate food.

The study area shared characteristics low education levels. Only 1.7% of persons aged at least 3 years acquired university education while. Another 14.6% had education (KPHC, 2019) compared to the national average among rural population of 37%. The proportion of the illiterate person in Marsabit County was 61.4% compared to a national average of 4.7% (KNBS, 2018). This may indicate an existing challenge that might have been influencing access, attitudes and or demand for education in the County.

The most common roofing materials was grass and twigs at 49%, cartons material at 19.6%, Makuti at 17% and only 10% used iron sheets. Mud or cow dung made of 25.6% and Grass/reeds was 26.2% of wall building materials (KPHC, 2019). According to a KNBS report, the type of housing in Marsabit was mostly Manyatta/traditional at 61.4% compared with the national proportion of 8.4% (KNBS, 2018). This is may indicate good access to shelter however with only limited capabilities of communities to afford quality shelters.

2.2.2: Economic dimension and Community Livelihoods

The monetary and income aspects of the community livelihoods that include but not limited to jobs, job opportunities, business and entrepreneurial business opportunities, development projects and other empowerment Interventions.

A study focusing on socio-economic Impacts of from Lake Turkana Wind Power in Kenya's Marsabit County, utilized a mix of extensive literature review, both grey and published and primary data collection methods (Olsen and Westergaard-Kabelmann, 2018). Other than published literature on REP projects, in-depth review of existing literature focused on documents and assessment reports from project, relate documents from national and local Government level such as the County Integrated Development plan and the then most Kenya Integrated Budget Household Survey. The assessment collected information from local government officials, representatives from German Agency for International Development (GiZ) as well as direct observation in the villages in the project area. A traffic survey was carried out along the major road going through the project to measure the traffic flow (Olsen and Westergaard-Kabelmann, 2018). A key aspect of investigating was influences on rural economy, transport and energy supply and cost. The key findings included a reduction in the cost of transportation to between 16-37% after the completion of the major access road going through the project site (Olsen and Westergaard-Kabelmann, 2018). A result of the project there was a 20-30% decline in prices of some foods in the local markets and a notable growth in the fresh fish market as evidenced by about three times profit increase. The study estimates about 1,800-1,900 local jobs during construction and about 320- 350 jobs during operation period. Based on Feasibility assessment studies, the study estimates that LTWP has the potential to lower power outages in Kenya by whooping 12.5% and contribute USD 176 million in GDP and

54,000 jobs at a national level. One key limitation of the study was, the study did not seek the views of the communities directly and indirectly influenced by the project area (Olsen and Westergaard-Kabelmann, 2018). Although this study will not assess the project contribution to GDP and power resilience, the study will focus on assessing communities' perception on the economic impacts reported. In my opinion, this assessment was conducted before the operationalization of the project specifically the evacuation of power to the national grid therefore the full scope of most recent impacts would not have been surfaced by this study. This study will assess the project impacts post construction period and aim to gather information directly from communities influenced by the project. Contrary to this, past studies suggest otherwise. May and Nilsen (2015) in their longitudinal study conducted in Germany, reported that there was no significant economic impact of the wind power projects on local economies and have no impact on GDP per capita. The type of methodologies used and the fact that the studies were conducted in different contexts; developing and developed countries may have contributed to the differences.

A Pakistan based case study by Li, Xu, Hui, Cai, and Zhang (2022) evaluated the contributions of renewable energy initiatives on local economy and employment. The analysis revealed renewable power projects generated a combined 8,905 jobs and about USD 39.8 million production values in related sectors. Wind power plants will create more jobs and increase more production values than solar power plants (Li et al., 2022). The study utilizes a case study approach similar to the current study however the current study is carried out in a different context and generates information from the communities were directly influenced by the project's economic impacts.

Another study by Ongoma (2017) analyzed the social, economic environmental dimension of the Wind Power projects as viable renewable energy sources in Kenya, a case study of Ngong Wind Farm in Kenya. The study targeting a sample size of 100 respondents drawn from the public (52%), power producers (30%) and suppliers (18%) informed by a desk review mapping. The study finds that the Ngong Farm Project improved local economy through the provision of job opportunities. Apart from direct jobs at the site, jobs and economic opportunities created through power fed into the main grid for national consumption could not be verified. Road construction contributed to opening up of the area through construction of roads leading to improved accessibility (Ongoma, 2017). The study was conducted in urban populations that may not reflect similar benefits to the ones seen in LTWP located in a rural set up and different communities. Their perceptions and needs may be different from urban populations whose source of livelihoods may be vary. To reinforce this economic role of REP, a study by Hatlelid and Aass (2016) in Rwanda demonstrated that REPs improve people's well-being and reduce poverty at the community level. Moreover Shoaib and Ariaratnam (2016) who conducted a study on the socio-economic impacts of REPs on a community in Afghanistan, the study found a moderate economic impact of REPs as anchored by moderate business growth and job creation. The current study will be conducted in a rural set up whose communities depend on natural resources include land for the livelihoods hence the likelihood of varying results.

2.2.3 Social Dimension and Community Livelihoods

The social dimension encompasses the intentional or unintentional negative and or positive impacts of a project on communities, their cultures, overall way of life and living. The indicators under this variable include social amenities, community

displacements, settlement and migrations, cultural Changes, water resource adequacy, conflict status and their causes.

Cormack and Kurewa, (2018)in their study titled "The changing value of land in Northern Kenya: the case of Lake Turkana Wind Power" collected data from Twenty-eight key informant interviews were carried out in Loiyangalani, South Horr, Sarima and Marsabit Town. The target interviewees were selected as they had varied opinions, perceptions and relationships with the project. The interviewees comprised of members of local community-based organizations (CBOs), religious leaders, elders, business people, persons who had participated in LTWP and community meetings, persons resettled by LTWP, unemployed youth, LTWP workers, local administration and Marsabit County government. The County Government representation included plaintiffs in a court case lodged by the community representatives against LTWP LTD. Data collection also included review of literature concerning the historical background of the project sites in light of different communities' claims of ownership, official project information on environmental and social impact assessments, relocation plans and indigenous people policy frameworks. Prior to this study, there were two divergent views on LTWP project. One that claims that the project is supported by the local communities, has brought development and stability to marginalized region and community by Cookson, Kuna, and Golla, (2017) and another by critics of the project who claim that the project did not seek consent from the communities and compensate the displaced (Voller et al. 2016). Cormack and Kurewa, (2018) aimed at finding out where two divergent opinions converge. The study found three key insights; the project has refreshed existing historical and cultural connections of the communities to the project land who feel that they should benefit from the project land. Secondly, the study finds that the value of the project

land goes beyond its physical nature and potential for utilization but also the resources and opportunities emanating from it. Thirdly, local communities feel new forms of exclusion in accessing benefits from a resource they consider their own. The study focused on new perceptions concerning project land resulting from the presence of LTWP. These include increased claims to land ownership by communities, increased value of land due to the presence of the LTWP and marginalization from benefits and opportunities. In my opinion, Cormac and Kurewa were narrow in their approach as they focused on parameters around the preceding insights leaving out environmental, institution and economic influences of the project on community livelihoods. Different from these, the current study will delve deeper into the felt social dimensional effects of LTWP on community livelihoods by focusing on social amenities, displacement, resettlements, emergence of new settlements and migrations, cultural changes, water resource adequacy as well as trends in conflict and its attribution LTWP's presence. The study will take a holistic approach by assessing not just social dimension effects but also economic, institutional and environmental dimensional ones on community livelihoods. Unlike Cormac and Kurewa, (2018), this study will interview a wider audience beyond those who are directly involved or affected by the project to assess spillover influences.

A Renkens' (2019) case study on Kenya's LTWP and Olkaria Geothermal power plants sought to assess whether there were improvements on the social, economic and cultural impacts on indigenous people compared to findings from previous studies conducted by 2015. Renkens utilized qualitative methods; literature reviews using snowballing methods, review of newspaper reports and semi-structured interviews with representatives of organizations working in the indigenous aspects with knowledge of the two REPs (2019). The key limitations of these study include; there

was no visit and direct data collection from the project sites and communities directly influenced by the project. Moreover, Semi-structured questionnaires followed an interview guide with probing questions where necessary hence, more one directional in that interviewees were allowed to express what they perceived as important.

Renkens established dwindling job opportunities as low skilled labor was scaled down towards the project completion with the few high skilled jobs going to persons from outside the local communities. Despite the presence of the project, conflicts in the project area persisted. In circumstances where consent was sought, REPs only involved a few community members lock out involvement of a majority of community members (Renkens, 2019). The REPs had effects on the community social fabric as findings indicated increased incidences of substance abuse, alcoholism, sexually transmitted diseases, prostitution (Renkens, 2019). Another impact was increased in migration that consequently led to a high population growth and poor sanitation in resettlement sites (Renkens, 2019). Anecdotal accounts by Olsen and Westergaard-kabelmann, (2018), suggest that a change of dress code to a more modern one within LTWP project area. Koissaba, (2017) also reported increased erosion of local cultures. According to Renkens, the major benefits of REPs to the community were building of access roads, markets and schools. In my opinion, despite the improved road network during the project construction period, it is only a matter of time before the road gets dilapidated as the Government of Kenya has a poor history of maintaining roads. The direct attribution of conflicts to the project, the level of conflicts at the time of the study and whether conflicts have increased since project inception was not assessed. The varying findings imply that impacts on security and cohesion may differ from one region to another, communities, way of life and settings. It might be interesting to assess for more insight into these social aspects

unique to LTWP project and communities. Finally, the studies did not assess direct linkage of conflict to the REPs projects. Although key aspects of the social influences have been investigated here, the findings were based on information available before the completion of construction phase. This study will assess the aspects post construction where job opportunities could have dwindled and give more insight into this aspect. The focus will be on social amenities, displacements and resettlements, new settlements and migrations, cultural changes, water resource adequacy, conflict status and causes, new settlements & migrations, cultural changes, social amenities including water resource adequacy and conflict status and causes.

Schilling, Locham and Scheffran (2018) evaluated a local to global perspective on oil and wind exploitation, resource governance and conflict in Northern Kenya. The data was collected through qualitative methods approach based on individual interviews, small group interviews and observations targeting 463 research participants consisting of 68 small group interviews, 38 individual interviews and 47 expert interviews (Schilling et al., 2018). In my opinion, the use of Group interviews may limit the honesty and accuracy of information retrieved, as some persons may fear providing certain information in public. Additionally, the qualitative methods may limit the accuracy of the information collected. The current study will utilize individual interviews and a mix of qualitative and quantitative methodology.

In the short to medium term, the local communities in both Oil and Wind power cases benefit from an improved water situation and improved business opportunities (Schilling et al., 2018). A key finding of the study was that failure to manage expectations for long-term employment and the perception of biased distribution of jobs was a key source of conflicts between local communities and representatives of the oil and wind Projects. The study findings identify employment as a key benefit for

the communities and a source of conflict and explain how pressure from different actors; local and international and Resource governance influence conflicts and economic benefits. The further finds a loss of jobs at the end of the construction phase that may have psychological effect the individuals who depended on the manual jobs (Schilling et al., 2018). Moreover, there was a perceived lack of appropriate compensation for land used by the wind and oil companies and a plan to benefit communities in LTWP area in particularly with access to energy. There were few reported cases of increased prostitution, HIV AIDs and alcoholism. Other benefits of the projects included delivery of social responsibility projects including school, Road and Health infrastructure (Schilling et al., 2018). The findings were based on the assessment done before the end of construction phase and beginning of the evacuation of power to the national grid. The study will provide findings at full operationalization of the LTWP hence providing an opportunity a more accurate and up to date influence of the LTPW on community livelihoods.

2.2.4: Environmental dimension and Community Livelihoods

Environmental dimension involves the positive and negative influences emanating from renewable energy projects including LTWP project that have the potential to affect community livelihoods. The indicators under this variable include household/work stations proximity to Turbines, levels of noise, dust and light and mitigation, attitudes to noise, dust and light, status and Causes of Harm, injuries and Death, landscape/Physical Changes, community project perceptions, and source and forms of energy in use and their access.

A study by Ata Teneler, A. (2018) on the Health Effects of Wind Turbines, reviewed articles published from 2008 to 2018, revealed relationship between the Wind Turbines and health effects. The 19 articles reviewed excluded studies that were

designed as reviews, case studies and guidelines as they were not appropriate. The findings were reviewed full text and thematically analyzed with a focus on turbine noise, annoyance, perception and attitudes, general health complaints, sleep disorders, and shadow flicker effect. In four of the nine studies focusing on noise annoyance, the findings show no significant association between noise annoyance and the turbine sound. The manifestation of the influences emanating from Wind turbines depends on the amount and the distance from the wind turbines. Moreover, individual factors including perceptions and attitudes towards wind power affect experiences and influence of the Turbine sound. The findings suggest the need to cater for social concerns of communities throughout the project life cycle. More specifically, the studies established that sleep difficulties, annoyance and shadow flicker effect were associated with wind turbines (Ata Teneler A., 2018). The studies approach was reviewing past studies from 2008 to 2018 and information analyzed thematically. The methodology utilized risks missing out on most current information on environmental effects in general and specifically those relevant to the context of LTWP project and communities. Specifically, it will assess the levels of proximity to Turbines, existing levels of noise, shadow and light flicker effects and its mitigation mechanism. Largely missing in reviewed studies, the study will assess on dust from the construction work and roads, hard levels, status & its causes, injuries and resultant deaths associated with LTWP project. Moreover, the study will assess on landscape/physical Changes, project perceptions, energy access, use, access and costs.

A study by Pawlaczyk-Łuszczyńska et al. (2018) assessed the perception and annoyance of noise from wind turbines in populated areas of Poland. Using a questionnaire, the study collected data from 517 persons aged 18 to 88 and residing between 204 – 1726 metres from the nearest wind turbine. The perception of high

annoyance was associated with the distance from the nearest wind turbine, general attitude to wind farms, noise sensitivity and terrain shape (annoyance outdoors) or road-traffic intensity (annoyance indoors). It was estimated that at the distance of 1000 m the wind turbine noise might be perceived as highly annoying outdoors by 43% and 2% of people with negative and positive attitude towards wind turbines, respectively. There was no significant association between distance and various health and well-being aspects. This reviewed study focusses on environmental impacts of Wind turbines however; the current study is more comprehensive as it assess economic, social and institutional factors. The study also a country wide study while the current study will narrow down to Lake Turkana Wind Power Project site and immediate communities.

A systemic review study by Freiberg et al., (2019) assessing the influence of wind turbine visibility on the health of local residents. Two independent researchers, reviewed relevant study abstract and full texts, extracted data, and critically appraised the methodology of included studies and analyzed the studies qualitatively and quantitatively. Based on 17 studies, prevalence of high annoyance due to altered views and shadow flicker of two cohort studies and 15 cross-sectional ones was 6% for each group. Annoyance by direct visibility, shadow flicker, and blinking lights was significantly associated with an increased risk for sleep disorders. The study is based on a review of past studies and therefore may not provide context specific and current environmental effects expected in a project like LTWP located in a pastoral community livelihood zone and developing country. More research such as the current study is need to confirm or not the findings to the reviewed studies. Related findings from other studies by Olsen and Westergaard-kabelmann, (2018), found increased

incidences of death and accidents along project access roads within LTWP project site.

2.2.5: Institutional dimension and Community Livelihoods

The overall institutional actions, strategies, systems, plans and policies that can affect community livelihoods, way of life and opportunities. The indicators under this variable include land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and wind Power installed capacity.

This section borrows heavily from a Cameroonian study that assessed the implication of governance structures for renewable energy policy implementation. The study employed literature review, observations, and direct interviews with stakeholders using qualitative data collections tools (Njoh et al., 2019). The research found that rural renewable energy programs were characterized by bureaucratic systems, leadership structures controlled from the top, lack devolved structures and finally lacked inter-organizational collaboration. The said impediments were found to have obstructed potential work place innovations, information dissemination, skill development and sustainability of the projects (Njoh et al., 2017). This study did not collect data from communities directly influenced by Project impacts potentially missing on felt influences reported by communities. The study focusses on policy impediments to success of the project however the proposed study will go beyond policy issues to assess on the institution challenges that may be have impacts on the community livelihoods. These include assessment of land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and Wind power installed capacity that were not assessed by this study. Indeed the study focused on stakeholder

and inter-agency partnership through the lens of inter-organizational learning and information sharing. The current study will assess collaborations and partnership in the lens of the partnership LTWP promotes with the aim of influencing institutional dimension of community livelihoods.

Schilling et al., (2018) conducted a study seeking to understand a local to global viewpoint of oil and wind exploitation, resource governance and conflict in Northern Kenya. The study deployed a qualitative methodology targeting individual interviews, small group interviews and observations. A total 463 participants were interviewed consisting of 68 small group interviews, 38 individual interviews and 47 expert interviews. The majority of interviews both group and individual were community members of both gender including youth and local administrators even distributed among villages. Key informant interviews with local administration; chiefs, political leaders, peace committee members, teachers and Project representatives, NGOs in the project area. At least two researchers, note takers and translators, conducted the interviewees. To enhance objectivity, once developed, the two set of notes were then triangulated and compiled. The research finds various communities currently living around or those who once lived in the area claim ownership of the project land. The claims are related to new value of land associated with the project presence in the area. Conflicts between communities and the project emanate from the failure of the LTWP to meet anticipations for increased job opportunity, income as well as perceived unfair distribution of resources among communities. Communities in the project area feel they have not been compensated amid questionable land acquisition modality as evidenced by a court case on land ownership. The Study observed continued access to project area by communities. The current study, will utilize both qualitative and quantitative methodology unlike the study under review that only

utilized qualitative one. The approach potentially makes the study less scientific, objective and therefore acceptable. The study utilized local research assistants who do not speak local language. The use of translator potentially risks causing loss of important information and limiting nuanced understanding of facts through translation and bias by local translators. The study targeted 68 small groups and 38 individual for interviews however the group set up may inhibit fear speaking in a group set up. The current study will target direct individual interviews targeting households that is likely to provide a free atmosphere to provide more information and data. Moreover, this study does not delve into community engagement in land acquisition and ownership issues, presence and level of cooperation between LTWP and other actors on development partnerships, co-created resource sharing framework/policies, accountability in benefits sharing, community representation's leadership mechanism, status of grazing land size and Wind Power installed capacity hence this study will focus on more.

A Study by Koissaba, (2017) Geothermal Energy and Indigenous Communities, examined as case study of Olkaria Geothermal Power Projects in Kenya. The study assessed institutional dimension specifically the level at which human rights goals and gender equality have been intervened through climate change investments by European Union in Kenya. The study aimed to provide recommendations on how the EU policies can be realized through Sustainable Development Goals and how stakeholders including Civil Society organization can be involved. The study used both literature review and 82 direct interviews with communities members living around the project area, 16 key informant interviews with representatives of Kenya Electricity Generating Company, Geothermal Development Company, Akiira Geothermal limited, McGill University, Kenya Land Commission, local County

Governments and civil society organization representative; Pastoralist Development Network of Kenya. Among the findings touching on institutional dimension, communities felt that there was inadequate compensation for the land acquired by KenGen, inappropriate land for relocation characterized by soil unfit for agriculture, steepness and frequent landslides. The social-economic livelihoods were not restored to the level equal or above their livelihoods before relocation against the guidance provided in the policies on voluntary resettlement by international lenders. In addition, there was no assessment of land use and quality as land was simply exchanged for another land. In addition, the land chosen by the project was culturally inappropriate for the local communities to use. This was attributed to the project's failure to assess whether the resettlement was appropriate for use compared to the communities' way of life and needs. Moreover, according to Koissaba, there were numerous incidences of family separation, inadequate housing upon resettlement and lack of consideration for the vulnerable. The situation was exacerbated by lack of consultation between the community and the project (Koisaba, 2017). The study was conducted in the context of agricultural communities, a different context compared to LTWP's pastoral and mobile communities. The current study will explore land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and wind power installed capacity particularly for LTWP power communities.

2.2.6: Renewable energy projects and Community Livelihoods

Reviews of studies on impacts of renewable energy sources shows that studies have either focused on one or more types of RES. The data available is therefore scattered as such. Kumar (2020) in Pakistan conducted one such research. Kumar used case study approach evaluate social, economic, environmental and socio-political

influences of the three REPs. He utilized quantitative and qualitative methods of data collection and surveying the communities. The REPs benefited communities through use of local labor, moderate employment, community shareholding opportunities and extended electric energy to local businesses.

Kumar's study published in early 2020, found that REPs in Pakistan contributed to a cheaper power. Kumar added that this was attributed to utilization of the different renewable energy sources (RES). These initiatives were likely to contribute to improvement of community livelihoods especially business that utilized electricity to run and through improved personal income from REPs' based employment. Kumar (2020), found that REPs increased employment opportunities, jobs, affordable and better health. These findings point to positive impacts of RES on community livelihoods. It was not however clear how improved health aspects came about.

My understanding of this research it is based on projects whose overall goal was to improve the community livelihoods through renewable energy benefits contrary to other large scale projects whose goals include contributing to national and global goals such as climate change mitigation, access to energy and SDGs. The findings however indicate the small-scale REPs' contributions to employment and access to affordable electricity.

2.3: Summary of Literature

Research by Renkens, (2019) and Kumar, (2020) points to REPs' role in promoting improved living standards and quality of life of the communities. Cumulatively trade, education, health, transport and communication services were found to have been positively influenced by said REPs. The mentioned four studies were linked to the role of REPs in improving and or building access roads, accessible schools and Market centres and communication structures.

On the social dimension, research shows that some communities had realized better access to water, food, greater job opportunities, improved infrastructure, basic education facilities and better trade (Renkens, 2019). Negating this positive impacts were displacements of original landowners without adequate consent and community involvement, inadequate compensation and culturally inappropriate resettlement (Koissaba, 2017; Renkens, 2019). Others were erosion of culture, increased prostitution, alcoholism and resource related conflicts (Renkens, 2019). Cormack and Kurewa, (2018) found the feeling of unfair distribution and exclusion from employment, corporate social responsibility projects benefits and parallel claims for ownership of land was a sticking point. Further, according to Schilling et al. (2018), LTWP has resulted to improved water availability, short-term employment, better road infrastructure and improved business. Conflict and tension resulted from unmet community expectations on employment and land compensation. This study however highlights the difficulty in foreseeing how communities respond to potential noise emissions, turbine flicker and light reflections effects. The need for rural electrification authority, Kenya Power and lightning Company in partnership with LTWP to provide local communities with energy (Schilling et al., 2018). No study so far assessed whether there is any turbine shadow flicker, light effects and accidents emanating from the turbine installation for the Lake Turkana Wind power project. This study assessed this aspect for the LTWP project.

The studies in Kenya do not conclude significant economic effect REPs. They however suggest some positive impacts associated with increased job opportunities, improved access to markets and business growth (Renkens, 2019).

The REPs have limited adverse environmental impacts especially in the short run with mitigating mechanism (Kumar 2020). Long periods some REPs' operations have been

shown to come with adverse influences on the environment and health. One such study in Kenya reported increased soil erosion, water pollution, release of poisonous gases and amplified incidences of skin and eye disease in Geothermal power stations (Renkens, 2019). In addition, wind power turbines were linked health effects such as noise, sound annoyance and the noise was linked to sleep difficulties as reported (Ata Teneler, 2018).

Effective Institutional structures may go a long way into promoting delivery of project objectives, goals, inputs and achievement of direct and indirect impacts. Research has flagged out REPs' system challenges such as bureaucracy, top-down leadership structures, inhibited collaboration and poor stakeholder involvement (Njoh et al., 2019). A number of REPs' strategies and policies may not favor realization of optimal project impacts. These included involuntary land take over, lack of community involvement, displacements and inappropriate compensation (Renkens, 2019). The review of the studies showed utilization of different methodologies and data collection methods. This may mean that the various studies had methodological limitation and applicability levels unique to different settings.

2.4: Knowledge Gaps

A summary of research gaps are stipulated in the matrix below;

Table 2 1: Knowledge Gaps

Variable: Economic Dimension			
Author (Year)	Title of studies	Key Findings	Knowledge Gaps
Olsen, M. D., & Westergaard-Kabelmann, T. (2018, June)	Socio-economic study of key impacts from Lake Turkana Wind Power (LTWP)	The key findings included a reduction in the cost of transportation to between 16-37% after the completion of the major access road going through the project site (Olsen & Westergaard-Kabelmann, 2018). A result of the project there was a 20-30% decline in prices of some foods in the local markets and a notable growth in the fresh fish market as evidenced by about three times profit increase. The study estimates about 1,800-1,900 local jobs during construction and about 320-350 jobs during operation period	The study lacks information and data on potential project impacts from communities directly influenced by the project as its methodology did not target the communities in the project area. The study focused on government representatives and workers of LTWP. Moreover, the study was conducted before the full operationalization of the project hence lacks potential impacts post project construction period. The study focusses on rural economy, transport and energy supply and cost aspects of the economic dimension. This study will delve into community perceptions post construction period on direct jobs and income changes, business growth, CSR Projects and implementation, economic felt effects and any development initiatives.
Li, R., Xu, L., Hui, J.,	China's investments	The analysis revealed renewable power projects	This study was conducted in a developed country therefore

Cai, W., & Zhang, S. (2022)	in renewable energy through the belt and road initiative stimulated local economy and employment: A case study of Pakistan	generated a combined 8,905 jobs and about USD 39.8 million production values in related sectors.	the findings may not be similar to what will be generated from LTWP project's influence assessment. The assessment was limited to employment related economic opportunities only. The current study will assess on entrepreneurship, CSR Projects & implementation and general development
Ongoma, V. (2017)	Socio-economic and environmental analysis of wind power projects as viable renewable energy resources in Kenya.	Ngong Farm Project improved local economy through the provision of job opportunities. Road construction contributed to opening up of the area through construction of roads leading to improved accessibility.	The study targeted Power producers, Supplies and Public (52%). The current study will have 100% of respondents coming from communities directly affected by the LTWP. The Ngong study was carried out in an urban set up. As a result the economic influence findings may differ from the communities influenced by LTWP; who depend on the natural resources; land and environment for the success of their pastoral livelihoods.
Variable: Social Dimension			
Cormack & Kurewa, (2018)	The changing value of land in Northern Kenya: the case of Lake Turkana	The study found three key insights; the project has refreshed existing historical and cultural connections of the communities to the project land who feel that	The study does not assess felt social dimensional effects of LTWP on community livelihoods; social amenities, displacement, resettlements, emergence of new settlements

	Wind Power	they should benefit from it. The study also finds that the value of the project land goes beyond its physical nature and potential for utilization and extends the resources and opportunities emanating from it. Thirdly, local communities feel new forms of exclusion in accessing benefits from a resource they consider their own.	and migrations, cultural changes, water resource adequacy as well as trends in conflict and its attribution LTWP's presence. The methodology was limited to a small target of 28 key informant interviews on those who actually experienced the impacts of LTWP or have knowledge of the project including the LTWP employees, the displaced communities, local leaders and County representatives within the County of Marsabit. The study also targeted household heads and caregivers who are likely to have felt actual as well as spillovers effects of LTWP within a 30-kilometer radius of the project site.
Renkens (2019)	The Impact of Renewable Energy Projects on Indigenous Communities in Kenya, the cases of the Lake Turkana	The Sarima; a village in the project area, was resettled without free, prior and informed consent as well as commensurate compensation and Social amenities. The study also established dwindling job opportunities as the need for none skilled phased out towards the project	The study potentially missed first-hand information from persons directly or indirectly influenced by the project. This was because the data collection methodologies used desk reviews of published and grey literature and interviewed third party respondents. The study failed to establish whether conflict increased

	Wind Power project and the Olkaria Geothermal Power plants	completion.	since the project inception and attribution of conflicts to the project. The study did not access whether the LTWP project led to increased income among local communities. The study did not assess whether there are other villages other than the Sarima Village, that was due to in migration and relocation by the project. Further, the study did not assess the status of Social amenities, the extent of displacements and resettlements beyond Sarima Village, emerging settlements, migration, cultural effects and water resource adequacy in the new settlements.
Schilling et al. (2018)	A local to global perspective on oil and wind exploitation, resource governance and conflict in Northern Kenya	Social benefits included water, short-term employment, road and school infrastructure and improved business. Conflict and tension resulted from unmet community expectations on employment and land compensation	The use of Group interviews may limit the honesty and accuracy of information retrieved, as some persons may fear providing certain information in public. Additionally, the qualitative methods may limit the accuracy of the information collected. The current study will utilize individual interviews and a mix of qualitative and quantitative

			methodology.
Variable: Environmental dimension			
Ata Teneler, A. (2018)	Health Effects of Wind Turbines: A Review of the Articles Published Between 2008-2018. European Journal of Public Health, 28(suppl_4).	The manifestation of the influences of wind turbines depends on the amount and the distance from the wind turbines. The studies established that shadow sleep difficulties, annoyance and shadow flicker effect were associated with wind turbines	The studies approach was reviewing past studies from 2008 to 2018 and information analyzed thematically. This methodology may miss out on most current information on environmental effects in the context of LTWP project. Specifically, it will focus on proximity to Turbines, existing levels of noise, shadow and light flicker effects and its mitigation mechanism. Largely missing in reviewed studies, the study will assess on dust from the construction work and roads, hard levels, status & its causes, injuries and resultant deaths associated with LTWP project. Moreover, the study will assess on landscape/physical changes, project perceptions, energy access, use and costs
Pawlaczyk-Łuszczyńska et al. (2018)	Response to Noise Emitted by Wind Farms in People	It was estimated that at the distance of 1000m the wind turbine noise might be perceived as highly annoying outdoors by 43%	Although this study assesses factors around turbine noise and related attitudes and perceptions, it does not assess other environmental factors

	Living in Nearby Areas	and 2% of people with negative and positive attitude towards wind turbines, respectively. There was no significant association between distance and various health and well-being aspects.	including dust, shadow flicker, potential Harm, injuries and death. Moreover, other physical factors such as physical landscape changes, overall project perceptions as well as prevalent energy forms, their use, access and costs.
Freiberg et al., (2019)	The influence of wind turbine visibility on the health of local residents	Based on 17 studies, prevalence of high annoyance due to changed landscape scenes and shadow flicker of was 6%. Annoyance by direct visibility, shadow flicker, and blinking lights was significantly associated with an increased risk for sleep disorders.	The study is based on reviews of past studies and therefore may not provide context specific and current environmental effects expected of LTWP. Moreover, although this study assesses factors around shadow flicker, turbine noise and physical landscape changes, it does not assess other environmental factors including dust, potential Harm, injuries and death. Moreover, other factors such as overall project perceptions as well as prevalent energy forms, their use, access and costs.
Variable: Institutional Dimension			
Njoh et al (2019)	Implications of institutional frameworks for renewable	The study revealed preference for top-down leadership structures, limited devolved structures and absence of for inter-organizational interaction,	This study did not collect data from communities directly influenced by Project impacts potentially missing on felt influences reported by communities.

	energy policy administration: Case study of the Esaghem, Cameroon. Community PV solar electrification project. Energy Policy		The study focusses on policy impediments to success of the project however the proposed study will go beyond policy issues to assess on the institution challenges that may be have impacts on the community livelihoods. These include assessment of land ownership, collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, leadership mechanism, status of grazing land size and Wind power installed capacity that were not assessed by this study.
Schilling, J., Locham, R., & Scheffran, J. (2018).	A local to global perspective on oil and wind exploitation, resource governance and conflict in Northern Kenya. Conflict, Security & Development	The research finds various communities currently living, living around or those who once lived in the area claim ownership of the project land. The claims are related to new value of land associated with the project presence in the area. Conflicts between communities and the project emanate from the failure of the LTWP to meet anticipations for increased job opportunity, income as	The current study, will utilize both qualitative and quantitative methodology unlike the study under review that only utilized qualitative one. The approach potentially makes the study less scientific, objective and compromises on acceptability. The study utilized translators who speak the local languages potentially risking loss of important information through translation and bias by local translators. The study targeted 68 small

		well as perceived unfair distribution among communities. Communities in the project area feel they have not been compensated amid questionable land acquisition modality as evidenced by a court case on land ownership. The Study observed continued access to project area by communities	group and 38 individual individuals. The current study will target households within the 30-kilometer radius of the project site and allocates the sample proportional to population size of each village sampled. This is likely to gather more and accurate information including information one may fear speaking in a group set up. This study does not delve into community engagement in land acquisition and ownership issues, presence and level of cooperation between LTWP and other actors on development partnerships, Project-community co-creation of resource sharing framework/policies, accountability in benefits sharing, community representation's leadership mechanism, status of grazing land size and Wind Power installed capacity.
Koissaba, (2017)	Geothermal Energy and Indigenous Communities : The Olkaria	The social-economic livelihoods were not restored to the level equal or above their former livelihoods prior to	The study did not collect data from communities directly influenced by project; LTWP project. Moreover, the study did not assess land ownership

	Projects in Kenya	relocation. Further, the study established a lack of community involvement on matters even affecting their own livelihoods and inadequate compensation for the land acquired by KenGen. Moreover, there was inappropriate land for relocation attributable to lack of assessment of land use and quality leading. In addition, the land chosen by the project was culturally inappropriate for the local communities to use.	in the context of pastoral communities. Furthermore, the study did assess aspects of collaborations and partnership, resource sharing framework/policies, accountability in benefits sharing, perception of local representatives and project leadership mechanism, status of grazing land size and wind power installed capacity particularly for LTWP power communities. The study utilized both literature review and direct interviews both communities, institution, organization and researchers. The current study will invest in direct interviews, target more communities and deploy both qualitative and quantitative approaches.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1: Introduction

This chapter describes the methodology that was used to carry out the study. This included the research design, research site, target population, study sample, sampling procedure, research instruments data collection procedures, data analysis techniques and ethical considerations made during study.

3.2: Research Design

The study utilized descriptive cross-sectional survey and correlational research design. The descriptive survey was used to analyze quantitative data while correlation design was used to test hypotheses. The descriptive design allows a researcher to describe the distribution of one or more variables at one particular time (Aggarwal and Ranganathan, 2019). The design has the ability to provide information on the current status of a given study phenomena, can help establish relationships between variables, less time consuming as data can be collected in one encounter and hence less expensive compared to other designs. In addition, descriptive survey design allows a predetermination of research objectives and questions. This may make it easier for a researcher to guide data collection to ensure that they are relevant and adequate to meet the research needs (Kothari, 2004). The study will use the analytical cross-sectional descriptive survey designs. The descriptive cross-sectional design allows room for a study to assess presence or level of the variable being assessed such as the characteristics, level of exposure or outcome in the target population at one specific time (Aggarwal and Ranganathan, 2019). Moreover, it can also help a researcher study relationship between presence of an exposure and that of an outcome. Therefore, the use of descriptive cross-sectional design was appropriate for

assessing the status of the economic, social, environmental and institutional dimension as a result of renewable energy projects at the time of the study. The study deployed both quantitative and qualitative data collection methods namely key informant questionnaires/interview guides and semi-structured questionnaires.

3.3: Research Site

The study was conducted within Lake Turkana wind power (LTWP) project site and communities within the project proximity of up to 30km radius from the Centre of the project site. This covered three (3) villages with one village being located within the project site and the other two (2) within the 30km radius.

3.4: Target Population

Target population refers to the proportion of the general population in the study area who are legible to participate in the study as they meet the needs of research goals (Asiamah Mensah and Oteng-Abayie, (2017). The study targeted 259 household heads or caregivers and four (4) key informants as calculated in section 3.5.1. The study also utilized document analysis for further insightful information and data relevant to research needs wherever available. The general estimated population in the study is tabulated in Table 3.1.

Table 3. 1: General Population (KNBS 2019 Census and Local Administration)

Cluster/Village/Target Name	**Estimated general population**	**No of Households**
Civicon	504	112
Sarima	1,355	301
Ntaletiani	698	155
Totals	**2,557**	**568**

3.5: Sample Size and Sampling Procedure

A sample is a fraction of the larger population chosen to represent the whole and it should be adequate and representative of the larger population of interest of a given

study (Salaria, 2012). Sampling procedure entails the mechanism utilized to select the sample for the study.

3.5.1: Sample Size

The study site was estimated to have 568 households according to the information from the village based opinion leaders and local administration. The estimated general population per cluster was calculated based on the average household size of 4.5 persons per household (KNBS, 2019).

The following formula was used to calculate sample size for proportions for a 95% Confidence level and degree of variability (P) of 0.5 (Yamane 1967, cited in Singh and Masuku, 2014),

Sample Size = $n = \frac{N}{1+N(e)^2}$

Where

e = +/- 5% (the desired level of precision/Margin of error)

n0 = Sample Size for a proportion

N= Population Size

$n = \frac{568}{1+568(0.05)^2} = \frac{568}{2.42} = 234.7 = 235$ Households

3.5.2: Sampling procedures

The study utilized a mix of sampling procedures to appropriately address unique sampling needs. To start with, the study population was divided into villages as they were located in different geographical locations within the 30km radius of the project site. This has been recommended for situations where the target population is divided into similar clusters with further sampling done separately per strata (Singh and Masaku, 2014). To choose the villages for the studies, the study will employ the census approach to pick all villages within the 30km radius of the project's administrative site, as they constitute a small manageable number. These villages

include Sarima, civicon and Ntaletiani. To ensure fair representation for the clusters of different population size, Skinner (2016) recommends that the 250 households (HHs) should be allocated to the different villages in a way that the sample allocated is proportionate to the household size respective villages thus the villages targeted were allocated household sizes proportionate to their estimated population size as stipulated in Table 3.2.

Table 3.2: Total Households per Village and their proportionate sample size

Cluster Name	No of HHs	Proportionate Sample Size
Civicon	112	46
Sarima	301	124
Ntaletiani	155	65
Totals	**568**	**235**

At the village/cluster level, the study applied both systemic and simple random sampling procedures to pick out the households for administering the questionnaires. Simple random sampling ensures that all samples have equal chances of selection for the study and provides a better and unbiased estimate of variables in a homogenous population (Singh and Masaku, 2014). The study utilized complete simple random sampling obtaining a full but manageable list of households.

3.6: Research instruments

Research instruments for this study included interview guides and questionnaires. The questionnaires were administered to household head/care givers and the interview guides were administered to the key informants who represent the Lake Turkana Wind power.

3.6.1: Semi-structured Questionnaires

The study deployed semi-structured questionnaires with both close and open-ended questions. The open-ended questions help the researcher to get greater understanding of meaning and quality of information from the respondents (Singer and Couper,

2017). The questionnaire was administered on a face-to-face approach to the community household heads/care givers. This gives an opportunity for the researcher and research assistants to explain the questions to the respondents and potentially reduces none response rates (Schröder, 2016). The questionnaires had two sections; one for collecting demographic data of the respondents and the other for collecting data on the dependent and independent variables. The dependent variables were used to gather data on the influence of renewable energy projects concerning access to food, shelter, education, health services and employment opportunities. The independent variables collected data for the parameters under each dimension of REPs; economic, social, environmental and institutional dimensions of community livelihoods being examined.

3.6.2: Pilot Testing of Research instruments

Mugenda and Mugenda, (2003) recommend that testing the questionnaires on 10% of the sample size of respondent will adequately inform on the reliability of the research instruments. A Cronbach's alpha test reliability coefficient of at least =/> 0.7 is acceptable (Jain and Angural, 2017, pp., 285-288). The pilot questionnaire for this study was planned to be administered on 10% of the 235 households which produced a pilot testing sample of 23 households. The pre-test pilot study was conducted in Loonjorin; a village near but different from the ones targeted for the study to ensure the planned participants of the study are excluded from the pilots.

3.6.3: Validity of the Research Instruments

Further according Haradhan, (2017), the validity of a research instruments involves its ability to measure exactly what it was intended to as well as to produce true, dependable and trusted results. The research supervisor determined the validity of the questionnaire for this study. The supervisor reviewed the questionnaire to assess

whether the questionnaires were relevant to the study questions and could adequately address the needs of study objectives.

3.6.4: Reliability of the research instruments

Reliability is level for which a research tool produces dependable and consistent results (Haradhan, 2017). The pilot questionnaire for this study was administered on 23 households. The pre-test pilot study was carried out in Loonjorin village. Loonjorin village is located outside the study area to ensure exclusion of the targeted study sites and research participants. Pre –test data from the 23 households of Loonjorin village were subjected to Cronbach alpha test to check the reliability and strength of consistency of the instruments. The results revealed a Cronbach's Alpha of 0.821. This is indicative of a high level of internal consistency. A Cronbach's alpha test reliability coefficient of at least =/> 0.7 is acceptable (Jain and Angural, 2017, pp., 285-288) hence this was acceptable.

Table 3.3: Cronbach's Alpha Based on Standardized Items

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
0.821	0.826	49

3.6.5: Data collection procedures

The researcher first secured research authorization letter and permits from African Nazarene University and National Commission for Science, Technology and Innovation (NACOSTI). This letters were used to seek the consent of the County Commissioner of Marsabit County, local administration officials and finally that of LTWP project. The research assistants were then trained on the sampling, data collection instruments and data collection procedures. Concurrently, the local administration, the key informants and the community were prepared to host and

support study by distributing permit letters through the local chiefs. Pilot data was then collected and analyzed and the questionnaires reviewed to reflect on the feedback from the research assistants and respondents. The research assistants and the researcher then conducted actual data collection in Sarima, Civicon and Ntaletiani village and others sourced from reviews of secondary sources such as relevant existing government and LTWP project reports and previous studies on Lake Turkana Wind Power.

3.7: Data Analysis Techniques

Data analysis was conducted using both descriptive and inferential statistics techniques. After data collection, data was cleaned, edited, coded and fed into SPSS software. In the SPSS software, the data variables were arranged in the order in which the study objectives and respective were arranged in preparation for analysis. The data from Likert scales designed on a scale of 1-5 was described using descriptive techniques such as frequencies and percentages. Linear regression was used to analyze the relationship between social, economic, environmental, institutional dimension (independent variables) and influence on community livelihoods (depended variable). Qualitative data was analyzed using narrative statement based on objective themes of the study.

3.8: Ethical Considerations

Ethical consideration involves that mechanisms put in place to promote achievement of research goals, maintain public trust and guide the conduct of researchers at all times (Resnik, 2015). In addition, ethical consideration protects against falsifying information and promotes truth, fairness, mutual respect, accuracy of research findings and accountability. For this research, the researcher sought written authorization and permit African Nazarene University and NACOSTI. This helped

secure cooperation and support from the community, research participants and local administration. The researcher also included a written introductory section on the questionnaires explaining the purpose of the study, how the data and information obtained will be used and the confidentiality strategy. The letter also sought to assure respondents that their views and identities will not be divulged to any unauthorized persons and or used for any unauthorized purposes other than academic purposes. In addition, this was confirmed orally to research participants prior and during actual data collection.

To strengthen ethical consideration for the study, the respondents were identified with household and questionnaire numbers. In addition to these, other identifiers for research participants will include clusters/village.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1: Introduction

In this section, the study presents the results of data analysis under the five objectives of the study. In addition to presenting the findings on respondents' demographics and response rate, this chapter will also presents the descriptive and inferential statistics of the study. These will be presented under the objective aligned thematic areas include economic dimension and community livelihoods, social dimension and community livelihoods, environmental dimension and community livelihoods, institutional dimension and community livelihoods, and joint renewable energy project dimensions and community livelihoods.

4.2: Questionnaire Return Rate

The results on questionnaire return rate are presented in figure 4.1

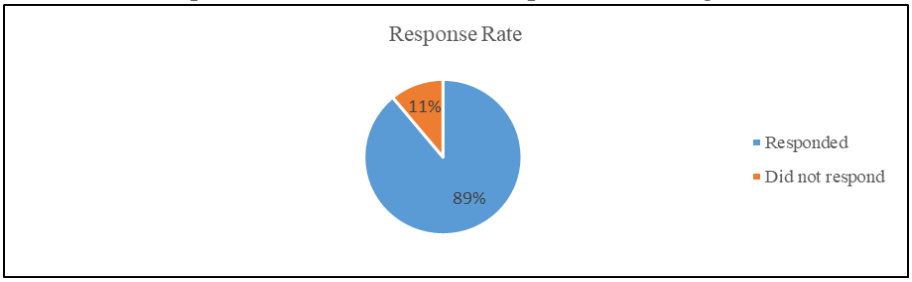


Figure 4.1: Questionnaire Return Rate

From the 236 questionnaires sent to the respondents, 209 were filled and returned for data analysis. This translated, to 89% response rate. There were no questionnaire had missing data. According to Mugenda and Mugenda (2003), this response rate is above 70%, therefore, is excellent for making study inferences.

4.3: Demographics of the Respondents

The study collected demographic information to help understand the distribution of study respondents. The respondents demographics parameters assessed were; gender, sex, and education levels. The parameters are discussed in the subsequent sub-themes;

4.3.1: Distribution of Respondents by Gender

The gender is important for assessing who among the household heads were actually available for the study, therefore the respondents were asked to state their gender. The Table 4.1 shows the results.

Table 4.1: Distribution of Respondents by Gender

Variables	Category	Response n = 209	Percentage
Gender	Male	80	38%
	Female	129	62%
	Total	209	100%

In terms of gender, results as presented in Table 4.1 indicated that 38% of the respondents were male while 62% were female. The result could suggest that most male participants failed to participate in the study as they are were not available at home during the time of the study but their spouses were. The segregation by gender makes it possible to analyze and associate the study findings including perceptions and attitudes to the different gender. Importantly, the results also indicate that both gender are directly affected by the project outcomes including economic, social, environmental, and institutional dimensions. The implication of the higher women ratio compared to men implies that women may be the most affected and are more likely to feel the pinch and or benefits of the influence of economic, social, environmental and institution dimensions of community livelihoods.

4.3.2: Distribution of respondents by Age

The data on the distribution of respondents by age was analyzed and are presented in Table 4.2.

Table 4.2: Distribution of respondents by Age

Variables	Category	Response n = 209	Percentage
Age	< 20 years	2	1%
	20 – 29 years	52	25%
	30 – 39 years	98	47%
	40 – 49 years	38	18%
	50 – 59 years	18	9%
	Total	209	100%

The research participants were asked to state their age to enable the research determine the age distribution of the households targeted for data collection. Moreover, this information would also be useful for further analysis to determine how age of the respondents would influence their perception and attitudes on how renewable energy projects influence community livelihoods.

The findings demonstrated that close to half 98 (47%) of the respondents were in the age category of 30 – 39 years, twenty-five percent were aged 20 – 29 years, and 38 (18%) of the respondents were aged 40 – 49 years. Another 18 (9%) of the respondents were aged above 50 years (see Table 4.1). The results, thus, suggest that majority of those who participated in the study were middle aged (20-39 years) men. This means that they form the majority (72%) of household heads in the community. Men who are usually key decision makers and opinion leaders in patriarchal communities who largely not found at home may not make use of and demand for better opportunities presented by LTWP project such a utilization of clean energy, development projects hence entrenching continued vulnerability.

4.3.3: Distribution of respondents by academic Levels

The results of the respondents' distribution of their academic levels were analyzed and presented in Table 4.3

Table 4.3: Demographic of the Respondents Results

Variables	Category	Response n = 209	Percentage
Academic qualification	Primary	22	10.5%
	Secondary	3	1.4%
	Post-secondary	1	0.5%
	None	183	87.6%
	Total	209	100%

The research participants were asked to state their highest level of education to enable the research determine education level of the respondents reached for data collection. Further analysis, this data would also be useful for determining how education level of the respondents influence their perception and attitudes on how the renewable energy projects influence community livelihoods.

The findings presented in Table 4.3 show that 183 (87.6%) of the respondents have no education whereas only 22 (10.5%) had primary level. Only 2 (1.4%) and 1 (0.5%) respondents had secondary and post-secondary education levels respectively. The results reflect on the existing reality of illiteracy level among some communities in rural part of Northern Kenya. The low literacy implies that these communities will be disadvantaged in firstly, they may not be able to take the full advantage of skilled jobs and opportunities emanating from REP energy project such as Lake Turkana Wind power. Those who are skilled mostly coming from the outside the community are likely to benefit from the project than the local communities. Moreover the illiterate community may not be fully engaged by the project in matters influencing community livelihoods as they are not properly skilled to understand their rights and to negotiate for fair share of resources emanating from the project. In summary, the low literacy

levels will affect the ability of the communities to optimize the utilization the social, economic, institutional and environmental dimensions of LTWP project.

4.4: Economic Dimensions and Community Livelihoods

Data from the respondents on economic dimension of REPs on community livelihoods was analyzed and presented in Table 4.4

Table 4.4: Economic Dimension and Community Livelihoods Descriptive Results

Economic dimension	SA	A	N	D	SD	Mean	Std. Dev
	n (%)	n (%)	n (%)	n (%)	n (%)		
LTWP project's economic dimension has increased job opportunities in the project area	0(0%)	69 (33)	37 (18)	92 (44)	11 (5)	2.78	.969
LTWP project's Economic dimension has increased business/entrepreneurial opportunities in the project area.	0(0%)	53 (25)	51 (24)	98 (47)	7 (4)	2.72	.883
LTWP power's Economic dimension has not delivered on its CSR projects promises to the	115 (55)	41 (20)	26 (12)	18 (9)	9 (4)	4.12	1.182
LTWP project has empowered the communities economically since the project inception.	1 (1)	57 (27)	27 (13)	85 (41)	39 (18)	2.50	1.097
LTWP project has invested in development projects that have empowered the communities economically.	1 (1)	39 (18)	42 (20)	112 (54)	15 (7)	2.52	.894
Composite Mean and Standard Deviation						2.93	1.005

n = Frequency, % - Percentage in brackets, SA – Strongly agree, A – Agree, N – Neither, D – Disagree, SD – Strongly disagree

First, the study sought to establish respondents' level of agreement with various statements related to the influence of economic dimensions on community livelihoods. The descriptive results were presented using Likert with 5 being strongly agree, 4; agree, 3; neither agree nor disagree, 2; disagree and 1 being strongly disagree alongside their respective means and standard deviations. In the interpretation, data for the strongly agree and agree were combined to form agree while data for the strongly disagree and disagree were combined to form disagree as shown in Table 4.4. The results in Table 4.4 showed that the means for economic sub variables ranges between 2.50 and 4.12 while the standard deviation ranges from

0.883 to 1.182. Generally, the established composite mean of 2.93 less than 3.0 indicated that participants slightly disagreed that economic dimensions improves community livelihoods.

Separately, the results confirmed that almost half (49%) of the participants disagreed that Lake Turkana Wind Power (LTWP) project's economic dimension has increased job opportunities in the project area *(M = 2.78, SD = .969)* compared to 33% and 18% who agreed and neutral (neither agreed nor disagreed) respectively. The mean of this parameter is lower than the composite mean (M=2.93, SD=1.005) hence the parameter has negative influence on community livelihoods. It also implies that for most participants felt that the economic dimension of LTWP project did not increase job opportunities. In a related finding, Fifty-nine percent of the participants disagreed that LTWP project has empowered the communities economically since project inception *(M = 2.50, SD = 1.097)* compared to 28% and 13% of the respondents who agreed and neither agreed nor disagreed respectively (see Table 4.4). The item line mean is lower than the composite mean (M=2.93, SD=1.005) meaning economic empowerment parameter negatively influences community livelihoods. The line item standard deviation of 1.097 greater than the composite standard deviation implies that in addition to negative influence on community livelihoods, the respondents views are diverging. Approximately 61% of the respondents as opposed to 19% and 20% who agreed and neutral respectively, disagreed that LTWP project has invested in development projects that have empowered the communities economically *(M = 2.52, SD = .894)*. The means of results on economic empowerment of the communities and project's investment in economic projects that have empowered the communities are lower than the composite mean (M=2.93, SD=1.005) implying that the project's economic dimension has a negative influence and therefore does not positively

influence community livelihoods. Its standard deviation of 0.894 is lower than the composite mean of 1.005 implying that the respondents' opinions were in agreement on the subject matter. Another 75% of the respondents against 12% and 13% who neither agreed nor disagreed and disagreed respectively agreed that LTWP power's economic dimension has not delivered expected corporate social responsibility (CSR) projects promised to the communities *(M = 4.12, SD = 1.182)*. The mean of this parameter is much higher than the composite mean (M=2.93, SD=1.005) inferring that the line item has the potential for positive influence on community livelihoods. The line item (SD= 1.182) is higher than the composite Standard deviation of 1.005 implying that there is divergent views among the respondents.

Given the quantitative data results in Table 4.4, the respondents were also given open ended questions to provide their opinions. The open-ended questions are placed immediately after the economic dimension Likert scale in the questionnaire. This is what they respondents had to say;

> *"Derived benefits from LTWP projects may also include drilling of boreholes, installation of solar panels for lighting in schools, COVID-19 awareness creation, and building of schools and dispensaries. The project has also led to increased small shops/canteens butcheries and bars. However, these cross-cutting activities did not seem to be adequate enough to spur economic influence."*

This qualitative result indicated participants' opinion that though the LTWP project has brought various benefits, such benefits have not adequately spurred economic changes on community livelihoods.

4.4.1: Correlation of Economic Dimension and Community Livelihoods

The study sought to assess the relationship between Economic dimension and Community livelihoods. Pearson correlation coefficient was adopted to test the relationship between Economic dimension and Community livelihoods at a significance level of 0.05. The correlations correlation analysis results obtained are presented in Table 4.5.

Table 4.5: Correlation Economic Dimension and Community Livelihoods

Variables		**Community livelihoods**
Economic dimension	Pearson correlation	.171*
	Sig. (2-tailed)	.013
	n	209

**. Correlation is significant at the 0.01 and 0.05 level (2-tailed)

The results shown in Table 4.5 indicated that there exist a weak significant correlation between economic dimension and community livelihood r(207), = .171, p = .013 < .05. The results suggest the relationship between the two variables are positive and that the contribution of LTWP projects in terms of economic contribution to the community livelihoods is minimal.

4.4.2: Regression of Economic Dimension and Community Livelihoods

A regression analysis was carried out in order to test if economic dimensions of LTWP project significantly causes changes on community livelihoods. These are further discussed in the following sub-themes:

4.4.2.1: Regression: Economic Dimension and Community Livelihoods

The model sought to establish how economic dimension as a predictor significantly or insignificantly predicted Community livelihoods. The regression model summary results are shown in Table 4.6.

Table 4.6:Model Summary of Economic Dimension and Community Livelihoods

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.171[a]	.029	.025	.41861

a. Predictors: (Constant), Economic dimension

A regression model summary was generated as shown in Table 4.6. The results; (R) = .171 and R – Square = .029 depict that the likelihood economic dimension of LTWP improving community livelihoods is about 2.9%, *(R^2 = .029, p = .013)*. The study suggested that though the likelihood of improvement is positive, the established findings demonstrated that the improvement is minimal to cause significant changes on the community livelihoods.

4.4.2.2: ANOVA of Economic Dimension and Community Livelihoods

The study sought to establish if the regression model is best fit for predicting community livelihoods after use of economic dimension. The results of regression ANOVA statistics are represented in Table 4.7.

Table 4.7: ANOVA of Economic Dimension and Community Livelihoods

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1.094	1	1.094	6.245	.013[b]
Residual	36.273	207	.175		
Total	37.367	208			

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Economic dimensions

The results of the regression ANOVA statistics as shown in Table 4.7 shows that the influence of economic dimensions though minimal, is significant, *F(1, 207), = 6.245, p = .013)*. The results suggest that the model was significant to test the influence of economic dimensions on community livelihoods.

4.4.2.3: Coefficient of Economic Dimension and Community Livelihoods

The study sought to establish the influence of Economic Dimension on Community livelihoods. The regression coefficients results are represented in Table 4.8.

Table 4.8: Coefficient of Economic Dimension and Community Livelihoods

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.767	.135		13.103	.000
Economic dimension	.112	.045	.171	2.499	.013

a. Dependent variable: Community livelihoods

Thereafter, this study tested the first hypothesis of the study; there is no significant relationship between economic dimension and community livelihood. The regression coefficient output in Table 4.8 shows significant positive influence of economic dimension on community livelihoods *(B = .112, p = .013)*. The findings mean that the study rejected the null hypothesis, accepted the alternative hypothesis and concluded that there is significant and positive influence of economic dimension of LTWP projects on community livelihoods. This means that there is enough evidence that reject to null hypothesis and that economic dimension has an influence on the community livelihoods in the project area. The findings disagree with May and Nilsen (2015) whose previous study indicated that community development projects like wind power do not have significant economic impact to local economies.

4.5: Social Dimensions and Community Livelihoods

The second objective of the study determined respondents' level of agreement with various statements related to the influence of social dimensions on community livelihoods. The descriptive results (Table 4.9) were presented using Likert with 5 being strongly agree, 4; agree, 3; neither agree nor disagree, 2; disagree and 1 being strongly disagree alongside their respective means and standard deviations.

Table 4.9: Influence of Social Dimension on Community Livelihoods

Social dimension	SA	A	N	D	SD	Mean	Std. Dev
	n (%)	n (%)	n (%)	n (%)	n (%)		
Sources of income have increased through LTWP project social dimension since project inception in the project area.	-	63 (30)	34 (16)	102 (49)	10 (5)	2.72	.952
The social dimension of LTWP meant that Communities were displaced from project site to pave way for the project	45 (22)	77 (37)	11 (5)	57 (27)	19 (9)	3.34	1.325
LTWP's Social dimension meant that where communities were displaced, they were adequately resettled	2 (1)	46 (22)	12 (6)	138 (66)	11 (5)	2.47	.925
LTWP projects' social dimension led to mushrooming of new settlements in and around the project area.	3 (1)	90 (43)	76 (36)	16 (8)	24 (12)	3.15	1.003
As a result of the LTWP's social dimension, new settlements are facing scarcity of social amenities (water, electricity, sanitation facilities, health care etc.)	13 (6)	41 (20)	75 (36)	73 (35)	7 (3)	2.90	.961
LTWP social dimension increased availability of social amenities/services e.g. water, electricity, schools etc. in all villages both new and old	-	21 (10)	18 (9)	153 (73)	17 (8)	2.20	.919
LTWP Power's social dimension has led to erosion of the local cultures.	1 (1)	26 (12)	68 (33)	88 (42)	26 (12)	2.46	.882
LTWP social dimension has led to increased incidences of diseases (HIV, waterborne diseases, alcoholism, prostitution) in the new settlements	74 (35)	76 (36)	21 (10)	36 (17)	2 (1)	3.88	1.105
LTWP power's social dimension has led to increased Insecurity/conflicts (cattle rustling, killings) and related violent act the inception of the project	92 (44)	67 (32)	12 (6)	33 (16)	5 (2)	4.00	1.162
Conflicts/insecurity in the project area are a result of competition for LTWP project's social dimension related resources (land, jobs, business opportunities, and all other benefits)	93 (44)	73 (35)	14 (7)	25 (12)	5 (2)	4.08	1.078
There has been equitable distribution of resources emanating from LTWP projects social dimension to different communities in the project area.	18 (9)	28 (13)	11 (5)	60 (29)	92 (44)	2.14	1.339
Composite Mean and Standard Deviation						3.03	1.059

n = Frequency, % = Percentage in brackets, SA – Strongly agree, A – Agree, N – Neither, D – Disagree, SD – Strongly disagree

In the interpretation, data for the strongly agree and agree were combined to form agree while data for the strongly disagree and disagree were combined to form disagree. The study established that means and standard deviations for all the social dimension variables ranges between 2.20 and 4.08 and from .882 to 1.339 respectively. The Table 4.9 results demonstrated a composite mean of 3.03 which suggest that to some extent, respondents slightly agree that social dimension has had no influence on community livelihoods. Several respondents who held this view, for instance, 58% contrasted to 5% and 37% who neither agreed nor disagreed and disagreed respectively agreed that the social dimension of LTWP meant that communities were displaced from project site to pave way for the project *(M = 3.34, SD = 1.325)*. The line item mean is higher than the composite mean (M=3.03, SD=1.059) implying that the item has the potential to cause a positive influence on community livelihoods. A standard deviation of 1.325 is larger than the composite standard deviation infers there is a divergent opinion on the matter. Related to this, is the finding that while communities were displaced from the project sites, 71% of the respondents as opposed to 23% and 6% of the respondents who agreed and neither agreed nor disagreed respectively disagreed that they were not adequately resettled (M=2.47, SD=0.925). With a mean lower than the composite mean (M=3.03, SD=1.059), implies that displacement of communities had a negative influence on community livelihoods due to lack of inadequate resettlement of those displaced by the project. Furthermore, about those who agreed, forty-five percent of the respondents as opposed to 36% and 19% who were neutral agreed that LTWP project's social dimension led to mushrooming of new settlements in and around the project area *(M = 3.15, SD = 1.003)*. The mean of emergence of new settlements is higher than the composite mean (M=3.03, SD=1.059) inferring that emergence of new

settlements in the project area has a potential to instigate positive influence on community livelihoods.

Besides, 76% of the respondents compared to 6% and 18% of the respondents who neither agreed nor disagreed and disagreed respectively agreed that LTWP project social dimensions has led to increased insecurity/conflicts (cattle rustling, killings) and related violence since the inception of project *(M = 4.00, SD = 1.162)*. The line item has a higher line item mean and standard deviation compared to composite mean (M=3.03, SD=1.059) implying that the line item has an influence on community livelihoods. The standard deviation is higher than the composite standard deviation hence there is a divergent opinion on the subject matter. This was attributed to competition for resources emanating from the project as indicated by 79% of the respondents who agreed compared to 7% and 14% of the respondents who neither agreed nor disagreed and disagreed respectively (*M=4.08, SD=1.078)*. The mean of this variable is much higher than the composite mean (M=3.03, SD=1.059) indicating that the parameter competition for resources has an influence on community livelihoods. The standard deviation is also greater than the composite mean meaning that the respondents had convergent opinions.

On another parameter; LTWP social dimension has led to increased incidences of diseases (HIV, waterborne diseases, alcoholism, prostitution) in the new settlements, 72% agreed, 18% disagreed while 10% were neutral (M=3.88, SD=1.05). This mean is higher than the composite mean (M=3.03, SD=1.059) indicating that the line mean has a potential to cause positive influence on community livelihoods if mitigated. The standard deviation is however lower than the composite standard deviation implying that there is convergent opinion on the matter.

Fifty-four percent of the respondents against 13% and 33% who agreed and neither agreed nor disagreed respectively disagreed that LTWP power's social dimension has led to the erosion of local cultures *(M = 2.46, SD = .882)*. The line item mean and standard deviation are lower than the composite mean and standard deviation (M=3.03, SD=1.059) implying the parameter has a negative influence on community livelihoods and that the views of the respondents do converge.

Also, fifty-four percent of the respondents compared to 30% and 16% who agreed and neither agreed nor disagreed respectively disagreed that sources of income have increased through LTWP project social dimension since project inception in the project area *(M = 2.72, SD = .952)*. Seventy-three percent as opposed to 22% and 11% of the respondents who agreed and neither agreed nor disagreed respectively disagreed that there has been equitable distribution of resources emanating from LTWP project social dimensions to different communities in the area *(M = 2.14, SD = 1.339*). Both line items have a lower line mean than the composite mean (M=3.03, SD=1.059) inferring that the items namely limited incomes and unequitable distribution of resources have a negative influence on community livelihoods. The lower standard deviation of the income parameter compared to composite standard deviation infers that there was a convergent opinion on incomes however opinions differ in regards to issue of unequitable distribution of resources as depicted by the higher standard deviation mean.

A few of the participants who responded to the qualitative questions related to the influence of social dimension on community livelihoods said that;

> *"Positive effects of LTWP projects to the community in terms of social dimension has been civilisation, intermarriages, and changes in dressing code. However, the negative changes have been encountered*

including erosion of culture as the major one plus other minor negative ones including alcoholism, prostitution, diseases like HIV and AIDS and early childhood pregnancy."

The results confirm earlier findings that though renewable energy projects may bring positive benefits to the community, there are also adverse that can result from such projects.

4.5.1: Correlation of Social Dimension and Community Livelihoods

The study sought to assess the relationship between Economic dimension and Community livelihoods. Pearson correlation coefficient was adopted to test the relationship between social dimension and Community livelihoods at a significance level of 0.05. The correlations results obtained are represented in Table 4.10.

Table 4.10:Correlation Output of Social Dimension and Community Livelihoods

Variables		**Community livelihoods**
Social dimension	Pearson correlation	.283**
	Sig. (2-tailed)	.000
	n	209

**. Correlation is significant at the 0.01 and 0.05 level (2-tailed)

The outcome provided in Table 4.10 showed that there is a significant and positive moderate correlation between social dimension and community r(207), = .283, $p < .001$. The results suggest there is a moderate linear relationship between social dimension of LTWP project and community livelihoods.

4.5.2: Regression of Social Dimension and Community Livelihoods

The study further conducted a regression analysis of the social dimension and the community livelihoods to test the likelihood of variations in the community livelihoods as a result of social dimension.

4.5.2.1: Model Summary of Social Dimension and Community Livelihoods

The model sought to establish how social dimension as a predictor significantly or insignificantly predicted Community livelihoods. The regression model summary results are shown in Table 4.11.

Table 4.11:Model Summary of Social Dimensions and Community Livelihoods

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.283[a]	.080	.076	.40752

a. Predictors: (Constant), Social dimensions

R square (R^2) of .080 exhibited that social dimensions of LTWP projects cause approximately 8% of changes in community livelihoods *($R^2 = .080, p < .001$)*. From the findings, it is evident that the likelihood of social changes in the community livelihoods are small.

4.5.2.2: ANOVA of Social Dimension and Community Livelihoods

The study sought to establish if the regression model is best fit for predicting community livelihoods after use of social of dimension. The results of regression ANOVA statistics are represented in Table 4.12.

Table 4.12: ANOVA- Social Dimensions and Community Livelihoods

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2.990	1	2.990	18.004	.000[b]
Residual	34.377	207	.166		
Total	37.367	208			

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Social dimensions

The results of regression ANOVA analysis in Table 4.12 confirms the effectiveness of the model in explaining the likelihood of significant influence of social dimensions on community livelihoods. The findings indicated that the model was appropriate for

explaining the influence of social dimensions of LTWP projects on community livelihoods, *F(1, 2017), = 18.004, p < .001*.

4.5.2.3: Co-efficient of Social Dimension and Community livelihoods

The study sought to establish the influence of Economic Dimension on Community livelihoods. The regression coefficients results are represented in Table 4.8.

Table 4.13:Coefficients of Social Dimension and Community Livelihoods

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.242	.203		6.116	.000
Social dimension	.281	.066	.283	4.243	.000

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Social dimension

The regression coefficient results in Table 4.13 presented the criteria for testing the second hypothesis of study; there is no significant relationship between social dimension and community livelihoods. The results demonstrated a significant influence of social dimension of LTWP projects on community livelihoods *(B = .281, p < .001)*. The outcome means that the study rejected the null hypothesis and concluded that there is a significant influence of social dimension of LTWP projects on community livelihoods. This means that there is enough evidence to reject the null hypothesis and that social dimension has an influence on the community livelihoods in the project area.

4.6: Environmental Dimensions and Community Livelihoods

The third objective of the study examined respondents' level of agreement with various statements related to the influence of environmental dimensions on community livelihoods. The descriptive results were presented using Likert of 5 Scales with 5 being strongly agree, 4; agree, 3; neither agree nor disagree, 2; disagree

and 1 being strongly disagree alongside their respective means and standard deviations as shown in Table 4.14.

Environmental dimension	SA	A	N	D	SD	Mean	Std. Dev
	n (%)	(%)	n %)	n (%)	n (%)		
My household/Homes/work place is located up to < 1km from the nearest turbine as informed by LTWP's environmental dimension.	3 (1)	26 (12)	18 (9)	126 (61)	36 (17)	2.21	.920
Electric power from wind power or the national grid is the main form/source of energy used at households and schools in the project area owing to LTWP projects environmental dimension	3 (1)	1 (1)	2 (1)	67 (32)	136 (65)	1.41	.682
There has been emergence of Turbine Noise since the installation of the Turbines owing to LTWP Projects environmental dimension	0(0%)	24 (12)	18 (9)	128 (61)	39 (18)	2.13	.848
There has been an increased dust due to LTWP environmental dimension since the operationalization of LTWP project	14 (7)	147 (70)	20 (10)	26 (12)	2 (1)	3.69	.810
There has been an emergence of shadow flicker effect since the installation of the Turbines attributed LTWP project's dimension	5 (2)	8 (4)	25 (12)	151 (72)	20 (10)	2.17	.746
LTWP Project's environmental dimension's increased turbine noise, dust and turbine shadow flicker effects is irritating and or annoying	23 (11)	54 (26)	37 (18)	79 (37)	16 (8)	2.95	1.178
LTWP project's environmental dimensional operation and road usage has increased injuries and death	7 (3)	83 (40)	60 (29)	57 (27)	2 (1)	3.17	.904
On the environmental dimension of LTWP, there have been adverse physical changes on the original land scape resulting from excavations, construction and turbine installation since the project inception	43 (21)	89 (43)	15 (7)	57 (27)	5 (2)	3.52	1.165
On environmental dimension, the community currently supports the project	6 (3)	84 (40)	31 (15)	77 (37)	11 (5)	2.99	1.049
On the environmental dimension, the community supports future expansion of the LTWP to cover more land area	8 (4)	30 (14)	28 (14)	51 (25)	92 (44)	2.10	1.221
On the environmental dimensional aspect, the project has negatively affected wildlife (Bird & other wild animals') population in the project area and its environs	8 (4)	35 (16)	45 (22)	61 (29)	60 (29)	2.38	1.175
Composite Mean and Standard Deviation						2.61	.973

n = Frequency, % = Percentage in brackets, SA – Strongly agree, A – Agree, N – Neither, D – Disagree, SD – Strongly disagree

In the interpretation, data for the strongly agree and agree were combined to form agree while data for the strongly disagree and disagree were combined to form disagree. The descriptive results reported a mean range for all sub-variables of between 1.41 to 3.69 and standard deviation range of between .682 and 1.221 with a composite mean of 2.61 less than 3.0, suggesting that respondents slightly disagreed that there has been major positive environmental influence of environmental dimensions on community livelihoods.

Specifically, seventy-nine percent of the respondents as opposed to 12% and 9% of the respondents who agreed and neither agreed nor disagreed respectively disagreed that there has been emergence of Turbine noise since the installation of the Turbines owing to LTWP projects environmental dimension *(M= 2.13, SD = .848)*. Furthermore, 82% of the respondents in comparison with 6% and 12% of the respondents who agreed and neither agreed nor disagreed respectively further disagreed that there has been an emergence of shadow flicker effect since the installation of the Turbines attributed to LTWP project's dimension *(M = 2.17, SD = .746)*. The means of these findings are lower than the composite mean of 2.61 and standard deviation of 0.973 implying that on the aspects of shadow flicker and turbine noise, the parameters have a negative influence on community livelihoods and there is a convergence of opinion between the respondents in both cases. The limited noise and turbine shadow flicker effect could be attributed to the finding that 77% of the respondents disagreed that their houses/home/work place is located up to less than 1km from the nearest turbine as informed by LTWP's environmental dimension *(M = 2.2 SD = .920)*. This is compared to 14% and 9% of the respondents who agreed and neither agreed nor disagreed respectively. The line item mean and standard diversion are both lower than the composite mean and standard deviation of implying that the

line item has the potential to cause negative influence on community livelihoods if not checked and that the views of the respondents are converging. Besides, forty-five percent of the respondents disagreed that LTWP project's environmental dimensions increased turbine noise, and that turbine shadow flicker effect is irritating and/or annoying *(M = 2.95, SD = 1.178* contrasted to 37% of respondents who agreed and 18% of those who were neutral. This item has a higher mean and standard deviation compared to the composite mean and standard deviation (*M: 2.61, SD: 0.973*). This implies the item has a positive influence on community livelihoods especially when mitigated however there was a divergence in opinion among the respondents. On whether wildlife population in the project area and its environs was negatively affected by the environmental dimension, 58% of the respondents disagreed, 20% agreed while 22% were neutral (M=2.38, SD=1.175). The mean was lower than composite mean and standard deviation (M=2.61, SD=0.973) implying that the environmental dimension has the potential to cause negative effects if not checked and the respondents' views on the subject of negative influence on the wildlife is similar and are generally in agreement.

There exist mixed feeling about whether the communities were in favor of the project existence. Whereas 43% agreed that on environmental dimension, the community currently supports the project, about 42% of the community disagreed while 15% of the respondents neither disagreed nor agreed *(M = 2.99, SD = 1.049)*. This mean and standard deviation are higher than to the composite mean of 2.61 and standard deviation of 0.973 respectively inferring that although the proportions are close, existing support though minimal has a positive on community livelihoods but the views of respondents are generally diverging from each other.

On adverse environmental influences, seventy-seven percent of the respondents against 10% and 13% of the respondents who neither agreed nor disagreed and disagreed respectively agreed that there has been increased dust since the start of LTWP project operation *(M = 3.69, SD = .810)*. This line item mean is higher than the composite mean but has a lower standard deviation *(M=2.61, SD=0.973)* implying that the increased dust has the potential to cause positive influence on community livelihoods if mitigated. In addition, there is an agreement among the respondents on their point of view. Another 63% of the respondents contrasted to 7% and 30% of the respondents who neither agreed nor disagreed and disagreed respectively agreed that there has been adverse physical changes on the original landscape resulting from excavations, constructions, and turbine installation since the project inception (M=3.52, SD=1.165). Again this higher means than the composite and standard deviation means (M=2.61, SD=0.973) implies that they influence on community livelihoods is positive especially if intervened and that the opinions of the different respondents is diverging. Another result on LTWP project's environmental dimensional operation and road usage has increased injuries and death, 43% agreed, 28% disagreed while 29% were neutral (M=3.17, SD=0.094). This item's mean score was higher than the composite mean (M=2.61, SD=0.973). This means that mitigation of potential increased injuries and death have the potential to influence community livelihoods positively. All the same, the views of the respondents were converging as the standard deviation was lower than the composite mean.

Almost all respondents (97%) disagreed that electric power from wind power or the national grid is the main form/source of energy used at households and schools in the project area owing to LTWP projects environmental dimension and while other 2% and 1% agreed and were neutral respectively (M=1.41, SD=0.682). This is much

lower than both the composite mean and standard deviation (M=2.61, SD=0.973) implying that despite the production of clean energy, the failure to provide access to clean energy has a negative influence on community livelihoods. Furthermore, 69% of the respondents disagree that the community supports future expansion of the LTWP to cover more land area, while another 18% agree and 14% were neutral (M=2.1, SD=1.221). This mean is lower the composite mean (M=2.61, SD=0.973) inferring future expansion of the project beyond its current land area has a negative influence to community livelihoods and therefore the community does not support further expansion of the project. The higher standard deviation implies there is diverging views on this statement.

4.6.1.1: Correlation of Environmental dimension and Community livelihoods

The study sought to assess the relationship between Environment dimension and Community livelihoods. Pearson correlation coefficient was adopted to test the relationship between Environmental dimension and Community livelihoods at a significance level of 0.05. The correlations results obtained are represented in Table 4.15.

Table 4.14: Correlation of Environmental Dimension and Community Livelihoods

Variables		**Community livelihoods**
Environmental dimension	Pearson correlation	.263**
	Sig. (2-tailed)	.000
	n	209

**. Correlation is significant at the 0.01 and 0.05 level (2-tailed)

The results outlined in Table 4.15 exhibited that there is a significant and positive moderate correlation between environmental dimension and community livelihoods, $r(207), = .263, p < .001$. The study outcome depicts a moderate linear relationship between the two variables of the study.

4.6.2: Regression of Environmental Dimension and Community Livelihoods

To describe the extent of likelihood of the environmental dimension causing changes of community livelihoods, a regression model summary was generated.

4.6.2.1: Model: Economic Dimension and Community livelihoods

The model sought to establish how social dimension as a predictor significantly or insignificantly predicted Community livelihoods. The regression model summary results are shown in Table 4.11.

Table 4.15:Model of Environmental Dimension and Community Livelihoods

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.263[a]	.069	.064	.40996

a. Predictors: (Constant), Environmental dimensions

As shown in table 4.16, the results of R square (R^2) of .069 suggested that the extent of likelihood changes on community livelihoods as a result of environmental dimensions of LTWP projects is around 6.9%, ($R^2 = .069$, $p < .001$). The results imply that environmental dimensions causes minor changes on community livelihoods.

4.6.2.2: ANOVA of Environmental Dimension and Community Livelihoods

The study sought to establish if the regression model is best fit for predicting community livelihoods after use of Environmental of dimension. The results of regression ANOVA statistics are represented in Table 4.17.

Table 4. 16: ANOVA of Environmental Dimensions and Community Livelihoods

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2.577	1	2.577	15.331	.000[b]
Residual	34.791	207	.168		
Total	37.367				

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Environmental dimension

Table 4.17 outlines the regression ANOVA statistics of environmental dimensions and community livelihoods. The established findings indicated that the model was significant in explaining the significant influence of environmental dimensions of LTWP projects on community livelihoods, *F(1, 207), = 15.331, p < .001*.

4.6.2.3: Coefficient: Environmental Dimension and Community Livelihoods

The study sought to establish the influence of Environment Dimension on Community livelihoods. The regression coefficients results are represented in Table 4.8.

Table 4.17: Coefficient of Environmental Dimension and Community Livelihoods

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.987	.285		3.467	.001
Environmental dimension	.425	.109	.263	3.916	.000

a. Dependent Variable: Community livelihoods

The study sought to test the hypothesis; there is not significant relationship between environmental dimension and community livelihoods. The regression coefficient results in Table 4.18 show that there is a significant influence of environmental dimension of LTWP projects on community livelihoods *($B = .425$, $p < .001$)*. The regression results, therefore, depicted that the study rejected the null hypothesis and concluded that there is a significant and positive influence of environmental dimension of LTWP projects on community livelihoods. Specifically, the results show that there is enough evidence to reject to null hypothesis and confirms that environmental dimension is vital in influencing community livelihoods in the project area.

4.7: Institutional Dimension and Community Livelihoods

The fourth objective of the study assessed respondents' level of agreement with various statements related to the influence of institutional dimension on community livelihoods. The descriptive results were presented using Likert scale of 5 points with 5 being strongly agree, 4; agree, 3; neither agree nor disagree, 2; disagree and 1 being strongly disagree alongside their respective means and standard deviations as shown in Table 4.19.

Table 4.18: Institutional Dimension and Community Livelihoods

Institutional Dimension	SA	A	N	D	SD	Mean	Std. Dev
	n (%)	n (%)	n (%)	n (%)	n (%)		
The Institutional dimension of LTWP has resulted to existing unresolved land ownership issues between the project and the community.	44 (21)	63 (30)	23 (11)	62 (30)	17 (8)	3.26	1.306
LTWP project institutional dimension provided for adequate consultation with the communities on project land acquisition.	11 (5)	42 (20)	26 (12)	116 (56)	14 (7)	2.62	1.046
LTWP project's institutional dimension promotes collaboration with other development partners such as government, civil society organizations and community in its work.	4 (2)	68 (32)	98 (47)	37 (18)	2 (1)	3.17	.769
LTWP's institutional dimension promotes free and fair access to opportunities such as jobs, businesses by all communities and community members.	7 (3)	19 (9)	14 (7)	86 (41)	83 (40)	1.95	1.064
LTWP's Project dimension help instill faith in the ability of the community representatives (e.g. Liaison officers) to advocate for the interests of the community.	3 (1)	37 (18)	19 (9)	88 (42)	62 (30)	2.19	1.093
LTWP Project institutional dimension's land acquisition has reduced the available livestock grazing land.	4 (2)	63 (30)	17 (8)	109 (52)	16 (8)	2.67	1.048
Composite Mean						2.64	1.054

n = Frequency, % = Percentage in brackets, SA – Strongly agree, A – Agree, N – Neither, D – Disagree, SD – Strongly disagree

In the interpretation, data for the strongly agree and agree scale were combined to form 'agree' while data for the strongly disagree and disagree scales were combined to form 'disagree.' Largely, the outcome revealed mean range for all institutional dimension sub variables between 1.97 and 3.26 and standard deviation ranges from .769 to 1.306. The established composite mean of 2.64 less than 3.0 suggested that respondents slightly disagree that institutional dimensions has successfully influenced community livelihoods. Accordingly, about 72% of the respondents as opposed to 19% and 9% of the respondents who agreed and neither agreed nor disagreed respectively disagreed that LTWP's project helped instill faith in the ability of the

community representatives (i.e. liaison officers) to advocate for the interests of the community *(M = 2.19, SD = 1.093)*. This is less than composite mean of 2.64 implying that the l failure by institutional dimension to instill faith in community representation has a negative influence on community livelihoods. The standard deviation of 1.54 is less than the composite standard deviation of 1.093 implying that the respondents had divergent views on the issue of community representation. Over half of the respondents (60%) compared to 32% and 8% of the respondents who agreed and neither agreed nor disagreed respectively disagreed that LTWP project institutional dimensions' land acquisition has reduced the available livestock grazing land *(M = 2.67, SD = 1.048)*. The mean is larger than the composite mean of 2.64 with standard deviation of 1.054 meaning the land grazing size does have a positive influence on community livelihoods, as the project did not adversely affect the size of grazing land available to communities. On the parameter that LTWP's institutional dimension promotes free and fair access to opportunities such as jobs, businesses by all communities and community members, a majority 81% of the respondents disagreed, 12% agreed and the other 6% were neutral. Its mean of 1.95 was lower than the composite mean of 2.64 inferring that the lack of free and fair access to opportunities has a negative influence on community livelihoods. The standard deviation of 1.064 is lower than the composite standard deviation of 1.054 implying that the respondents had converging opinions. Moreover, on the construct that LTWP project institutional dimension provided for adequate consultation with the communities on project land acquisition, 63% disagreed, 25% agreed while another 12% were neutral. With a mean of 2.62, which is higher than the composite, mean of 2.64 implies that the lack of adequate consultation if mitigated has a positive

influence on community livelihoods. The standard deviation of 1.046 lower than the composite standard of 1.054 means that the respondents' views were converging.

There were mixed results on whether LTWP institutional dimension promoted collaboration with other development partners such as government, civil society organizations, and community in its work as evidenced by 47% of the respondents who indicated that neither agreed nor disagreed contrasted to 34% and 19% of the respondents who agreed and disagreed respectively *(M = 3.17, SD = .769)*. The mean score is higher than the composite mean of 2.64 meaning that the line item has the potential to have a positive influence on community livelihoods. The standard deviation of 0.769 is lower than the composite standard deviation of 1.054 means that the opinions are generally converging.

On the other hand, the findings show that some respondents, however, agreed to various constructs of institutional dimensions. For example, fifty-one percent of the respondents respectively agreed that the institutional dimension of LTWP has resulted in existing unresolved land ownership issues between the projects and the community *(M = 3.26, SD = 1.306)* as opposed to 11% and 38% of the respondents who neither agreed nor disagreed and disagreed. With a line item mean of 3.26 being greater than the composite mean of 2.64, the result imply that existing unresolved land ownership issues have an influence on community livelihoods. The standard deviation of the line item *(SD=1.306)* is higher than the composite standard deviation *(SD=1.054)* meaning that the respondents had divergent opinions on the matter.

4.7.1: Correlation of Institutional Dimension and Community livelihoods

The study sought to assess the relationship between institutional dimension and Community livelihoods. Pearson correlation coefficient was adopted to test the relationship between institutional dimension and Community livelihoods at a

significance level of 0.05. The correlations results obtained are presented in Table 4.20.

Table 4.19: Correlation of Institutional Dimension and Community Livelihood

Variables		Community livelihoods
Institutional dimension	Pearson correlation	.114
	Sig. (2-tailed)	.099
	n	209

**. Correlation is significant at the 0.01 and 0.05 level (2-tailed)

The results provided in Table 4.20 of the study demonstrated that there exist a weak insignificant positive correlation between institutional dimension and community livelihoods, *r(207), = .114, p = .099*. The results confirm that the correlation between institutional dimension of LTWP projects and community livelihoods is insignificant.

4.7.2: Regression of Institutional Dimension and Community livelihoods

A regress analysis was carried out to determine whether institutional dimension of LTWP power have influence of community livelihoods. This is described in the following sub-themes.

4.7.2.1: Model of Institutional Dimension and Community Livelihoods

The model sought to establish how institutional dimension as a predictor significantly or insignificantly predicted Community livelihoods. The regression model summary results are shown in Table 4.11.

Table 4.20: Model of Institutional Dimensions and Community Livelihoods

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.114[a]	.013	.008	.42209

a. Predictors: (Constant), Institutional dimensions

A regression analysis was conducted to generate the results shown in Table 4.21 that show a coefficient determination of 0.114 and R – Square of 0.013. The established R^2 indicated that the institutional dimensions of LTWP projects accounts for 1.3%

likelihood of variances on community livelihoods, (R = .013, p = .099). The findings suggest that the likelihood of institutional dimension causing influence on community livelihoods are insignificant.

4.7.2.2: ANOVA of Institutional Dimension and community Livelihoods

The study sought to establish if the regression model is best fit for predicting community livelihoods after use of institutional of dimension. The results of regression ANOVA statistics are represented in Table 4.17.

Table 4.21: ANOVA of Institutional Dimensions and Community Livelihoods

Model	Suma of Squares	df	Mean Square	F	Sig.
1 Regression	.488	1	.488	2.740	.099[b]
Residual	36.879	207	.178		
Total	37.367	208			

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Institutional dimension

The results indicated that the model was insignificant in predicting the influence of institutional dimensions of LTWP project on community livelihoods, *F(1, 207), = 2.740, p = .099 > .05*. Thus, the model could only predict a small likelihood of variances caused by institutional dimensions on community livelihoods.

4.7.2.3: Co-efficient of Institutional Dimension and Community Livelihoods

The study sought to establish the influence of Institutional Dimension on Community livelihoods. The regression coefficients results are represented in Table 4.23

Table 4.22: Coefficients of Institutional Dimensions and Community Livelihoods

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	**t**	**Sig.**
1 (Constant)	1.828	.165		11.105	.000
Institutional dimension	.101	.061	.114	1.655	.099

a. Dependent Variable: Community livelihoods

Finally, the regression coefficients output shown in Table 4.23 illustrates that institutional dimensions of LTWP projects have insignificant influence on community livelihoods *(B = .101, p = .099 > 0.05)*. The findings, therefore, demonstrated that the study accepted the null hypothesis and concluded that there is no significant relationship between institutional dimensions of LTWP projects on community livelihoods. This further means there is enough evidence to accept to null hypothesis. It further points to the fact the institution dimension as it is by the time of conducting this study has not influenced community livelihoods in the project area. The findings are in agreement with previous scholars like Njoh et al. (2019) who found that rural renewable energy programs are characterized by bureaucratic systems, leadership structures controlled from the top, and importantly, lacks inter-organizational collaboration, which does not bring positive benefits to the community.

4.8: Renewable Energy Dimension and Community Livelihoods

The section provides a summary of the joint correlation and regression analyses results of the joint renewable energy projects' dimensions (economic, social, environmental, and institutional dimensions) influence on community livelihoods using multiple regression model.

4.8.1: Correlation- Joint Renewable Energy and Community Livelihoods

The study sought to assess the relationship between Joint Renewable Energy dimension and Community livelihoods. Pearson correlation coefficient was adopted to test the relationship between Joint Renewable Energy dimension and Community livelihoods at a significance level of 0.05. The correlations results obtained are presented in Table 4.24.

Table 4.23: Correlation of Joint Renewable Energy and Community Livelihoods

Variables		Economic dimension	Social dimension	Environmental dimension	Institutional dimension	Community livelihoods
Economic dimension	Correlation	1				
	Sig. (2-tailed					
	n	209				
	Correlation	.095	1			
Social dimension	Sig. (2-tailed	.171				
	n	209	209			
Environmental dimension	Correlation	.219**	-.099	1		
	Sig. (2-tailed	.001	.156			
	n	209	209	209		
Institutional dimension	Correlation	.557**	-.136**	.271**	1	
	Sig. (2-tailed	.000	.049	.000		
	n	209	209	209	209	
Community livelihoods	Correlation	.171*	.283**	.263**	.114	1
	Sig. (2-tailed	.013	.000	.000	.099	
	n	209	209	209	209	209
	Correlation					
	Sig. (2-tailed					
	N					

**. Correlation is significant at the 0.01 level (2-tailed)

The Bivariate Pearson Correlation output in Table 4.24 indicated that jointly, economic dimensions, $r(204), = 0.171, p = 0.013$, social dimensions, $r(204), = 0.283, p < .001$, and environmental dimension, $r(204), = .236, p < 0.001$ variables all have significant and moderate correlation with community livelihoods. The results further provided that there is a weak insignificant positive correlation between institutional dimension and community livelihoods, $r(204), = .114, p = .099$.

4.8.2: Regression: Joint Renewable Energy and Community Livelihoods

The study further conducted a joint regression analysis to generate results of a combined (Social, Economic, Environmental and Institutional) dimensional influence of renewable energy projects on community livelihoods.

4.8.2.1: Model: Joint Renewable Energy and Community Livelihoods

The model sought to establish how Joint renewable energy dimension as a predictor significantly or insignificantly predicted Community livelihoods. The regression model summary results are shown in Table 4.25.

Table 4.24: Model of Renewable Energy Projects and Community Livelihoods

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.417[a]	.174	.157	.38909

a. Predictors: (Constant), Economic dimensions, Social dimensions, Environmental dimensions, Institutional dimensions

The regression model summary results in Table 4.25 shows a coefficient of determination (R) of 0.417 suggesting that overall, there is a correlation between joint influence of renewable energy projects and community livelihoods. Importantly, the established R square of .174 indicated that in general, the joint influence of renewable energy projects accounts for 17.4% likelihood variances on community livelihoods, *(R^2 = .174, p < .001)*. This suggests that there could be other dimensions of the LTWP projects influencing community livelihoods but not included in this study.

4.8.2.2: ANOVA: Joint Renewable Energy and Community Livelihoods

The study sought to establish if the regression model is best fit for predicting community livelihoods after use of Joint renewable energy dimensions. The results of regression ANOVA statistics are represented in Table 4.26.

Table 4.25: ANOVA of Joint of Renewable Energy and Community Livelihoods

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	6.484	4	1.621	10.708	.000[b]
Residual	30.883	204	.151		
Total	37.367	208			

a. Dependent Variable: Community livelihoods
b. Predictors: (Constant), Economic dimensions, Social dimensions, Environmental dimensions, Institutional dimensions

The established joint regression ANOVA results in Table 4.26 clearly demonstrates that the overall model of the study was significant in predicting the likelihood of joint influence of Joint renewable energy projects on community livelihoods, $F(4, 204), = 10.708$, $p < .001$. The results, significantly explain changes in community livelihoods as a result of variations in the joint influence of renewable energy projects.

4.8.2.3: Coefficient: Joint Renewable Energy and Community Livelihoods

The study sought to establish the influence of Joint Renewable energy dimension on Community livelihoods. The regression coefficients results are represented in Table 4.27.

Table 4.26: Regression: Joint Renewable Energy and Community Livelihoods

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	**t**	**Sig.**
1 (Constant)	-.202	.364		-.555	.820
Economic dimension	.034	.052	.052	.663	.508
Social dimension	.310	.066	.312	4.729	.000
Environmental dimension	.432	.108	.267	4.007	.000
Institutional dimension	.049	.071	.055	.693	.489

a. Dependent Variable: Community livelihoods

The regression analysis results in Table 4.27 further reveals that though all the independent variables (economic dimension, social dimension, environmental dimension, and institutional dimension) have influence on community livelihoods, only social dimension and environmental dimension have significant values less than

5% level of significance. The findings showed that the study rejected the stated null hypotheses of both social dimension *(B = .310, p < .001)* and environmental dimension *(B = .432, p < .001)* and concluded that there is a significant influence of both social dimension and environmental dimensions on community livelihoods. As for economic dimension and institutional dimension, the study accepted the null hypotheses and concluded that there is no significant influence of both economic dimensions *(B = .034, p = .508)* and institutional dimension *(B = .049, p = .489)* on community livelihoods.

The findings, therefore, indicated that when all factors/dimensions are held constant, the state of community livelihoods would be -.202. However, execution of LTWP projects would only contribute about 3.4% and 4.9% in terms of economic dimensions and institutional dimensions to community livelihoods respectively. Consequently, improvement in the implementation of LTWP projects would significantly contribute about 31% and 43.2% in terms of social dimensions and environmental dimensions to community livelihoods respectively.

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1: Introduction

This chapter briefly provides the summary of the study including the findings together with a broad discussion of the study findings. The chapter further covers conclusions, recommendations of the study, and areas of further research.

5.2: Discussion

This section comprehensively discusses the findings of the study and then demonstrates similarities and differences between findings of this study with those of previous studies highlighted discussed in the literature review. The discussions are based on the joint regression analysis results conducted to test the joint influence of renewable energy projects on community livelihoods. The justification for basing the discussion on joint regression hypothesis tests was to maintain the focus on idea of the study; the influence of renewable energy projects on community livelihoods. The discussions follows the flow of research objectives.

5.2.1: Economic Dimension and Community Livelihoods

A regression analysis conducted to test the hypothesis of the study reported a p-value (p=0.489) higher than the recommended significance level (p=0.01) for testing the hypothesis. The finding confirmed the stated null hypothesis of the study; economic dimension has no significant influence on community livelihoods. A joint regression analysis conducted to test the hypothesis of the study reported a p-value (B = .034, p = .508) higher than the recommended significance level (p=0.01) for testing the hypothesis. The stated null hypothesis of the study was therefore accepted and concluded that there is no significant influence of economic dimension on community livelihoods. This was further supported by the descriptive findings where the majority

of the respondents disagreed that the LTWP project has led to increased job and business opportunities, invested in economic development and has spurred community economic empowerment. Similarly, more respondents agreed that the LTWP project's economic dimension has not delivered on its community social responsibility promises to the communities. These findings were based on direct interviews with the communities within the project area and during full operationalization of the project. Therefore the study and its findings help fill a gap seen from previous study by Olsen and Westergaard-Kabelmann (2018) that did not conduct direct interviews with communities but project representatives and secondary sources and the study was conducted just before the end of the construction phase when job opportunities were still significant.

The findings agree with Renkens (2019) in his case study on Kenya's LTWP and Olkaria Geothermal power plants. Renkens established dwindling job opportunities attributed to scaling down of low skilled labor after at end of construction period to allow limited skill requiring jobs, which favored skilled persons from outside the local communities (2019). Moreover, the findings of this study are in agreement with the previous outcome outlined by May and Nilsen (2015) in their longitudinal German study. May and Nilsen reported that there was no significant economic impact of the wind power projects on local economies and have no impact on GDP per capita. Besides, the authors affirm that the importance of wind power to local economic developments is marginal. Olsen & Westergaard-Kabelmann, (2018) agreed with the finding on lack of influence on increased job opportunities as he estimated that the available jobs by LTWP would reduce by a whopping 82% from about 1850 during construction to a dismal 335 jobs during operations.

The outcome of this study, however, disagreed with several authors who previously conducted a similar study and found a significant relationship between the economic dimension and community livelihoods in different countries. To start with, a study by Olsen and Westergaard-Kabelmann, (2018) focusing on socio-economic impacts of from Lake Turkana Wind Power in Kenya's Marsabit County, utilized a mix of extensive literature review, both grey and published and primary data collection methods. The study posited that LTWP project led to improved economic fortunes as evidenced by reduction in cost of food by an estimated 25%, transportation by 26.5%, three fold profit growth in the fresh fish market as well as about 1800-1900 local jobs during construction period. While the Olsen and Westergaard-Kabelmann investigated on value addition, cost of foods, and transport cost impact, the current study address gaps around community perceptions post construction period on influence on direct jobs, income, business growth, corporate social responsibility projects (CSR) Projects and investment in project with the potential to spur local economic growth.

Furthermore, Ongoma (2017) while focusing on the social, economic environmental dimension of the Wind Power projects as viable renewable energy sources in Kenya, a case study of Ngong Wind Farm in Kenya established that the Ngong Farm Project improved local economy through the provision of job opportunities and opening up of access roads to the project site. Similarly, the study disagreed with Hatlelid and Aass (2016) whose study in Rwanda demonstrated that REPs improve people's well-being and reduce poverty at the community level. The study further disagreed with Shoaib and Ariaratnam (2016) who conducted a study on the socio-economic impacts of REPs on a community in Afghanistan. The outcome of the study found a moderate economic impact of REPs evidenced by moderate business growth and job creation.

Further the findings disagree with the findings of a Pakistan based case study by Li, et al., (2022) whose study on the contributions of renewable energy initiatives on local economy and employment suggested improved local economic influence as evidenced by a combined 8,905 jobs and about USD 39.8 million production values in related sectors to the economy. To add to this, Renkens, established that although the exploitation and community land and its resources is highly profitable to the external players, community themselves do not benefits.

Whereas these studies provided moderate or significant positive benefits of economic dimension of wind energy projects, the results are not in agreement with the findings of this current study, which has established no significant influence of the economic dimension of LTWP projects on community livelihoods in Marsabit County.

5.3.2: Social Dimension and Community Livelihoods

The study performed a joint regression analysis to test the second hypothesis of the study; there is no significant relationship between social dimensions and community livelihoods. From the established joint regression coefficients findings, the study rejected the null hypothesis and concluded that there is a significant influence of social dimensions of LTWP projects on community livelihoods in Marsabit County. The findings however point to the influences being two fold; positive and negative influences.

The majority of the respondents feel that the social dimensional has not increased income, has led to displacement without commensurate resettlement and led to emergence of new settlements. Although researchers (Olsen and Westergaard-Kabelmann, 2018; Schilling et al. 2018; Cormack and Kurewa, 2018; Renkens 2019;) acknowledged the resettlement Sarima village with the LTWP project, they do not assess the emergence of other settlements. This study established the emergence of

new settlements other than the resettlement Sarima village suggesting that displacement, related poor resettlement and in migration situation could be worse than originally thought. Further agreeing with the findings mentioned, Koisaba, (2017) found that for the communities displaced by Olkaria Geothermal Power project, their livelihoods were not restored to the level equal or above their status before relocation. The study findings also agrees with Schilling et al. (2018) which established that communities in the project area agree that they have not been adequately compensated amid questionable land acquisition modality. Schilling however used qualitative methods and group interviews that may limit the accuracy of the findings established as respondents may shy away from providing sensitive information in a group set up. To fill this gap, the current study utilized individual interviews with the communities potentially influenced by REP project; LTWP.

Still on the negative influences of the social dimension, the findings pointed to increased social ills including disease incidences, alcoholism and prostitution. Agreeing with this finding, Renkens, (2019) established emergence of substance abuse, alcohol, gender based violence and increased conflict over scarce resources in the Sarima Village within LTWP project site. Renkens potentially missed first-hand information from persons directly or indirectly influenced by the project he sourced his data from desk reviews of published and grey literature and interviewed third party respondents. This study addressed this gap by using direct interviews targeting the community members in the project.

Another key finding was the increased insecurity and conflicts found to have increased since the inception of the project attributed to competition for resources emanating from LTWP project. Although previous studies reported incidences of insecurity and conflicts (Olsen and Westergaard-Kabelmann, 2018; Renkens 2019;

schilling et al., 2018), it was never clear whether the insecurity increase was linked to the project itself. This study addressed this gap as it established not only increased insecurity but direct linked it to REP; LTWP. Specifically, increased insecurity was linked to competition for resources emanating from LTWP. The finding is also attributable to prevailing unequitable sharing of resources and opportunities among the communities and stakeholders as established by the study. In fact, Renkens finds that Kenya natural resource sharing bill has not been fully implemented (Renkens, 2019) therefore limiting the extent to which the REPs may positively influence community livelihoods. These findings further agreed with findings by Cormack and Kurewa, (2018) in their study titled "The changing value of land in Northern Kenya: the case of Lake Turkana Wind Power. The study found the project has refreshed existing historical and cultural connections of the communities to the project land making them feel that they should benefit from it. They also find that the value of the project land goes beyond its physical nature, its potential for utilization to include the resources and opportunities emanating from it. If these resources are not equitably shared as established, becomes a recipe for conflicts in an already insecure area characterized by cattle rustling. Cormack and Kurewa add that communities go through new forms of exclusion in accessing benefits from a resource they consider their own (2018). Furthermore, the findings of this study concur with Schilling et al. (2018) who established that the conflict emanate from unmet promises of compensation for land, employment and unfair sharing of resources.

On the cultural front cultural effects, Renkens found erosion of local cultures however; this study established that the social dimension had no effect on local cultures (2019). Renkens however used secondary data and third party respondents to

establish this finding. The study current however addresses the existing gap by using direct interviews with community members living in the project area.

Overall, based on the descriptive results, the negative influences out way the positive ones as evidenced by inappropriate compensation and resettlement, failure to increase job opportunities, increased conflicts attributed to competition for LTWP related resources, increased incidence of disease and social ills including alcoholism and prostitution. The joint regression analysis confirms that the influence of the social dimension is significant. In conclusion, therefore, the social influences of renewable energy projects are significant but mostly negative at the time of this study. This clearly calls for strategies to mitigate adverse social dimension aspects.

5.3.3: Environmental Dimension and Community Livelihoods

The third hypothesis; there is no significant relationship between the environmental dimension and community livelihoods was carried out. As per the joint regression analysis results, the environmental dimension produced a significant p-value ($B = .432$, $p < .001$), hence the null hypothesis was rejected and alternative hypothesis accepted. These findings suggested that there is a significant and positive influence of the environmental dimension of the LTWP project on community livelihoods.

The descriptive results find that majority of the communities did not experience turbine noise, shadow flicker effects usually associated with turbines, irritation and annoyance associated with dust, noise and shadow flicker and that the turbines had no effect on wildlife. Kumar (2020) agrees with the limited negative environmental impacts as the researcher found that wind energy projects have minimal impact on land as it lack pollutants and wastes that penetrate into the earth and flow into rivers.

Disagreeing with the finding that Wind Power environmental dimension have no adverse effects on community livelihoods, Ata Teneler in his study reviewing various

studies to assess the relationship between Wind Turbines and health effects, established that sleep difficulties, annoyance and shadow flicker effect were associated with wind turbines (Ata Teneler, 2018). This is attributable to a related finding that established that wind turbines were located at recommended distances of over 1km from the households and homes. The manifestation of the influences emanating from Wind turbines depends on the number of turbines and the distance from the wind turbines (Ata Teneler, 2018). The study by Ata Teneler was collected through a review of previous studies and therefore may not have the most updated information relevant to the influence of LTWP on community livelihoods. The current study therefore provides a more current environmental influence data.

Pawlaczyk-Łuszczyńska et al. (2018) who assessed the perception and annoyance of turbine noise in populated areas of Poland, found that other factors influencing perception include general attitude to wind farms, noise sensitivity and terrain shape (annoyance outdoors) or road-traffic intensity (annoyance indoors) (Pawlaczyk-Łuszczyńska et al., 2018). Renkens (2019) who established devastating environmental impacts of renewable energy projects in Kenya further disputes the findings. Renkens found increased pollution of water, soil and air through bad smell as well as increased incidence of respiratory, eye and skin diseases associated with toxic gases (2019). Further studies differing from the finding on limited adverse environmental effects established that annoyance emanating from direct visibility, shadow flicker, and blinking lights was significantly associated with an increased risk for sleep disorders (Freiberg et al., 2019). The systemic review study by Freiberg et al., (2019) assessed the influence of wind turbine visibility on the health of local residents. On the effect on wildlife, Renkens, (2019) established that Geothermal Power station in Olkaria

Kenya led to loss of 32 square kilometre of wildlife habitation potentially leading to loss of wildlife. This disagrees with the finding in this study.

The study established increased dust as well as increased incidences of injuries and death associated with road usage. Agreeing with these findings Olsen and Westergaard-kabelmann, (2018), found increased incidences of death and accidents along project access roads within LTWP project site. The current study further established physical changes to the land due to excavations, construction work and turbine installation. Renkens in its study of LTWP and Geothermal power stations found that there was soil erosion and overall land degradation associated with the projects (2019).

Two key parameters not previously studies by other studies include the perception on community support of the project in its current form and a potential future expansion. It was established that there opinion is split on those who support and those who do not however what came out clearly was that the communities do not favor expansion of the project beyond its current coverage.

The limited adverse and more positive effects explains the prevailing support of the project by communities however, this may change if the adverse effects begin to affect communities. These findings point to significant and positive environmental influences compared to negative ones for the case of LTWP. Therefore, there is a need for LTWP and other stakeholders to mitigate adverse effects to ensure that the positive influence of the environmental dimension outweighs the negative impacts.

5.3.4: Institutional Dimension and Community Livelihoods

The fourth objective of this study sought to examine how institutional dimension of the LTWP project influences community livelihoods. The aim was to test the hypothesis; there is no significant relationship between institutional dimension and

community livelihoods. From the regression analysis conducted; the findings clearly upheld the null hypothesis that there is no significant influence of institutional dimension of the LTWP project on community livelihoods *(B = .049, p = .489)*.

The finding is supported by the descriptive results which established the existing unresolved land ownership issue, the adequate consultation of the communities on land acquisition by the project, limited free and fair access to opportunities such as jobs emanating from the project and limited faith in the community representation. The descriptive results further supported the regression analysis that the individuals involved in the study were unaware or were neutral regarding whether the LTWP project's institutional dimension promoted inter-organizational collaborations with other players to optimize how the project benefits the communities living around the project area. This findings agree with Njoh et al. (2019) whose study demonstrated that rural renewable energy projects are characterized by bureaucratic systems, and leadership structures which are controlled from the top and to a greater extent, do not promote inter-organizational collaboration. According to the authors, such systems limits the degree to which institutional dimension of renewable projects can optimize benefits to the communities. Moreover, the results by Njoh et al.'s study indicated that bureaucracy itself and the lack of collaboration obstruct potential information dissemination, which is critical for the support and sustainability of renewable energy projects in developing countries. Further findings agreeing with the finding on lack of significance influence of institutional dimension specifically is depicted in a study by Schilling et al., (2018) which sought to understand a local to global viewpoint of oil and wind exploitation, resource governance and conflict in Northern Kenya including LTWP. The findings by the current study specifically; unresolved land ownership issues, inadequate consultation of the communities on land acquisition by the project

and limited free and fair access agree with Schilling et al., (2018) who also found the questionable land acquisition issue, inappropriate resettlement as well as unfair sharing of resources.

Moreover, still agreeing with these findings, Koisaba found inappropriate resettlement and compensation that was worsened by the failure of the project to consult the communities and lack of due diligence before resettling (2017). This led to displacement and resettlement of communities in a land that is not appropriate to their livelihoods and unfit for agriculture. This is according to a study by Koissaba focusing on Geothermal Energy and Indigenous Communities, a case study of Olkaria Geothermal Power Projects in Kenya. According to Schilling et al., (2018), the existing court case against the LTWP Project land acquisition is a testimony that not all are communities were in agreement with the questionable modality of the acquisition. In fact, Cormack and Kurewa, (2018), added that the project has refreshed existing historical and cultural connections of the communities to the project land who feel that they should benefit from the project land. They added that local communities feel new forms of exclusion in accessing benefits from a resource they consider their own.

One positive outcome from this study was the finding that the project has not reduced grazing land size so far implying that communities are still able to access grazing areas. This finding is as agreeing with a finding by Schilling, et al., (2018) who observed continued access to project areas of LTWP and Tullow Oil generation in Turkana by communities despite the project's presence.

For this project to influence communities significantly, mechanism for adequate community engagement needs to be put in place to promote free and fair access to opportunities by different communities and stakeholders, provide a platform for

prioritizing community needs as well as streamlining processes and benefits for using resources emanating from locally available resources.

5.3.5: Joint Renewable Energy Dimension and Community Livelihoods

In addition to establishing the specific influence of the research objectives independently as outlined above, the study further established the joint influence of renewable energy projects on community livelihoods. From the regression and correlation analysis conducted, the results confirmed renewable energy has a significant influence on community livelihoods. The Significance of the result is mainly because of the significant social and environmental dimensional influence. The results are in agreement with previous studies such as Kumar (2020) that found that renewable energy projects benefit communities in many ways. Kumar finds that such initiatives include job creation, community participation which expands community shareholding opportunities, and provision of renewable energy to the community geared towards improving community livelihoods and also emphasizes the significant impact of renewable energy projects on the community. The economic dimension and institutional dimension were found not have had significant influence on community livelihoods owing limited job creation and economic empowerment initiatives while the institutional aspects was attributed to poor institutional frameworks for community involvement, resource sharing and representation, land acquisition challenges and poor collaboration mechanisms with stakeholders. The improvement in the institutional and economic dimension of LTWP paying attention to the weak areas identified in the study will result into a bigger positive influence on community livelihoods.

5.3: Summary of Findings

Kenya's quest to meet the green energy and the ever-growing energy demand has led to rapid development of renewable energy projects. Despite the numerous investments in green energy in developing countries, little attention been paid to understanding the potential influence of such projects on community livelihoods especially in rural communities. To summarize the influences of renewable energy projects on community livelihoods, the findings are summarized under the following sub-themes;

5.3.1: Economic Dimension and Community livelihoods

Concerning the specific objectives of the study, the study found that there is no significant influence of economic dimension *(B = .034, p = .508)* on community livelihoods. This finding is further strengthened by the composite mean of 2.93 that was less than 3.0 with a standard deviation of 1.005. The correlation and regression results, *r(204), = 0.171, R^2 = .029, p =0.013)* showed significant and moderate correlation between economic dimension and community livelihoods however its influence on community livelihoods was minimal at just 2.9%. The regression ANOVA statistics further confirmed that the influence of economic dimensions though minimal was significant, F(1, 207), = 6.245, p = .013).

The results of joint regression analysis conducted to test the hypothesis of the study informed the conclusion that there is no significant influence of economic dimension on community livelihoods. The majority of the respondents reported that LTWP project did not bring about increased job and business opportunities did not invest in economic development initiatives, has not delivered on its Corporate Social Responsibility (CSR) projects as were planned and therefore did not inspire community economic empowerment. Therefore, as it is without any intervention to change the status of these parameters on economic dimension, the communities are

likely to continue to miss on economic opportunities with potential of a positive influence on community livelihoods.

5.3.2: Social Dimension and Community livelihoods

The study established that social dimension had a significant influence on community livelihoods in Marsabit County (B = .281, p < .001>0.05). The social dimension demonstrated a composite mean of 3.03 which greater than 3.0 and a standard deviation of 1.059. Further the study established a significant and moderate linear correlation between social dimension and community livelihoods, r(207), = .283, p < .001. The social dimensions of LTWP projects had the potential to cause approximately 8% of changes on community livelihoods (R2 = .080, p < .001). The ANOVA results, *F (1, 2017), = 18.004, p < .001)* confirmed appropriateness of the model predicting the influence of social dimension on community livelihoods.

Based on the descriptive results, the findings show that social influences are all undesirable but one; majority of the respondents reported that the social dimension had no adverse influence on local cultures. The rest of the influences were negative with a majority of respondents reporting that the social dimension has not increased income, caused displacement without commensurate resettlement and inspired the emergence of new settlements which is not necessarily good in an underdeveloped Marsabit County characterized by scarcity and limited social amenities. There was increased social ills; alcoholism and prostitution, diseases, increased insecurity linked to the competition for social dimensional related resources, prevailing unequitable sharing of resources and opportunities. This clearly points to social dimensional influences that were clearly adverse.

5.3.3: Environmental Dimension and Community livelihoods

The study established that environmental dimensional influence on community livelihoods was found to be significant *(B = .425, p < .001>0.05)*. This variable produced a composite mean of 2.61 less than 3.0 and had a standard deviation of 0.973. The correlation analysis produced a significant and positive moderate correlation, r(207), = .263, p < .001) between environmental dimension and community livelihoods. The regression analysis produced an R square (R^2) of (R^2 =

.069, p < .001) showing potential to cause minimal changes on community livelihoods. The ANOVA results of F (1, 207), = 15.331, p < .001>0.05) confirmed its appropriateness of the model for analysis.

This finding is backed up by a series of data points that point the limited adverse influence of environmental dimension on community livelihoods. The majority did not experience turbine noise, shadow flicker effects, irritation and annoyance resulting from dust, noise and shadow flicker and that the turbines had no effect on wildlife population. Comparably only three negative parameters did not attract positive perception from the respondents. These included the finding that a majority of the respondents reported increased dust, increased incidences of injuries and fatalities associated and physical changes to the land due to excavations, construction work, road usage and turbine installation. More striking was the finding that almost all, 203 (97%) of the respondents among the 235 interviewed reported they have no access to electricity despite the production of clean energy near their homes. Although opinion is split on whether the community currently supports the project, seemingly the more negative than positive influences may be attributed the finding that a majority of the respondents do not support further expansion of the project to cover more land area.

5.3.4: Institutional Dimension and Community livelihoods

The study established that there is no significant influence of institutional dimension of the LTWP project on community livelihoods *(B = .101, p = .099 > 0.05)*. This variable produced a composite mean of 2.64 and a standard deviation of 1.054. The relationship between institutional dimension and community livelihoods was weak and insignificant, r (207), = .114, R^2= 0.013, p =.099). The regression model was found fit for predicting the influence of institutional dimension on community livelihoods *F (1, 207), = 2.740, p = .099 > 0.05)*.

Based on the descriptive statistics, a majority of the respondents reported existing unresolved land ownership issue, the adequate consultation of the communities on land acquisition by the project, limited free and fair access to opportunities such as jobs emanating from the project and limited faith in the community representation. The perception on whether the institutional dimension did not promote collaboration between the project and stakeholders for the benefit of the community livelihoods. The only positive influence of the institutional dimension was the finding that a majority of the respondents reported that the dimension has not reduced grazing land size.

5.3.5: Joint Renewable Energy Project and Community Livelihoods

The study confirms that the joint renewable energy dimension overall has a significance influence on community livelihoods. This is attributable to the significance influence of both social dimension *(B = .310, p < .001<0.05)* and environmental dimension *(B = .432, p < .001<0.05)*. The economic dimension *(B = .034, p = .508>0.05)* and institutional dimension *(B = .049, p = .489>0.05)* were found not have had significant influence on community livelihoods. This suggests that the influence of economic and institutional dimension on community livelihoods were minimal. The correlation analysis showed that jointly, all independent variables were significant and moderately related to community livelihoods; economic dimensions, *r(204), = 0.171, p =0.013*, social dimensions, *r(204), =0.283, p < .001*, and environmental dimension, *r(204), = .236, p < 0.001)*. The results further showed that there was a weak insignificant positive correlation between institutional dimension and community livelihoods, *r(204), = .114, p = .099)*. The regression model summary results *(R^2 = .174, p < .001)* meant that the Joint Renewable energy dimension has a potential to cause change of 17.4% of Joint Renewable Energy dimension on

community livelihoods. The joint regression model utilized was fit, $F(4, 204) = 10.708$, $p < .001$) for predicting the influences of Joint renewable energy dimension on community livelihoods.

The influence of social and environmental dimension are significant. As earlier reported the social and environmental dimension of community livelihoods have the potential to contribute about 31% and 43.2% changes in community livelihoods respectively. It is worth noting by the time of conducting this study, the social dimensional parameters point to largely negative influences. To start with, a majority of respondents reported no increased income, occurrence of displacement without commensurate resettlement, emergence of new settlements and increased social ills including disease incidences, alcoholism and prostitution. Moreover, there increased insecurity and conflicts since the inception of the project attributed to competition for resources emanating from LTWP project. The only notable neutral influence of social dimension was that the fact the social dimension did not have adverse influence on the local culture as previous reported by Renkens in 2019.

The Environmental dimension on community livelihoods was found to be significant. From the analysis, the dimension so far has not caused adverse effects that the community could notice based on a majority of the respondents. The majority did not experience turbine noise, shadow flicker effects, irritation and annoyance associated with dust, noise and shadow flicker and that the turbines had no effect on wildlife population. The only negative influence of the environmental dimension was the finding that a majority of the respondents reported increased dust, increased incidences of injuries and death associated with road usage and construction works and physical changes to the land due to excavations, construction work and turbine installation. This concurs with findings by Renkens LTWP and Olkaria Geothermal

power stations that established the occurrence of soil erosion and overall land degradation associated with the projects (2019).

The economic dimension was found to have no significance influence on community livelihoods. This is largely attributed to findings a majority of the respondents disagreed that economic dimension of LTWP had so far stimulated increased job and business growth, invested in economic development, led to community economic empowerment and delivered the community social responsibility projects to the communities. The insignificance influence of the institutional aspects was attributed the findings that that the respondents reported the institutional dimension did not project-community community involvement, resource sharing, poor community representation, questionable land acquisition factor and LTWP's poor collaboration mechanisms with stakeholders.

5.4: Conclusions

Following detailed analysis as well as comprehensive discussions of the research findings, this study makes several conclusions as per the research objectives.

Objective One

First, the study concludes that though renewable energy projects may be important in empowering the communities economically through appropriate development, so far the project has not influenced the community livelihoods in that front. Despite the full operationalization of LTWP and evacuation of power to the national grid, still economic dimension of LTWP has no significant influence on community livelihoods. While the Kenya Government is paying the investors for the power, evidently little of the income has trickled down to the community. Specific findings show that the LTWP project's economic dimension has not implemented corporate social responsibility projects (CSR) projects promised to the communities. Job

opportunities have also dwindled post construction period of the project hence reducing the likelihoods of project benefiting the community economically. The communities still depend on their traditional livelihoods as the main source of income Moreover, despite the evacuation of power, communities in the project area do not yet access electric power. The study also concludes that the LTWP project has not invested in development projects that that can empower the communities economically.

Objective Two

This study further concludes that indeed there is a significant influence of the social dimension of the LTWP project on community livelihoods. Important to note is that the influence is two-fold; positive and negative. Various negative influences established included the displacement of communities without adequate compensation, reported no increase in income, emergency of new settlements, and increased incidences of new diseases and social ills such as alcoholism and prostitution. The study also established increased insecurity and conflicts associated with competition for local resources. The increased conflicts was attributed to competition for resources and maybe the established unequitable distribution of resources to communities. There were mixed findings about whether new settlements faced scarcity of social amenities such as water could have been as a result of mitigation by LTWP which was found to have provided water in the new settlements (Renkens, 2019). With a deliberate effort to tackle social challenges through investments in social responsibility projects, dimension aspect of renewable energy projects can significantly, improve community livelihoods.

Objective Three

Third, this study concludes that there is a significant influence of the environmental dimension of the LTWP project on community livelihoods. Specifically, the findings showed that there was negligible adverse effects on wildlife, shadow flicker and turbine noise effects and no reports of shadow flicker effects being irritating and annoying. The latter three are attributed to the fact that a majority of the homes were established at distances beyond 1km from the nearest turbine. However the communities reported adverse influences including increased incidences of injuries and death, disfigured landscapes and increased dust. The LTWP did not provide electricity despite producing power from the project site. Although the prevailing community support shows mixed results, community do not favour future expansion of the project to cover more land area.

Objective Four

Regarding the institutional dimension of LTWP project, the study concludes that the institutional dimension has no significant influence on community livelihoods. This is attributed to weak institutional frameworks for strengthen the processes and actions for which REPs could improve community livelihoods. This is evidenced by limited community involvement in pertinent matters on land acquisition and project management, weak collaboration strategies and reported unfair sharing of resources among communities and stakeholders. There was also a lack of faith on community representatives and poor handling of resettlement and compensation mechanisms of the displaced persons. Appropriate institutional frameworks are necessary to bring the community on board and ensure that the community enjoys the institutional benefits of renewable energy projects.

Objective Five

The study concludes that the joint renewable energy dimension overall has a significance influence on community livelihoods however, the economic dimension and institutional dimension were found not have had significant influence on community livelihoods. This suggests that the influence of economic and institutional dimension on community livelihoods are minimal. On the other hand, social and environmental dimension were found to have a significant influences on community livelihoods, in fact, where the social and environmental dimensions of LTWP project are mitigated, the implementation of LTWP projects would significantly contribute about 31% and 43.2% in terms of social dimensions and environmental dimensions to community livelihoods respectively. Specifically, on the environmental dimension, if mitigation mechanism are put in place to address the lack of access to electricity to communities, land degradation, paving of the roads to reduce dust emission and reduction in the incidences of fatalities and death associated with road usage then the positive influences of the project on community livelihoods felt by the communities. On the social front, mechanism should developed that address the plight of displaced communities who belief they are not adequately compensated as well as the changing needs of vulnerable populations that have settled in the emerging settlements. Opportunities and initiatives that spur economic and business growth and create jobs for low literate communities will help change the fortunes of the economic dimension by making it more useful for improving community livelihoods. The mitigating increased social ills such as alcoholism and prostitution as well as increased incidences of diseases could help make the social dimension influences positive for the benefit of improved community livelihoods. To address most of these, an

improved institutional dimension that provides a mechanism for free and fair access of resources and opportunities, provides a framework for community engagement,

5.5: Recommendations

The study puts down the following recommendations based on the findings and limitations of this study,

1. It is clear that there is a need for more robust, transparent, and sustainable investment in socio-economic and community-based initiatives in vulnerable and low literate communities. This is likely to spur positive economic and social impacts through community led needs prioritization.
2. There is a need for a robust policy and strategies for ensuring transparent and fair sharing of opportunities, managing community expectations, tackling insecurity, and mitigating environmental and social concerns such as alcoholism, prostitution, pollution and land degradation and access to social amenities.
3. A strategic community engagement approach taking into consideration the different ethnic and interest groups. This strategy may help promote project sustainability and inclusion of community voices on matters that influence their livelihoods and secure community backing.
4. LTWP project management team could collaborate with other stakeholders including the national, County Government and Kenya Government's Rural Electrification Program to advance energy access to the communities and institutions in and around the project area. This has a double role in promoting access to clean energy and promoting environmental conservation by reducing dependence on wood fuel and charcoal.

5. There is need to address the increased insecurity that has been linked to competition for resources emanating from LTWP project by promoting transparency and fair sharing of resources.

5.6: Areas of Further Research

In spite of the study conducted on the influence of renewable energy project on community livelihoods, still other aspects need further research. Therefore, the following areas need further research.

1. There is a need to investigate the Health effects Wind Turbine noise and shadow flicker effects on personnel who work in the wind turbines. The current research targeted those living in the households often located at safe distances from the wind Turbines.
2. It will be vital conduct a separate study to assess whether Wind Turbines have had effects on the wildlife especially flying birds. Previous studies in other part of the world found that wind Turbines killed flying birds and destroyed flying objects. This was not easy to verify from the communities during this study.
3. It is necessary to understand how LTWP promotes collaboration with other development partners such as government, civil society organizations, and the community in its work to spur economic development and promote community support, as this did not come clearly from the community.

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APPENDICIES

Appendix I: Household Questionnaire

This questionnaire is aimed helping the research to generate data and information required to assess the influence of renewable energy projects on community livelihoods in Marsabit county: a case of Lake Turkana Wind Power project in Marsabit County, Kenya. The study is part of the requirements for partial fulfilment of a Master of Arts in monitoring and Evaluation (MandE) that is required of all MandE students in Africa Nazarene University. You are kindly requested to provide candid and honest information and or data required to fill out the questions therein. This information will be used for academic purposes only and will be kept confidential. Your name or any information that can identify you will not be required.

SECTION A: SOCIO-DEMOGRAPHIC DATA/INFORMATION OF THE RESPONDENTS

1. Questionnaire No: …… Household No: ……
2. Village/Cluster name: ……
3. Gender: 1: Male ☐ 2: Female ☐
4. Select age you belong

   1: <20 ☐ 2: 20 – 29 ☐ 3: 30– 39 ☐

   4: 50-59 ☐ 5: => 60 ☐ 4: 40 – 49 ☐

5. Select your highest academic qualification

   1: Primary ☐ 2: Secondary ☐ 3: Post-secondary ☐ 4: None ☐

6. Select your Current residence/village

   1: Sarima ☐ 2: Civicon ☐ 3: Ntaletiani ☐

5: Others (specify)……

SECTION B: SOCIAL DIMENSION

7. By ticking in the space provided, indicate the extent to which you agree or disagree with the influence of Lake Turkana wind power on the following social aspects of community livelihoods

   5: Strongly agree, 4: Agree, 3: Neither agree/disagree 2: Disagree 1: strongly disagree

Social dimension	**1**	**2**	**3**	**4**	**5**
Sources of income have increased through LTWP project social dimension since project inception in the project area					
The social dimension of LTWP meant that Communities were displaced from project site to pave way for the project					
LTWP's Social dimension meant that where communities were displaced, they were adequately resettled					
LTWP projects' social dimension led to mushrooming of new settlements in and around the project area					
As a result of the LTWP's social dimension, new settlements are facing scarcity of social amenities (water, electricity, sanitation facilities, health care etc)					
LTWP social dimension increased availability of					

social amenities/services e.g water, electricity, schools etc in all villages both new and old					
LTWP Power's social dimension has led to erosion of the local cultures					
LTWP social dimension has led to increased incidences of diseases (HIV, waterborne diseases, alcoholism, prostitution) in the new settlements					
LTWP power's social dimension has led to increased Insecurity/conflicts (cattle rustling, killings) and related violent act the inception of the project					
Conflicts/insecurity in the project area are a result of competition for LTWP project's social dimension related resources (land, jobs, business opportunities, and all other benefits)					

8. If there are any new villages that have cropped up due to resettlement or increased population influx into the project area, name them…….…….....
9. If there are any negative or positive changes to local cultures and way of live in the project area, state what changes you have noticed:

   ……

   ……

SECTION C: ECONOMIC DIMENSION

10. By ticking in the space provided, indicate the extent to which you agree or disagree with the following statement on the influence of Lake Turkana wind power project on economic aspects of community livelihoods in the project area

    5: Strongly agree, 4: Agree, 3: Neither agree/disagree 2: Disagree 1: strongly disagree

Economic dimension	**1**	**2**	**3**	**4**	**5**
LTWP project's economic dimension has increased job opportunities in the project area					
LTWP project's Economic dimension has increased business/entrepreneurial opportunities in the project area					
LTWP power's Economic dimension has not completed/delivered all its CSR projects promised to the communities					
LTWP project has empowered the communities economically since the project inception					
LTWP project has invested in development projects that have empowered the communities economically					

11. What project have LTWP project brought to improve community livelihoods?

    .....

12. What businesses/entrepreneurial activities that have emerged and grown as a result of LTWP

    .....

13. Name the main source of energy used at homes and schools? ……..

SECTION C: ENVIRONMENTAL DIMENSION

14. By ticking in the space provided, indicate the extent to which you agree or disagree with the contribution of the following environmental aspects to Lake Turkana Wind power project's influence on community livelihoods

    5: Strongly agree, 4: Agree, 3: Neither agree/disagree 2: Disagree agree 1: strongly disagree

Environmental dimension	**1**	**2**	**3**	**4**	**5**
My household/Homes/work place is located up to < 1km from the nearest turbine as informed by LTWP's environmental dimension					
Electric power from wind power or the national grid is the main form/source of energy used at households and schools in the project area owing to LTWP projects environmental dimension					
There has been emergence of Turbine Noise since the installation of the Turbines owing to LTWP Projects environmental dimension					
There has been an increased dust due to LTWP environmental dimension since the operationalization of LTWP project					
There has been an emergence of shadow flicker effect since the installation of the Turbines attributed LTWP project's dimension					
LTWP Project's environmental dimension's increased turbine noise, dust and turbine shadow					

flicker effects is irritating and or annoying					
LTWP project's environmental dimensional operation and road usage has increased injuries and death					
On the environmental dimension of LTWP, there have been adverse physical changes on the original land scape resulting from excavations, construction and turbine installation since the project inception					
On environmental dimension, the community currently supports the project					
On the environmental dimension, the community supports future expansion of the LTWP to cover more land area					
On the environmental dimensional aspect, the project has negatively affected wildlife (Bird and other wild animals') population in the project area and its environs					

15. Specify Specific reason/s for support or not of LTWP project and its future expansion plans……

SECTION D: INSTITUTIONAL DIMENSION

16. By ticking in the space provided, indicate the extent to which you agree or disagree with the following institution aspects of LTWP project in influencing community livelihoods in the project area.

5: Strongly agree 4: Agree, 3: Neither agree/disagree 2: Disagree 1: Strongly disagree

Institutional Dimension	**1**	**2**	**3**	**4**	**5**
The Institutional dimension of LTWP has resulted to existing unresolved land ownership issues between the project and the community					
LTWP project institutional dimension provided for adequate consultation with the communities on project land acquisition					
LTWP project's institutional dimension promotes collaboration with other development partners such as government, civil society organizations and community in its work					
LTWP's institutional dimension promotes free and fair access to opportunities such as jobs, businesses by all communities and community members					
LTWP's Project dimension help instil faith in the ability of the community representatives (e,g Liaison officers) to advocate for the interests of the community					
LTWP Project institutional dimension's land acquisition has reduced the available livestock grazing land					

Appendix II: NACOSTI License

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RESEARCH LICENSE



This is to Certify that Mr.. Leokoe Lolmuget Titus of Africa Nazarene University, has been licensed to conduct research in Marsabit, Samburu on the topic: INFLUENCE OF RENEWABLE ENERGY PROJECTS ON COMMUNITY LIVELIHOODS IN MARSABIT COUNTY: A CASE OF LAKE TURKANA WIND POWER PROJECT IN MARSABIT COUNTY, KENYA for the period ending : 09/March/2022.

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Appendix II: NACOSTI Introductory Letter



26th, February, 2021

E-mail: researchwriting.mba.anu@gmail.com,

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Tel. 0202711213

Our Ref: **16M03DMME020**
The Director.
National Commission for Science,
Technology and Innovation (NACOSTI),
P. O. Box 30623, 00100
Nairobi. Kenya

Dear Sir/Madam:

RE: RESEARCH AUTHORIZATION FOR: LEOKOE LOLMUGET TITUS

Leokoe Lolmuget Titus is a postgraduate student of Africa Nazarene University in the Master of Arts in Monitoring and Evaluation (MME) Program; School of Business Studies. In order to complete his program, Titus is conducting a research entitled: "**Influence of Renewable Energy Projects on Community Livelihoods in Marsabit County: A Case of Lake Turkana Wind Power Project in Marsabit County, Kenya.**"
Any assistance offered to him will be highly appreciated.

Yours Faithfully,



Dr. Wanjiru Nderitu

MME, Coordinator, School of Business,

Africa Nazarene University.

Appendix III: Study Site Map

