Volume 1, Number 1, 2023 **ISSN N0 ISSN 2791-190Xv**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Laikipia University Journal of Social Sciences, Education and Humanities (*JSSEH*), ISSN No. 2791-190Xv is published by Laikipia University, P.O. Box 1100-20300, Nyahururu, Kenya.

Preamble

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Onyango, J.O. (2012) *Discursive Masculinities and the War against AIDS: The Kenyan Experience.* Kenya: Egerton University Press.
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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Email: rec@laikipia.ac.ke
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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Volume 1, Number 1, 2023 ISSN N0 2791-190X

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LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Anchoring Climate Change in the Ongoing Educational Reforms in Kenya

Peter Githae,[1*] Charity Chemnjor,[1] Josephat Kigo[2]
[1]Department of Curriculum and Education Management, Laikipia University, Kenya
[2]Department of Physical Sciences, Kenya Methodist University, Kenya

Abstract
The entire globe is mobilizing around climate change issues while being driven by a pressing desire to take action to understand its causes and effects and to mitigate its impact. Education has been identified as one among the key interventions, motivated by the belief that it can bring about fundamental mindset shifts in not only addressing the causes but also adapting and coping with the unavoidable effects of climate change. There is, therefore, need to make the curricula of schools more responsive to climate change by integrating aspects of climate and environment, which include among others, its concepts, greenhouse emissions, protection measures and support for individual and societal climate change resilience. Kenya has been undertaking reforms in the education sector with a shift from the knowledge-based to competency-based curriculum since 2017. To what extent has the new curriculum integrated aspects of environment, climate and climate change? This paper used the existing documentary evidence to analyse the extent to which the aspects have been integrated in the curriculum for pre-primary (PP 1-2) and primary schools (Grades 1-6). It is expected that the paper will inform the curriculum review process in Kenya on the critical role of environmental education as a tool for combating climate change.

Keywords: Climate change, climate change resilience, curriculum review, educational reforms, environmental education

Introduction

Climate change is the long-term alteration in the earth's climate and weather patterns. It is mainly caused by greenhouse gases emitted in the atmosphere as a result of human activity. Carbon IV Oxide (CO2) has the greatest effect which according to scientists, if its levels in the atmosphere are doubled, global temperatures would increase by about 5 (five) degrees (History.Com Editors, 2022). Climate change threatens to undo and even reverse the progress made towards meeting the Sustainable Development Goals (SDGs) and poses as one of the most serious challenges to achieving sustainable development for the international community (Walter et al., 2021).

According to the United Nations International Panel on Climate Change (UNIPCC), the continued changing climate will have widespread effects on human life and ecosystems (Intergovernmental Panel on Climate Change, 2012). Muchangi (2022) notes that African countries, especially in Sub-Sahara are already struggling to adapt to the reality of a changing climate. A study carried out by the Save the Child Organization in 2021 showed that the Kenyan child born in the year 2020 and after, will on average, face 4.6 times more droughts during their lives than their grandparents.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Kenya is a leader in addressing climate change. It was one of the first African countries to enact a comprehensive law and policy to guide national and subnational (county) climate action. The Climate Change Act of 2016 and the National Climate Change Action Plans (NCCAP) 2013-2017 and 2018-2022 provide guidance for low carbon and climate resilient development (USAID, 2022). According to USAID, the Country's priorities as articulated through these documents include; adaptation, afforestation and reforestation, landscape restoration, climate-smart agriculture, geothermal and clean energy development, energy efficiency, and drought and flood risk management. However, none of these plans have outlined how education can be used as a tool for addressing climate change.

Kumar et al. (2023) underscores the paramount importance of education in promoting Climate Action. Education is acknowledged as a vehicle that transforms lives by unlocking the potential of citizens (Kariuki, 2017). Quality education is Goal Number 4 in the World's Sustainable Development Goals (SDGs). It is identified as the key that will allow achievement of other SDGs including Goal 13 on Climate Action. The SDGs and the United Nations Educational, Scientific and Cultural Organization (UNESCO) Global Education Monitoring Report (2020) inform the role of education in addressing climate change. This is especially important given that understanding the causes and effects of climate change is, as posited by Sofiyan et al. (2019), the first step in shifting mindsets, establishing new ways of limiting its impact and adapting to its unavoidable effects. There is, therefore, need to make education more responsive to climate change by integrating or mainstreaming its aspects in the curriculum of schools.

Many countries, especially in the developing world, are reforming their education systems in order to meet the demands for the 21st century (Kabita & Ji, 2017). The SDGs recommended Education for Sustainable Development (ESD) which aims to promote knowledge, skills, attitudes and values necessary to shape a sustainable future (Ministry of Education [MoE], 2018). ESD proposes learning methodologies that are suitable for promoting critical thinking, problem-solving skills as well as collaboration.

Kenya is in the process of reforming its education with a shift from the Knowledge-Based Curriculum (KBC) to a Competency-Based Curriculum (CBC). This shift is informed by the country's desire to achieve its national aspirations as well as meet the international obligations. The shift is meant to provide for integration of Kenyan education to that recommended for the East African Community (EAC) (EAC, 2012); align the education to the requirements of the Constitution of Kenya (2010); and equip the youth with requisite competencies that will propel Kenya to achieve the Vision 2030 which is the country's blue print for national development.

According to the Sessional Paper Number 2 of the Republic of Kenya of 2018 on Reforming Education and Training for Sustainable Development, the reform process is a response to the challenge of providing relevant and quality education. Proponents of CBC argue that by focusing on competencies (what learners can do) rather than objectives (what learners are expected to know) with the education they receive, CBC is better suited to ensuring that education responds to the needs of the society.

The new CBC in Kenya is designed to develop individuals in a holistic way, which will produce citizens who are competent intellectually, emotionally and physically. The Basic Education Curriculum Framework (BECF) outlines seven core competencies to be achieved by every learner in basic education: communication and collaboration; self-efficacy; critical thinking and problem solving; creativity and imagination; citizenship; digital literacy; and learning to learn. (Republic of Kenya (2015). The basic education under CBC has identified six pertinent and contemporary issues facing Kenyan society to be embedded in the curriculum. One of these areas

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

is Education for Sustainable Development (ESD) which includes environmental education as one of the pertinent and contemporary issues. It would be expected that aspects of climate change should be covered under this theme. Indeed, one of the goals of education in Kenya points to promotion of positive attitude towards environmental protection.

Mainstreaming Aspects of Climate Change in Education

Studies worldwide have attempted to analyse the extent to which elements of climate change have been integrated in the curricula of educational institutions. Nepras et al. (2022) carried out a review that focused on the topics covered in the curriculum for the Grades 1 and 2 pupils for the International Standard Classification of Education (ISCED). The study presented an analysis showing the breadth and frequency of the topics as reported by journals between 2009 and 2021. Results indicated that as the urgency of climate change increases so do the number and diversity of research studies on climate change. The areas that received significant attention included: knowledge about climate and climate change (47%), pro-environmental behaviours (42%), climate action (30%) and experiences regarding climate and climate change (20%).

Kumar et al. (2023) carried out a study in Pakistan that sought to find out the contribution of the Science, Technology, Engineering and Mathematics (STEM) curriculum in schools in generating effective mitigation solutions for Climate Change. The study results showed that climate change literacy increased by 94 percent in primary schools and 45 percent in secondary schools. The authors recommended development of tailored technology-enhanced STEM educational programmes for different age category of learners in order to improve learning outcomes regarding climate change.

A study by Sofiyan et al. (2019) aimed at analysing how climate change content integrated with the newly developed geography curriculum for secondary schools in Indonesia. The study used content analysis method to review the curriculum document. The study found that the topics of climate change in the syllabus were minimal and were dominated only by aspects of cognition. The condition outlined in the syllabus that the overall basic competencies should provide huge opportunity for students to learn climate change was not supported by the content. The study also established that teachers' understanding of the climate change content was limited leading to challenges in teaching aspects of climate change.

Walter et al. (2021) sought to find out the extent to which matters related to climate change were addressed within the teaching and research practices at the universities in several European countries. The focus was on the degree of involvement of the universities in reducing their own carbon footprint as well as identifying the training needs of the teaching staff. Respondents reported that climate change was a matter of concern in their countries and that there was a demand for professionals with adequate training in this area. Majority of the universities were found not to be fully prepared for addressing climate change in their curricula. The study recommended enhancement of international partnerships for promotion of climate change education and exchange of experiences among the universities to facilitate curricula innovations geared towards integrating aspects of climate change across the spectrum of their academic disciplines.

In Africa, Rwobusiiki et al. (2021) remarked that despite the great role played by education in creating knowledge and developing skills and attitude among people, little climate change and mitigation content exists in the taught curricula in most developing countries. Their study used a comprehensive content analysis to do a comparative assessment of the extent to which countries in the Eastern, Western, Central and Southern Africa had included climate change in their curricula and the efforts that these regions have done to adopt strategies and policies for mitigating climate

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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change in their education systems. The findings included the fact that climate change is an emerging challenge for most African countries and that secondary schools in the region have climate change integration in their curricula at very low levels. The study recommended that African countries integrate aspects of climate change in their school curricula as a way of creating awareness and mitigating its impact. However, the study focused on secondary schools whereas the concepts should be grounded from the nascent stages of education.

Olalekan (2019) carried out a study which aimed at investigating the extent of integrating climate change issues in the upper basic school curriculum in the Gambia. However, the study focused on an audit of only two subject areas; social studies and geography. Among other findings was that there were gaps in the curricula in relation to climate change, for example, insufficient explanation of concepts. Anyanwu and Chimeze (2023) sought to find out the extent of integration of climate change into the social studies curriculum at the basic education level in Nigeria. The researchers discussed the relationship between climate change education and social studies curriculum content and concluded that the needed climate content awareness would be made possible via corresponding topics in the social studies curriculum. Hence, the study recommended that effective and efficient integration of concepts and learning experiences be made in the curriculum.

In Kenya, Kimiti and Cheruto (2013) highlighted the benefits of mainstreaming environmental education in the curricula of schools. The authors argued that mainstreaming environmental education would equip learners with the necessary knowledge and skills that are instrumental in preserving and conserving the environment. Indeed, Murikira (2019) opined that environmental education is a critical tool for combating climate change. According to Murikira, aspects of climate change have not been broken down in a way that the ordinary person can understand. In a study to find out the level of awareness of climate change aspects, Muchangi (2022) found that close to 75 percent of Kenyan university students are unaware of the global responses to climate change despite majority of them admitting to having experienced climate change-fuelled phenomena that included increased temperatures and erratic rainfall. More than 60 percent of the sampled students were unaware of the Kenya's National Climate Change Action Plan (NCCAP). However, is it the students who have ignored the plan or vice versa? It is notable that the plan does not mention anywhere how it intended to work with the Ministry of education to promote learners' awareness and response to climate change.

In a study to establish the contribution of school curriculum in creating awareness of climate change among learners in secondary schools in Githunguri Sub-County of Kenya, Kariuki (2017) found that the climate change content was inadequate and that implementation of the curriculum did not impact significant awareness in climate change. The study reported that of the sampled curriculum developers, 63 percent and 13 percent rated the curriculum as poor and very poor respectively with regard to infusion of climate change content in the curriculum. Among its recommendations, the study identified the need for further research to establish the infusion of climate change among learners in early stages of learning. This informed the rationale for the present study.

A formidable climate action starts with a tailored curriculum. As the Ministry of Education in Kenya scales up the CBC, it is an opportune time to anchor tailored Climate change content in the curriculum. CBC presents the best approach to transferring knowledge and skills to learners. The new education system has moved to the third level, the Junior Secondary after completing the Pre-primary and Primary school levels. To what extent has the curriculum for these basic levels embedded components of Climate change? This paper analysed the designs, referred to in the

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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former 8-4-4 education system as syllabi as well as the course books for Pre-primary levels (PP 1-2) and Primary (Grades 16) with a view to appraising integration of Climate change aspects in the curricula.

The Enquiry and Theoretical Framework

The aim of the study was to use the existing documentary evidence to analyse the extent to which aspects of environment and climate change have been mainstreamed in the curriculum for Pre-primary (PP 1-2) and Primary schools (Grades 1-6) with a view to identifying gaps and inform the curriculum review process on the critical role that environmental education can play as a tool for combating climate change. The study sought to answer the following research question: To what extent has the new CBC curriculum for the Kenyan Pre-primary (PP 1-2) and the Primary (Grades 1-6) school covered aspects of environment and climate change?

The study was anchored on Bruner's Theory of Cognitive Development developed in 1966. The Theory as articulated by McLeod (2023) views the learner as an active agent of learning, and emphasizes the importance of existing schemata in guiding learning. As they learn, learners are encouraged to discern links between structures of the subject content; that is, concepts, facts and theories. According to McLeod, unlike other psychologists like Jean Piaget, Bruner did not contend that the stages in a learner's cognitive development are necessarily age-dependent or invariant. Bruner believed that development does not consist of discrete stages but is a continuous process. He argued that the aim of education should be to create autonomous learners that are ready to take responsibility of their own learning, thereby entrenching the competence of learning to learn as spelt out in the Kenya's BECF (2015).

Bruner (1966) was concerned with how knowledge is represented and organized through different modes of thinking or representation. In his theory, he suggested three modes of representation that included the enactive, iconic and symbolic modes. During the enactive mode which manifests between birth and when the child is one year, knowledge is primarily stored in the form of motor responses. Thinking is based entirely on physical actions by encoding physical action-based information and storing it in memory. During the next stage referred to as iconic mode and which manifests between the age of 1-6 years, information is stored as sensory images (icons) usually in visual form. These form pictures in the learner's mind. This explains the importance of using diagrams, pictures, illustrations and video images among others, to accompany verbal or written information during teaching. Thinking is also based on using other sensory mental images formed as a result of hearing, smelling or touching. In the last stage denoted symbolic mode of representation, knowledge is stored primarily as language, for example, mathematical symbols, words and music among others. During this stage which manifests when the child is above 7 years of age, symbols are a useful tool of learning as they can be easily manipulated, ordered or classified. The symbols are arbitrary.

As articulated by McLeod (2023), Bruner (1961) explained that the purpose of education is not to impart knowledge but to facilitate child's thinking and problem-solving skills. This makes active learners who are autonomous and who construct their own meaning. By extension, this implies that a child, irrespective of age, is capable of understanding any information however complex. This gives credence to the 'spiral' mode of curriculum development where content is structured so that complex ideas can be taught at a simplified level in the beginning and then re-visited at more complex levels later on. The spiral curriculum is based on the principle that learners should review a particular concept over and over again during their educational experience, each time building on the previous learning and increasing their sophistication continuously. Therefore,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

concepts like climate change can be taught as simplified content in lower levels and at gradually increasing difficult levels as the learner advances through the stages of learning.

Methodology

The study adopted the documentary analysis research which involves using already existing documented information as the data (Glenn, 2009). In this type of research, documents are reviewed by the analyst to assess an appraisal theme, which in this case is climate change. The documents are dissected with a view to establishing the extent to which a theme has been captured by the documents and how. The purpose is usually to answer specific evaluative questions with a view to making conclusions and recommendations based on the findings.

The aim of this study was to find out the extent to which components of Climate change have been infused in the curriculum for Pre-primary 1-2 and Primary Grades 1-6 in the current CBC dispensation in Kenya. The documents analysed comprised the designs for the grades and their respective instructional course books. The designs and course books analysed were limited to those for 'Environmental Activities' and 'Hygiene and Nutrition Activities' for learners up to Grade 3 and 'Social Studies' and 'Science and Technology' for learners from Grade 4 to Grade 6. Analysis involved identifying concepts in the general area of environment and mapping them onto a six-level profile on notions of climate and climate change.

Results and Discussion

The study sought to examine the extent to which aspects of environment and Climate change have been mainstreamed in the curricula of basic levels of learning in the CBC framework in Kenya. Environmental activities are important for young learners as they provide opportunity for exploration, experimentation and interaction with the immediate environment (Njuguna, 2012). In turn, these scientific processes enable the learner to acquire skills in order to enjoy learning, promote good health, safety and environmental conservation as well as appreciate the rich cultural diversity. The study noted that every design specified Kenya's educational goal number 8 which is to promote positive attitude towards good health and environmental protection.

The components of environment and climate change as identified in the documents for each level were scaled against a six-level hierarchical profile as detailed hereunder and the results were as displayed in the subsequent tables: Elements of weather; conservation of environment; causes of climate change; effects of climate change; mitigating effects of climate change; and adaptation to effects of climate change and resilience.

Findings from Table 1 indicate that for the levels up to Grade 3, the concepts covered mostly the lower conceptions that included elements of weather and conservation of the environment. These are aptly covered by the expected learning outcome as outlined in the designs for the levels for learning 'Environmental Activities'; that by the end of the Early Years Learning, the learner should be able to explore the immediate environment for learning and enjoyment. However, in order to capture elements of climate change, there is need to expand on the outcome and design suitable activities and experiences to achieve them. It is also notable that quite a number of the conceptions are only implied and not explicitly expounded in the course books. The conceptions have only been captured in form of pictures.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 1: Concepts of Environment and Climate Change Covered in Pre-Primary and Primary Levels Grades 1-3

Profile Level	Concepts (with Relevant Activities)	PP. 1	PP. 2	GD. 1	GD. 2	GD. 3
1	Uses of elements of weather like winnowing	X				
	Elements of weather	X	X	X		
	Components of Environment	X	X	X		
	Weather conditions/suitable activities	X	X	X	X	
	Keeping/dressing safe in different weather				X	X
	Recording weather/decoding weather messages				X	
2	Managing waste (Collecting and burning garbage) – safe handling	X		X		X
	Care for the immediate environment		X			
3	Dangers of Polluting environment			X		
4	Dangers of water – Flooding (implied)		X			
	Extreme/unfavourable weather conditions		X*			X
5	Effects of unfavourable weather conditions					X*
	Warning people of impending extreme weather					X*
6	None					

*Means only implied

Grades 4-6 constitute part of the 'Middle School Learning' in the Kenyan CBC dispensation which covers 'Upper Primary' and 'Junior School' levels of education. For this level, environment and climate are covered under 'Social Studies' subject. The designs outline the expected learning outcome as follows; By the end of the Middle School Years Learning, the learner should be able to explore, manipulate, manage and conserve the environment effectively for learning and sustainable development. The element of sustainable development suggests aspects of climate change. After analysing the designs and the recommended course books for the levels, the concepts of environment and climate change were mapped out as outlined in Table 2.

Even though slightly different concepts were covered at these grades and at a higher level of cognition as seen in Table 2, the concepts were mostly in the lower hierarchies of climate change. It is notable that level 6, which is adaptation and resilience has not been captured at all. There is, therefore, need to expand the expected learning outcome to cover the aspects of climate change. It was also notable that the designs failed to capture the golden chances of advancing concepts of climate change on a number of concepts. For example, on the concept of the influence of climate change on human activities, the vice versa-influence of human activities on climate was completely ignored. There was no concept identified on the components or manifestations of climate change, like extreme weather conditions. Similarly, there was no conception on the effects of climate change like drought and flooding.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Table 2: Concepts of Environment and Climate Change Covered in Primary Levels Grades 4-6

Profile Level	Concepts (with Relevant Activities)	GD. 4	GD. 5	GD. 6
1	Seasons in the County and activities related	X		
	Weather elements and the sky (weather conditions)	X	X	
	Recording weather	X		
	Meaning of weather and climate		X	
	Climatic regions in Kenya/East Africa		X	X
	Main physical features in East Africa			X
	Influence of climate on human activities			X
2	Conserving physical features and natural resources	X	X	X
	Waste management and cleaning the environment	X	X	
	Conservation and protection of natural resources	X		
	Care for vegetation in school			X
3	Air/water pollution and its effects	X*		X
4	None			
5	Environmental club activities in schools	X*		
6	None			

*Means only implied

The foregoing findings are in tandem with those of other studies in developing countries and even some of the so-called developed countries. For example, Sofiyan et al. (2019) reported minimal and insufficient content to cover aspects of climate change in the curricula of schools in Indonesia. Similarly, Anyanwu and Chimeze (2023) found that the climate change content covered in the social studies school curriculum in Nigeria was minimal to make any significant impact to address the impact of climate change.

Conclusions and Recommendations

From the foregoing findings, the study derived a number of conclusions. Firstly, that there is a fair attempt by the curriculum of basic education to include aspects of environment and climate that aptly cover the expected level learning outcome as outlined in the designs. However, the curriculum is scanty in the concepts of climate change. Still, on the few concepts touching on climate change, the distribution of the concepts is skewed with those covering content on mitigation and adaptation as well as resilience receiving very little or no attention at all.

Secondly, the curriculum has attempted to build up the concepts from lower to higher levels of cognition. The same or similar concepts have been covered across the grades at different cognitive levels. This is in tandem with Bruner (1966) Theory of Cognitive Development. For example, some of the conceptions like physical features were developed from those found in the locality to those available in the Counties, in Kenya and in the East African region in general. Similarly, the topic of pollution has been handled from causes, its effects and its safe management. In the same vein, high level concepts of climate change like adaptation and resilience can be covered at low cognition, like learning to dress for unfavourable or extreme weather conditions.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Thirdly, the curriculum failed to exploit available opportunities to mainstream critical components of climate change. These include, among others, the effects of human activities on the environment leading to climate change; negative effects of industrialization; and the harmful greenhouse effects of Carbon IV Oxide. These concepts could have been captured alongside the concepts of influence of climate on human activities, positive impact of industrialization and the benefits of Carbon IV Oxide, like use in fire extinguishers, that have been adequately covered by the designs.

In the light of the findings and the conclusions, the study made specific recommendations. As the government works on the national Climate Change Action Plan for the year from 2023 after expiry of the previous plan, there is need to outline a clear strategy on how education right from the basic levels to teacher and university education should be used to address climate change. This should be done in constant consultation and engagement of all relevant stakeholders.

The goals and learning outcomes that guide environment education should be reviewed with the aim of expanding them to aptly cover components of climate change. This will allow for suitable content and learning activities as well as experiences that will expose learners to climate change; its causes; effects; mitigation and adaptation; and resilience. This is likely to impart knowledge, skills, attitudes and values to grow up on the learners while embracing in them, the tenets of climate resilience for sustainable development.

Curriculum development experts, teachers, book writers and researchers should make concerted effort to develop relevant content, including digital content and derive appropriate learning activities and experiences as well as assessment strategies for concepts of climate change. This will facilitate effective mainstreaming of concepts of climate change in the curriculum of schools and colleges as a way of mitigating and coping with the effects of its change.

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Indigenous Knowledge and Education as a Transformative Agent for Sustainable Development

Florence Wamahiga Githuthu
Tangaza University College, Kenya

Abstract
Countless studies indicate that the use of indigenous or traditional knowledge and education with regard to resource administration is an invaluable option for developing economies to decrease the impacts of drought and enhance sustainable development. Indigenous knowledge system is conscious of the adjustable skills of indigenous communities to their surroundings when confronted by any type of calamity. This knowledge is passed on by word of mouth down to generations to come. In acknowledgement and gratitude of indigenous knowledge, many nations are embracing it. It is a substantial and valuable knowledge system that is adjustable as well as aggressive and is founded on skills, potentials, and rational techniques that adjust over time depending on environmental circumstances. Several nations are beginning to recognize its worth, and efforts have been put into place through policy and legislative structures to integrate it with education.

Keywords: Community, education, indigenous knowledge, resources, sustainable development

Introduction

Globally, humans are facing exceptional challenges; drought, floods, storm, cyclones, climate change, intense and hateful ideologies, mass loss of biological diversity, new conflicts and violence and the risks of world pandemics just to name a few. Never before has the human race faced the convergence of such crises. If *traditional* cultural practices and ceremonies had not been prohibited and had traditional stewards been listened to over the years, perhaps human beings would not find ourselves in the circumstances they are in today; with the deprivation, destruction and pollution they face as a worldwide community (Sergon et al. 2022). Indigenous knowledge (IK) is a valuable component of the ability to face not only the crises mentioned above, but also the conservation and safeguarding of all of our resources for sustainability. Indigenous knowledge and education need to be customized to equip societies with the knowledge, education, values, and capacities to act as responsible individuals of an international society for the benefit of all people and the earth. Scholars have come to realize that there are a variety of ways of viewing the world we live in and acquiring knowledge about it. The scientific investigation or Western Epistemology is not the only and 'right' way of gaining knowledge but simply one way to acquire knowledge. Accommodating epistemological pluralism can lead to more successful consolidated knowledge (Mazzocchi, 2018).

Indigenous knowledge is about protecting a way of life that is at risk of extinction. Almost half of the human culture is fronting extinction. Therefore, it is imperative to bring indigenous knowledge onto the discourse. Currently, there is a serious threat of much indigenous knowledge being lost, and along with it, invaluable knowledge about ways of living sustainably both environmentally and socially. The role of colonialism in disregarding and sometimes defaming indigenous knowledge has been well documented by various authors. As a result of the impact of

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

unfavourable values and mind sets towards indigenous knowledge systems (Sillitoe, 1998), even during early postcolonialism, many academics considered indigenous knowledge systems as backward, primitive, simplistic and static. For instance, language is a main feature of an indigenous society and yet Indigenous languages are under serious danger. Approximately, one language disappears every 3 months or so, which means that by the end of the century, over three thousand languages will have died (Sillitoe, 1998; Bromham et al., 2022). When a language disappears from *a society* that has not developed literacy, that society also loses its identity and knowledge. Such a society recognizes speech not only as a means of everyday communication but also as a means of preserving the wisdom of ancestors, which will not happen if languages die.

The other reason for considering indigenous knowledge is recognition that when more forms of evidence are considered, better decision-making is the consequence. Acknowledgement and inclusion of indigenous knowledge in decision-making benefits all actors. Indigenous peoples have long appealed that indigenous knowledge be constantly and purposely included in decision making processes.

The Place of Indigenous Knowledge in Sustaining Development

Indigenous Knowledge has been defined by different authors to mean a body of awareness, unwritten and written knowledge, creative, applications, and beliefs developed by ethnic and indigenous people through intercourse and experience with the environment , Giorgia, 2016). Indigenous (local) knowledge is a time-honoured wisdom and cultural practices within groups, often passed on orally. This kind of knowledge is communicated in myths, folk tales, traditions, rites, songs and dance**,** artefacts**,** and even regulations. The application of these elements and beliefs promotes sustainability and responsible ownership and management of traditional and natural resources by interaction of humans and their environment.

As has been observe, the information revolution clearly upholds the predominance of technology and science knowledge over other types of knowledge such as indigenous knowledge, traditional knowledge, oral culture, daily learning and the like. The primary characteristic of these types of knowledge is the manner in which people produce, interchange and adjust their knowledge, in spite of their culture. What gives unification to this apparently differing assortment of knowledge is its almost tacit feature. These are the skills, ideas and experiences that people learn over time but are not graded and may not necessarily be easily expressed. The originality of traditional knowledge makes it most challenging to measure in an organised, precise way, as is normally done with science and techno-knowledge, as documented by articles in academic publications (Mazzocchi, 2006).

Preference for scientific knowledge in place of local knowledge would have devastating consequences for humanity, and in particular for developing countries, because scientific knowledge is not enough to protect certain kinds of critical knowledge and information. Optimizing production while still respecting the environment for future generations is what sustainable development is all about. These human actions and behaviour are informed by indigenous knowledge that often times proves vital.

It is impossible to separate indigenous knowledge from the people inevitably connected to that knowledge. It relates to phenomena across physiological, communal, traditional, and supernatural systems. Indigenous peoples have cultivated their knowledge systems over thousands of years, and persists based on proof attained through direct contact with the environment, lifelong experiences, large scale observations, learning, and techniques. This ancestry bonding with nature facilitates the ability to uncover often faint, minute changes in order to base decisions on insight of patterns and procedures of change in the environment which people are a part of. The facts and

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

cumulative historical and traditional ecology contained deep within indigenous languages, applications, attitudes, naming, dances, and narratives hold information and knowledge that are pertinent today.

It has been assessed that presently, across the planet, indigenous peoples and long-established communities bound together, are stewards of over 24 percent of territory. This territory accommodates roughly 40 percent of all environmentally intact topography and sheltered areas left on earth. This constitutes an impressive 80 percent of the global biological diversity (Emilie et al., 2021). All indications, therefore, are that the most intact ecological systems on earth rest in the hands of human communities who have remained closest to the environment. The world has officially acknowledged indigenous knowledge as one of the many crucial bodies of knowledge that gives back to the research base, practical and the social-economic development of our collective understanding of the environment.

The term 'sustainable development' was first presented in a Global Commission (Brundtland Commission) in 1983 that set to address the issues of global warming (Jacobus, 2006). It was described as meeting the needs of the current generation with no negotiations that may harm the ability of tomorrow's generations to meet their own needs. Additionally, sustainable development pursues issues of poverty to create impartial quality of life and to provide the basic needs of humanity, devoid of irreparable destruction to our environment. Nevertheless, this description centres only on the way development should nurture and nourish human needs. It gives a black out to the needs of other categories (Jacobus, 2006).

Indigenous communities' ability to protect natural ecological systems is obvious worldwide. Their regard for and acknowledgement of their homeland has implied the preservation of the countless animal species that live within their ancestral land. For example, in the Rift valley, indigenous territories have lower rates of de-forestation than most forests; they are protected regions (Njiraine & Onyancha, 2011). This is largely due to traditional peoples' knowledge and competence with forestry and avoiding pursuits that generally threaten forests such as illegal logging and cattle grazing. Protecting forest ecological systems is critical to the continuance of numerous animal varieties that would not survive outside of this natural environment. A good number of the world's populace depended on these sectors for their sustenance. Therefore, indigenous knowledge remarkably contributes towards sustainability of trillions of people globally.

As the original administrators of the environment, indigenous communities have competence critical to identifying solutions to the climate change and protecting our ecological systems. Government needs to provide guidance to help ensure that voices of indigenous communities are included across regions for the collective good of our communities and planet earth. Decision making is outstanding when enlightened by all forms of knowledge. This kind of guidance will help actors integrate indigenous knowledge in their work from research base, to environmental norm setting, to control and organization of land and waterbodies included for sustainable development. Indigenous communities have long sought recognition of the worth of their knowledge and practices (Haruna & Raphael, 2020). With guidance, indigenous knowledge can be better acknowledged, recognized, and included in relevant discussions.

Globally, as societies we are at a turning point. Though indigenous knowledge and education are the foundation for restoration and transformation, world disparities, and a pressing need to reconsider why, how, what, where, and when we get the knowledge implies that education is yet to fulfil its promise to shape peaceful, just, and sustainable development. In our pursuit for growth and development, we have overloaded our natural environment, undermining our very existence. Currently, high standards of living coexist with widening imbalances. Increasingly, more people are

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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involved in public life, but the basic structure of civil society and democracy is eroding in many places around the world (Tom et al., 2019). Rapid technological advancements are transforming many aspects of our lives, but these innovations are not sufficiently directed at justice, incorporation and participative democracy. That is the reason we must reimagine indigenous knowledge and education.

If indigenous knowledge is going to be transformative, it must involve the education geared to inspire and empower communities to take conscious choices and behaviours at a personal, community and overall levels. If it is going to be transformative, we are going to have to use previous interpretations of indigenous knowledge to construct a revised or a new interpretation of their meaning in order to guide future behaviours that will preserve our environment. What does transformative mean in our context? It means a substantial structural shift in the foundational assumptions of mental, emotional and behaviours to support sustainability. A shift of awareness that changes our way of being in the world; understanding ourselves, our self-locale and our interpersonal relationships in the world (Knopf, 2015). It means comprehending power relations in the interconnected structures of social inequality as experienced by members of collective social groups, and/or their convergence, at the personal, communal and structural level. This calls for a paradigm shift, i.e., a revolution in our view as a society of how things work in the world; how indigenous knowledge works in the world. It means beginning to critically examine and reflect on our societal predetermined premises and beliefs so that we are more accessible, inclusive, thoughtful and willing to embrace change is the way to go.

Indigenous knowledge is considered an important source of information for society's, occurrences, establishments and culture, among many. It has also been shown beyond doubt that this knowledge system has an important role to play in designing formal and well organised extension services (Rebeka et al., 2018). In the world, indigenous communities are continually struggling to sustain their rights, their culture, their traditions, and their knowledge, in a network yet led by Euroscepticism; a Western perspective. They experience the problem of a double life at the same time, the indigenous and foreign, the modern one, in continual pressure and strain with one another, with the non-indigenous over powering in shaping the indigenous. For hundreds of years, indigenous communities have had to bear with aggression and imposition, and periodically they have witnessed their knowledge surpassed by non-indigenous knowledge, forced on them by western societies. Still, indigenous societies have survived for decades modifying in a variety of ways to unfavourable weather patterns and created sustainable maintenance.

Different types of knowledge, with deep roots in their linkages with the environment and also in cultural cohesiveness, have enabled many of the communities to handle natural resources, to safeguard their surroundings and to increase their persistence. Their observation, adaptation and mitigation has assisted many indigenous populations face unfamiliar and disturbing conditions that have oftentimes severely affected their way of live and their regions. Indigenous knowledge and education /technologies which are economical, result in a sustainable economy among other dimensions. It is decisive therefore to exhibit and further these applications/ technologies in the territories (Justice & Sandra, 2019). These exhibitions, their circulation and their reproduction by indigenous communities will symbolize as evidences for enlightened knowledge. Based on these evidences, the indigenous community members will advocate that these practices should be advanced by County and National governments in their plans and programs and cater for them in their budget. The mutual encouragement from a large number of target audience will be necessary for influencing strategies.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Method, Scope and Limitation of the Study

This study was purely based on existing data. Data was collected from different relevant writings, journals, the web and print media. There was a lot of relevant and pertinent data in the web and a huge amount of raw data, but only the most important were incorporated in this paper. Experience and knowledge got by the author in the process of this research is also incorporated.

As reported by many researchers' works there is little doubt that when indigenous or local knowledge is excluded from the strategizing and policy constructing process of any territory, the results are such that growth is either doomed or occasionally adverse (Kangalawe et al., 2014). This is because non-indigenous approaches alone are (in and of themselves) inadequate reaction to today's interconnected elements of social, administrational and economic climate concerns (Desta et al., 2010). The positioning of indigenous knowledge has been acknowledged recently by numerous research bodies and Non-Governmental Organizations. But many impediments such as ecological deterioration, lack of effective strategies and economic development make safeguarding and advancing indigenous knowledge a challenge.

This study was conducted from 30th November, 2017 to 27th January, 2018 and time was a challenge. This was desk research that relied on already existing information since field survey was not feasible at the time. **The** objectives of the study **were to:** review the role of indigenous knowledge in sustainable development; establish gaps in utilization of indigenous knowledge for climate change; and identify the spheres of contribution of indigenous knowledge.

Indigenous Knowledge Systems in Sustainable Development

A particularly interesting example with regard to indigenous knowledge in development that is sustainable came from a village in Central Province, Nyeri County in Kenya which has embraced a model to alter their procedures to forest safeguarding and control especially against illegal logging. Recently, from 2001 through to 2004, Communities numbering 1,885 in the County finished putting together their community regulations of forest administration under the County guidelines. As a result, there exists numerous grounds for a lucrative community forest control and safeguarding. It is noticeable that the community forest is achievable due to its relevance to local traditions of the Agikuyu; distinctive of collective property, their self- control, founded on their indigenous knowledge in vegetation and biological diversity as well as the function of the local government. Due to the regulations and collective benefits, all indigenous members are guided by the local adjustments during the forest ecosystem sustainability. In summary, the linkage of traditions and the environment in general and biological diversity in particular, mirrors the cultural traits of this ethnic group through their actions and accommodation of nature for sustainable development.

A similar example is an agricultural method system of the same ethnic group. Efforts by a certain Aid group to introduce unfamiliar crop variety seedlings into this area in an effort to raise production, have not borne fruit because the unfamiliar variety neither fits into the farming method nor the traditions of these indigenous people. In addition, the inputs required to realize the expected increased production cost far too much for the local people. For example, it is a given that the indigenous maize type has minimal yield than the unfamiliar varieties. However, advantages include among the following: it is organic and fertilizers are unrequired; it is does not attract many insects; it will mature and dry in the field till harvest; its product is such that the flour is without moisture, nut-like flavoured and sweet scented; it can be made into a thick type; it is tastes better than the unfamiliar types; it has a long shelf life and it is less prone to worm contagion. The experience gained from this region is that the indigenous maize variety has evolved, improved and been used for years and it is appropriate in terms of being accommodated in the indigenous physical conditions

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

and tradition. As such, any external interference may not work if elements are not considered. It is worth noting that the limitations and benefits of indigenous knowledge is that it is local (Giorgia, 2016).

Indigenous Knowledge and Re-Forestation

For many years, regional and nonregional support to re-forestation has aimed at planting of varieties of exotic species. Tropical pines, American conifers, eucalyptus, acacia, all these species have been planted, partly because they are drought-resistant and also because non-indigenous planters knew nothing to do with indigenous trees. The eucalyptus, which was used extensively, has been attacked and damaged by fungal infection. In addition, it did not succeed in countering soil erosion on sloppy areas. Conscious of the critical importance of forests in the indigenous ecology, the indigenous people finally agreed that with the current situation of their region, the only option was to plant indigenous species, few that still grew in the native forest, to re-forest the barren sloppy areas.

Within three years of launching the re-forestation programme, the indigenous people have counteracted myriad of problems of wood for fuel as well as water challenges. The indigenous people also sowed other higher value hard wood tree species such as mangroves as inter-cropping. Currently, a good portion of an entire region in the central part of Kenya; Nyeri is covered with forest, and indigenous agricultural yields have improved significantly since then. Generally, re-forestation results have improved due to local people knowing which indigenous tree species to use at what time.

On the contrary, the government and other Aid groups have attempted to use exotic tree species which are not suitable to the local circumstances. There is an inclination of the government wanting to find a ‘quick Fix’ for all indigenous communities and in all areas in the sloppy areas instead of considering the diversity of the mountainous region in terms of the social natural environment.

Indigenous Knowledge and Traditional Medicine

According to an evaluative review of therapeutic and medicinal herbs of Kenya, there are 105 of them belonging to 43 family types. It is foreseen that the number can could go higher. They are all over in the region and the communes know how to use most of them for several medicinal purposes Odongo et al., 2022). Most of the people and families in the region can use most of the therapeutic and medicinal herbs which are available in the communities to treat normal illnesses such as headache, diarrhoea, fever, vomiting, stomach aches. Multiple studies have demonstrated that there are herbalists in every indigenous community in various nations. They are the people who hold indigenous knowledge and experiences in identifying and using medicinal herbs for curing and healing in their communities.

The plant-based medicine both preserves public health and also adds to hunger extermination and poverty alleviation in homes. These plants have been considered as special goods in many homes of Kenya. Numerous communities in the area are involved in gathering, refining and selling plant-based medicine. With many benefits and huge demand, a large amount of wild plant-based medicine has recently been gathered to supply local pharmacies and also sell out of the country. It is predicted that a substantial quantity of species of plant-based medicines have been gathered in a manner that cannot be sustained. Some species have been overutilized and are therefore worn out (Bouvier, 2016). Undoubtedly, the consequent biological diversity loss means destruction of indigenous knowledge which is a critical issue.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Indigenous Knowledge and Ecologically Responsible Tourism

As stated previously, indigenous communities have their own actuality of sustainable development, which is different from the idea of the one attached to the current societies. Indigenous knowledge adds value to the sustainable management of territories, safeguarding biological diversity and lessening carbon emissions, yet it is demeaned and secluded from decision-making and areas of policy.

Respect for the environment including its preservation as well as collective-based management of earth and its organic matter are key to the indigenous ideas of welfare. Organic matter or natural resources are not commercialised and the community is the support upon which indigenous peoples structure their lives (Reed, 2022). Regions are vital for indigenous communities because it is in these spaces that indigenous groups can perform their social-cultural, economic, traditional and environmental duties. These duties include sustainable management and utilization practices as well as resource preservation and administration strategies, most of which are based on traditional/indigenous knowledge and local systems of governance (Townsend et al. (2020).

Indigenous Knowledge and the Environment

Indigenous communities live in the most susceptible ecological systems and environments, which vary from visible ice cold, high mountainous areas, Coastal plains, jungle rainforests, tropical woods, desert areas, minute islands to lowland zones. Indigenous regions are directly afflicted by the present environmental crisis accounting for issues such as global warming and loss of biological diversity. Amid the environmental crisis threats, indigenous communities from a variety of countries have experienced the worsening of major storms, seasonal strong winds and flooding, rise of sea level and accumulation of salts in soil (Giorgia, 2017). Indigenous people have suffered the effects of erosion, extreme drought and rainfall shortages (Lambert, 2014; Gyampoh et al., 2009). Similarly, other authors such as Goh (2012) identified scenarios such as thawing of icebergs, the intensity of hurricanes, the budding of the water levels in the sea and changes in patterns of rainfall among so many more.

As a consequence, and in order to step up climate action, indigenous peoples must be considered as dynamic actors of change, and thus granted access to secure work chances and the opportunity to engage in the development, execution and assessment of sustainable procedures and usages which are aimed at tackling climate crisis. Concurrently, it is also of essence that the issues which make indigenous peoples especially vulnerable to climate issues be addressed in an apparent and clear manner.

Indigenous Knowledge and Impacts of Hazards Related Disasters

The consideration of indigenous knowledge in hazard related disaster concerns has not received adequate attention in comparison with other fields of study. In fact, only recently, research on impacts on disaster related issues has evidenced the worth of indigenous cultural knowledge in deterring and alleviating the consequences of natural and manmade disasters, and also red alert systems, readiness, retaliation and resilience (Nnamdi, 2016; Zulfadrim et al. 2019). Indigenous communities worldwide embrace differing techniques depending on the environmental hazards they have to deal with. Therefore, indigenous communities worldwide who also experience the same weather conditions, use the same (common) techniques at times.

Among the techniques that have been detected by investigators, are preservation techniques dependent on weather predictions and the adjustment of what farmers undertake to control damages to plants and other interpositions to preserve the people and the animals from an array of dangers.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Dube and Munsaka (2018) in their analysis of indigenous communities in developing countries, identified some of the areas that in the last few years, have been the most damaged by natural calamities. The authors have grouped these techniques into general classifications that encompass land management schemes, construction design, **humanitarian** and food security, social support, and climate resilience.

Education for Climate Change

In accordance with most traditions, values and ethics of indigenous societies in Africa, they define education as a process of gaining knowledge and transformation of the land. It actually concentrates on awakening the gifts and purpose of creation and also awakening the giant within the learner. Basically, education was aimed at initiating, awakening the higher consciousness of a human person, awakening the mental and spiritual understanding of the universe and how the world is like. This awakening plays a role in forecast the weather, comprehending climate threats, managing climate effects, informing and boosting responses to climate alteration and volatility, and establishing adaptation choices. Therefore, education in traditional societies was seen as a cyclical process of initiation and transformation.

The Acquisition of Knowledge in Indigenous Societies

Indigenous knowledge is acquired quite differently from the way other forms of knowledge are acquired. The process of finding out about the world is far more empirical experimental which indigenous knowledge is about. First-hand experience is considered the best and at some times the only way to properly learn. To understand a thing, one must use one's sense of perception, and also language to express and experience it. The requirement to walk on the land in order to know and understand it is a different approach than the single dimensional, literate approach to knowing and understanding.

Senior members of indigenous societies mind the learning process. They transmit knowledge to younger individuals by sharing stories. This storytelling provides wide-ranging information to their listeners, such as the origin of the Earth, the way animals and plants came about, reasons certain moral rules endure within the society and the like. This way of acquiring knowledge has two important implications: firstly, the need to use own imagination means that listeners or learners develop a close bond with the environment in which they live. Secondly, the storytelling, song learning, or ritual dancing helps to reinforce community bonds, with the younger generation learning from the much older, and building respect for their knowledge and positioning in society (Senanayake, 2006). This is the reason many indigenous societies consider written knowledge to be subordinate to spoken language.

Indigenous worldviews that inform our every thought and action see the whole person (physical, emotional, spiritual, and intellectual) as intertwined to land and in relationship to others such as family, communities, and nations. This is a holistic view, which is an important dimension of supporting indigenous education. Indigenous philosophies are supported by a worldview of close relationships among the spiritual, the natural and the self, forming the foundation or beginnings of indigenous ways of knowing and being. On an individual level, it encompassed total preparation of the total person for living a total life (Shelley, 2022). Indigenous knowledge and education need to be custom-made to equip societies with the knowledge, education, values, and capabilities to perform for the good of all people and the earth, as responsible individuals of an international community.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Knowledge Systems and the its Implication for Sustainable Development

For several years, the perspective of indigenous knowledge has been set side by side with research-based knowledge, positioning the latter as privileged in comparison to the former. Nevertheless, since it is uncommon for advancement of knowledge systems to occur in seclusion, viewing indigenous knowledge and empirical or research-based knowledge as two different and confined entities fails in its description of the reality (Agrawal, 1995).

Furthermore, writings on the topic have reinforced the fact that the divide between the two is blurred, and that the incorporation of indigenous and research-based knowledge is critical, as one knowledge system may be useful in sealing gaps. This is what Njiraine and Onyancha (2011**)** defines as multiple paradigms being a more sustainable way of life.

Obstacles in Protecting and Advancing Indigenous Knowledge Systems

Pluralism of the African tribal people in the nation mirrors the variation of indigenous knowledge, which is one obstacle with respect to designing of projects on the one hand. On the other hand, many studies have pointed out that locals are oftentimes excluded from managerial and processes of planning (Arlinghaus et al. (2002). As a matter of fact, many policies and projects tended to force the same national development action on locals without considering the heterogeneity of ethnic tradition and natural circumstances. Those involved in planning lean towards focusing on new automations that have been imported from other regions instead of banking on indigenous knowledge, since it is thought of as backward. The consequence is a corrosion of indigenous knowledge and a deprivation of a crucial fall back for sustainable development (Romer et al.2009).

Conclusion and Recommendation

The traditional knowledge and proficiency, deeply seated in the connection of indigenous peoples with the earth and community, is undeniably effective in responding to sustainable development; nevertheless, it is hardly adequate. Trapped between the dangers of the environmental on the one hand and development pursuits on the other, if some remedies are not considered immediately there is likely to be unfavourable repercussions for the sustainability of this populace in addition to the knowledge systems.

It is critical that the regional and international communities start acknowledging indigenous peoples and their competence as important support in the issue with environmental and sustainable development threats and in sustaining global biological diversity. Synergy is to advance and execute appropriate initiatives to entitle indigenous communities to advocate and ascertain their rights and be engaged in the managerial processes, therefore being active participants of this transformation. From the foregoing, there is clarity that Indigenous Knowledge plays a significant role in advancement of several categories, including forest management, cultivation, and medical remedies.

Indigenous Knowledge is ecologically sustainable and it is a significant source of local subsistence and food resilience. Indigenous Knowledge Systems have been swept away by many social economic and ecological reasons. All things considered, we have worked inside and with governments at the clan, indigenous, regional, national, and international positional levels, and we have seen manifestation of achievement when knowledge systems are integrated.

Respectful incorporation of Indigenous Knowledge at all phases within the administration can result in decisions that are founded on a more holistic and all-inclusive understanding of the planet. Ultimately, advancing wise policies and efficient, unbiased programs to improve the lives of all humanity and the health of the environment is what drives the work of individuals and the administration.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

As such, it is imminent to put the Indigenous Knowledge Systems back on track by considering certain recommendations. It is thus recommended that indigenous knowledge should be gathered, recorded and circulated. There should be conserving and revitalising of Indigenous Knowledge by affirming local people and reclaiming the values of the knowledge. There is need to reconstruct and reinforce regional institutions regarding indigenous knowledge. There is also a necessity to popularize Indigenous Knowledge in regional development planning especially poverty alleviation and biodiversity preservation programmes, in addition to advancing and reinforcing Indigenous Knowledge through partnering and key stakeholders. Different deliberate steps should be taken up in this region for publicizing and enlarging biodegradable indigenous agricultural praxis for sustainable development.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Extroversion Personality Traits for Stress Management and Attitude Towards Climate Change Among Teacher Counsellors in Secondary Schools in Kakamega County Kenya

Monica Okubo*, Janerose Mayabi, Isaac Kingori
Laikipia University, Kenya
*Corresponding Author

Abstract
Climate Change is a global issue that touches the lives of all human beings, each with a different outlook while affecting their different personalities. This study examines the relationship between extroversion personality trait stress management and attitude towards climate change among teacher counsellors in secondary schools in Kakamega County Kenya. The study was guided by The General Adaptation Syndrome theory of stress management and Seligman's 3Ps theory of resilience. Correlation survey design was used. The population was 327 teacher counsellors in secondary schools. The proportionate, purposeful and simple random sampling designs were used to select 181 teacher counsellors. Data was collected using questionnaires adopted from the Big Five Inventory (BFI) tool with its published reliability coefficient of 0.8, and the Ego-Resiliency Scale (ER89) with its published reliability coefficient of 0.76. A pilot study was done in neighbouring Bungoma County. Content validity as well as expert opinion from psychology department Laikipia University was used to verify the validity of the instruments. Data collected was analysed using Pearson's correlation with the aid of Microsoft Excel statistics. Data was presented in frequency tables, graphs and charts. The study findings showed a strong relationship between extraversion and stress resilience. Extroverts were found to be oriented towards nature conservation for a safe environment. The results also showed that Extroverts with their social interrelating motivated others into climate change intervention behaviour. Extroverts were involved in societal civic engagements that educated others on matters of climate change control. The study indicated that extrovert teachers had high levels of stress management and positive attitude towards climate change because they openly shared their views on contemporary and other concerns. This conflicted with introverts who were found to be self-isolating and reserved. The study results are expected to assist teacher counsellors to understand the significance of personality traits and how they can use them to influence climate change.

Keywords: Climate change, extroversion, personality trait, stress resilience

Introduction

Personality traits are a significant asset in every individual's life (De Terte, 2014). A person's traits are the mark of their identity. An individual's behaviour, their inclinations and their habitual reactions reveal their nature. Personality traits are displayed in daily engagements, and are the source of the strength that enables an individual to perform competently at work (Darkwah, 2014).Personality traits help the individual to manage their reactions in emerging situations such as climate change. Climate change refers to the alterations evident in the ecosystem resulting from

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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natural occurrences or from human activities (Mongonia, 2022). Personality traits strengthen the individual's self-management in readiness to climate change adaptation. Human behaviour which is very significant in counselling is among the major elements that affect climate change. This study examines the relationship between extroversion personality trait for stress management and the attitude towards climate change among teacher counsellors in secondary schools in Kakamega County Kenya. Extroversion is one of the big five personality traits which are the major traits under which every individual falls (Fayambo, 2010). The rest of the big five personality traits are; neuroticism, openness, agreeableness and conscientiousness.

The purpose of this study was to investigate whether extroversion as a personality trait that influences the development of the teacher counsellors' stress management could empower them to embrace and instil positive attitude towards climate change in the communities within the secondary schools. Secondary schools have diverse communities that include the learners (and their parents by extension), the teaching and non-teaching staff, the stakeholders as well as the residents in the school neighbourhood. Teacher counsellors play a very important role in preparing the youth to identify and manage their issues early in life (Oketch & Kimemia, 2012). They handle all the psychological, academic and social issues that are harmful to learners and curtail their self-progression. These issues that harmful to learners include practices that are destructive to the environment thereby contributing to negative climate changes. Counselling plays a big role in the client's connection to nature or individual eco-wellness (Mongonia, 2022). Counselling guarantees individual psychological wellbeing, mental fitness and physical aptness (Nelson-Jones, 2011). It empowers individuals to find acceptance in the society. Teacher counsellors in secondary schools require strong personality traits that will enable them to be stress resilient because they occupy significant positions in school that give them the mandate to propagate a positive attitude towards climate change among their clients within all the school communities.

The big five personality traits have underlying qualities that support and build them. These underlying qualities are adjectives that display the character strength of each individual and reveal their personality. A study by van Aarde et al. (2017) showed that extroverts were rich in positive character. They had characteristics that gave them a positive outlook towards life. Extroverts are gregarious, assertive, energetic, talkative, initiative, outgoing, friendly and agile (Thompson & Goodvin, 2016). They were found to be generally agile and full of life because their underlying qualities made them resilient and be able to manage their stress satisfactorily. Resilience to stress for the extrovert teacher counsellors was seen to be a guarantee for competent counselling services to the learners. Psychology contributes immensely to climate change (Whomsley, 2021) through counselling.

Whomsley explains that psychologists strive to change human behaviour that threatens climate change. They purpose to increase human connection with nature in a positive way to heal both man and the planet. They also provide support and psychological interventions for those affected by climate change. Additionally, they instil preparedness for negative outcomes while helping with adaptation and survival mechanisms. Extroverts have good stress management that motivates the teacher counsellors and gives them high self-esteem. The drive to create positive attitude towards climate change requires aggression and wholesome inclusiveness (APA Task Force, 2011). Extroverts' underlying traits described by Thompson and Goodvin (2016) make them competent in sensitizing the communities within the schools on climate change. These secondary traits empowered the teacher counsellors to steer the communities in secondary schools towards the right direction in the acquisition of positive attitude to climate change. School counselling offered by competent counsellors equipped the clients with the preparedness they

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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required to confront life's challenges and cope in a changing environment. A serene psychological state will crave and flourish in a serene environment (Morrissey & Riser, 2015). Thus, psychologically comfortable learners, staff and stakeholders will fight for positive climate change.

Secondary school learners, who enjoy competent counselling, transit to their next settings well prepared to function according to societal expectations. With everyone experiencing the bad impact of negative climate change, societal expectations include positive practices that are expected to boost climate change. Resilient teacher counsellors re-directed the attitude of the entire school communities to embracing positive climate change behaviour. Competent counselling earned the teacher counsellor the respect they required to take charge of the behaviour amendments that put controls on the climate change severity (Whomsley, 2021). Counsellors who are extroverts are assertive and outspoken and are able to professionally employ psychological skills to win the clients' trust and inspire behaviour change in favour of a suitable environment.

This paper looks at how personality traits enhance stress management and improves attitude towards climate change for the teacher counsellors in Kakamega County Kenya. Its objective was to determine the relationship between extroversion personality trait for stress management (resilience) and attitude towards climate change among the teacher counsellors in secondary schools in Kakamega County, Kenya. Consequently, the hypothesis stated was as follows:

H_{01} There is no statistically significant relationship between extroversion personality trait for stress management (resilience) and attitude towards climate change among the teacher counsellors in secondary schools in Kakamega County, Kenya.

Theoretical and Conceptual Framework

The study was guided by the General Adaptation Syndrome (GAS) theory of stress management which states that the body responds to stressful situations in three successive stages: the alarm stage; the resistance stage; and the exhaustion stage (Gross, 2015). The individual's awareness of the effect that stress has on them is an indication of the possibility to overcome the stress. The body responds to the stressor using the traits that the individual has within their personality. Adverse outcomes of climate change are stressful and harmful (Tomaka, 1993) to human beings and needs to be overcome through positive personality traits that inspire resilience. Teacher counsellors who are extroverts have supportive traits that enable them to overcome stress. Individuals will thus be encouraged to utilize their traits for the control of stress. They will require social value awareness and understanding (van Lange & Joireman, 2008), so that they direct their behaviour towards the benefit of the majority.

The study was also guided by Seligman's 3Ps theory of Resilience (Yates & Masten, 2004). This theory has its roots in positive psychology which advocates for an optimistic outlook on life. The theory looks at the obstacles that may hinder the growth of resilience in an individual. Seligman derived the title to this theory from the initials of three emotional realities: – Personalization, Pervasiveness and Permanence, which he uses to explain how resilience is emphatically restrained by cognitive distortions in unsuspecting individuals. When the individuals personalise stressful climate change issues and recline in them or accept them as being permanent, then they will make no effort to work towards attaining behaviour change. Considering negative climate change occurrences to be pervasive or inescapable leads to resignation and failure to elevate one's self. There is need to understand climate change risks and take preventive behaviour (Weinstein, 1988).

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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These two theories encourage the individual to utilize positive character traits to adopt behaviour that will improve situations in the wake of adverse climate change outcomes.
The conceptual framework of this study comprises the concepts that teacher counsellors who are extroverts possess strong underlying traits that render them stress resilient. The underlying traits include gregarious, assertive and outspoken, (Thompson & Goodvin, 2016). Stress resilient teacher counsellors are able to handle climate change repercussions individually and by sensitizing members of the school communities through counselling.

Methodology

The research method that was used in this study was the correlation research design. This is a design that investigates the relationships between variables without any controlling or manipulation (Price et al., 2017). The study concern was to examine the relationship between extroversion personality trait for stress management and attitude towards climate change among teacher counsellors in secondary schools. The data was collected using questionnaires and was analysed within the correlation research design with the aid of Microsoft Excel computer package.

The study was carried out in Kakamega County, Kenya. Kakamega County in Kenya is one among the forty seven counties in the country that has a high number of secondary schools as reported in the MOEST (2019). The schools had teacher counsellors who offered counselling services to the learners as required of them by the Ministry of Education (MOEST, 2016). These same teacher counsellors also taught two subjects as demanded of them by their employer (MOEST 2014), which is the Teachers' Service Commission (TSC). The teacher counsellors were additionally assigned other responsibilities by their administrators, like being a class teacher, co-curriculum teacher or teacher on duty (TOD) alongside the counselling assignments. These created additional tasks that greatly overwhelm teacher counsellors in secondary schools in Kakamega, thus causing them stress and curtailing their involvement in climate change sensitization. Curtailed involvement together with stress had adverse effects on the teacher counsellors. This caused them low self-esteem, poor interpersonal relationship, temperamental reactions and self-isolation (Rokonuzzaman & Rahman, 2011).

The negativities just described impeded the teacher counsellors' authority in spearheading the climate change campaign within the school communities. It is against this background that Kakamega County was chosen for the investigation of the relationship between extroversion personality traits that enabled stress management and how it helped improve attitude towards climate change among teacher counsellors in secondary schools. A pilot study was carried out in Bungoma, a neighbouring County that experienced similar challenges for the teacher counsellors in the secondary schools.

The population of the study consisted of all the teacher counsellors from the 327 sub-county secondary schools in the twelve sub counties demarcated by the Ministry of Education (MOE, 2019) in Kakamega County, Kenya. The sample size of this study was derived from Krejcie and Morgan's (1970) sampling table for fixed population sizes and was found to be 181 out of the 327 schools in the twelve MOE sub-counties. The participants in the study were the teacher counsellors from the 181 sampled schools. These participants were the teachers, who were entrusted with the responsibility of offering counselling services to the learners in those specified schools. The 181 secondary schools total was arrived at through proportionate stratified random sampling. This is an unequal sampling method that was done in proportion of the sample strata in relation to the size of the population identified (Borden & Abbott, 2016).

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The specific schools that made up the 181 sample size required were identified through simple random sampling (Law, 2009). This was done by randomly assigning numbers to all the schools in each county then the needed total for that county was randomly picked from the lot of numbered schools. The number that was picked identified the name of the school that was sampled.

The participants for the study were selected from the named schools through the non-probability, purposive sampling procedure which selected participants basing on predetermined criteria as explained by Borden and Abbott (2016). Purposive sampling in this study was pegged on the criterion that the participants were the main persons in charge of the guidance and counselling programme in the selected secondary schools. Data was collected from these participants with the help of research assistants after official permission had been obtained from relevant authorities such as the National Commission for Science, Technology and Innovation (NACOSTI). The questionnaire return after distribution was 100 percent because the research assistants visited the particular schools to administer to only one participant and left the school with the filled in questionnaire. The study was done in adherence to research ethics.

The tools of data collection were the Big Five Inventory (BFI) developed by Naumann and Soto (2008) and the Ego-Resiliency Scale (ER89) that was developed by Block and Kremen (1996). Both tools are peer reviewed and have a published reliability coefficient. In addition, they were subjected to expert opinion from the Psychology department of Laikipia University and tested in a pilot study carried out in the neighbouring Bungoma County.

The data analysis was done by editing, coding and grouping the data collected in relation to the study variables and objectives before examination. The analysed data results were presented in form of frequency distribution tables and charts. They were analysed using Pearson's correlation with the help of the Microsoft Excel. Microsoft Excel was preferred because besides having all the qualities that the otherwise popular Statistical Package for Social Sciences (SPSS) has: - such as being effective and covering a wide range of general statistics and graphic data analysis, -it is contemporary and easy to use, it is also all-encompassing because it can be used for researches of all disciplines. The research was carried out with strict observation of all the moral obligations owing to the social sciences discipline. It was research that was based on one objective and one hypothesis extracted from a larger study that covered all the big five personality traits.

Study Results and Discussions

The results of this study that examined the relationship between extroversion personality traits stress management and attitude towards climate change among teacher counsellors in secondary schools in Kakamega County Kenya, established that there was a strong relation between extroversion as a personality trait for stress management and attitude towards climate change. These findings showed that there was significant relationship between extraversion resilience and attitude towards climate change. Since the P-value of this study was 0.7, only values above 0.7 would allow for the acceptance of the hypothesis. The results of the Pearson's correlation analysis that was carried out in excel on the relation between extroversion resilience and attitude towards climate change was -0.5047 correlation coefficient. This indicated that there was a strong negative correlation between extroversion resilience and attitude towards climate change. Hence, the rejection of the null hypothesis at 0.05 significant level and the conclusion that there was a relationship between extroversion resilience and attitude towards climate change.

The study looked at all the Big Five personality traits and grouped the sampled 181 participants under Extroversion, Neurotic, Openness to experience, Agreeableness and Conscientiousness personalities. This grouping was done because the 181 sampled teacher

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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counsellors were not only extroverts but they belonged to all the big five personality traits. These five personalities were easily identifiable because the respondents were aware of their supportive traits as mentioned in the questionnaire items and responded to them by indicating whether they were Very Accurate (VA), Moderately Accurate (MA) or Inaccurate (IN) in reference to themselves. Those respondents who had the correct supportive traits that led to the specified major personality trait showed the trait they belonged to. The 181 sampled teacher counsellors were grouped per trait as shown in figure 1.

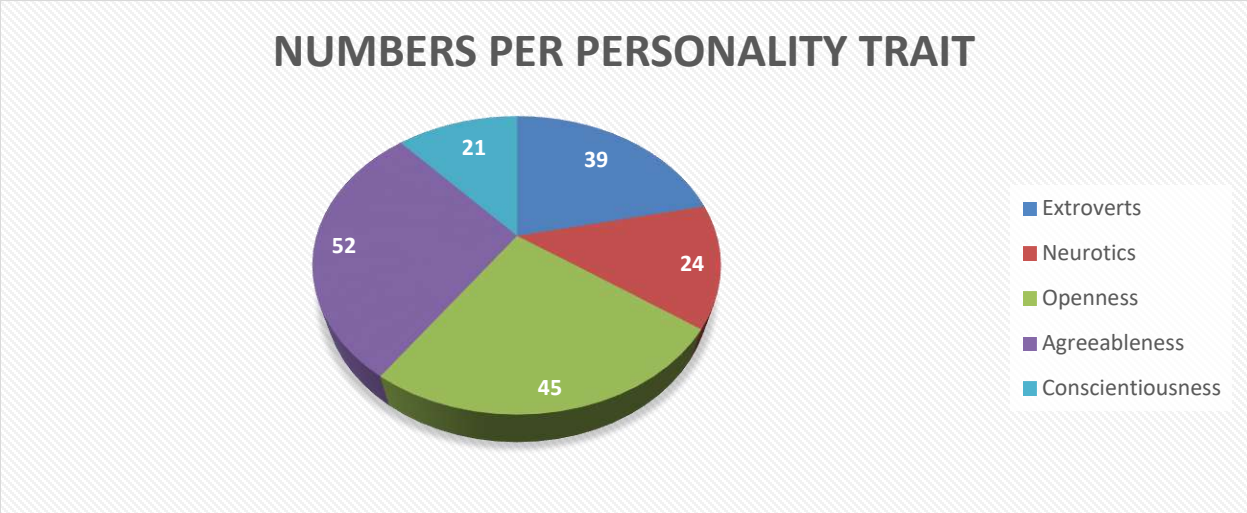

Fig. 1: Number of Teacher Counsellors per Personality Trait
Source: Field data

Grouping the participants in accordance to the big five personality traits, revealed the supportive traits that the teachers possessed. It revealed the positivity and strength that determined the individuals' potential in directing the communities towards climate change initiatives. The counsellors' world viewpoint as supported by their character, determines their passion for climate change. Human behaviour contributes to climate change and psychology regulates human behaviour through counselling (Swim et al. 2011). Teacher counsellors with resilient personality traits stand a great chance to manipulate the school communities into suitable behaviour change. Swim et al. (2011) also reported that counselling was crucial for mental health restoration during disasters caused by climate change. Climate change leads to natural disasters that generate stress (Morrissey & Riser, 2015). Counsellors must be at hand to instigate behaviour change or journey with the stressed victims. It is important that the individual teachers know their traits because personality traits direct their performance.

A study by Oliver et al. (2008) agrees that traits are very significant in the individual's life. They give the individual the stamina to act. Although personalities are not cast on stone, it is essential that one knows the basic characteristics that one possesses. One must be aware of their character inclinations and utilize them correctly. Weinstein (1988) emphasized understanding climate change risks and adapting preventive behaviour. Counselling informs about the effects of climate change.

Wolf and Weissing (2010) stated in their research findings that the big five personality traits did not have limitations over their underlying traits. They argued that each trait ran into the other and that they were all interrelated due to plasticity and stretching over boundaries. All the five

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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have positive character but extroversion was endowed with the relevant characteristics (Thompson & Goodvin 2016) for positive behaviour change. Extrovert teacher counsellors have resilience and motivate communities to self-appraisal in relation to preparedness for climate change. They had the characteristics that powered behaviour change that is the major instrument for climate change. The data results revealing the extrovert teacher counsellors' traits that enhance climate change behaviour was found to be as indicated in table 1.

Table 1: Extroverts' Response Frequencies to Behaviour Change Indicators

Traits supporting Extroverts	VA	MA	IN	N/A	DK	Tot
I am very talkative and can easily convince others.	28(73.8)	6	5	0	0	39
I am full of energy and inventiveness.	32(82.1)	4	3	0	0	39
I like to impress others and to stay in the limelight but I fear failure.	14(46.6)	16	9	0	0	39
I am assertive and explorative.	23(59.7)	12	4	0	0	39
I am very friendly, outgoing and sociable.	34(87.2)	5	0	0	0	39
Total Responses	131	43	21	0	0	-

Source: Field data

The data results showed the extroverts' frequency response for being talkative and convincing as 28 (73.8%).Their being energetic and inventive was 32(82.1%). The data further showed that they were 23 (59.7%) assertive and explorative while 34(87.2%)of them were friendly, outgoing and sociable. These positive characters were found to be relevant for instilling attitude to climate change. The findings were in agreement with the findings of Thompson and Goodvin (2016) which indicated that extroverts had positive underlying adjectives that gave them character strength. These traits empowered the extroverts to influence others to have a view of life that was similar to their own view.

Similar results were posted by Saeed et al. (2018) in their findings that showed extroverts as having a rich positivity that kept them lively and cheerful and at the same time enabled them to cheer up those who were around them as well. Larsen and Buss **(**2010) also found the extroverts to be charmingly social and to enjoy a charisma that enhanced positive behaviour. They prevailed over community decisions as ambassadors of positive attitude towards climate change.

Extroverts were found to draw their energy from resilience. The data frequencies showed that they were inclined towards resilient practices as indicated in table 2.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 2: Extrovert Teachers Resilience Responses

Resilience Indicators	VA	MA	IN	N/A	DK	Total
I quickly get over and recover fast from being startled	32	6	1	0	0	39
I usually succeed in making a favourable impression on people.	35	4	0	0	0	39
I get over my anger at someone reasonably quickly.	27	9	3	0	0	39
I recover from emotional hurts considerably fast and move on.	29	8	2	0	0	39
I like to involve myself in doing new and different things.	16	13	10	0	0	39
Total responses	**139**	**40**	**16**	**0**	**0**	**--**

Source: Field data

Extroverts were found to be self-rejuvenated and in control of their stressors. These results are in agreement with the results that Martinez-Marti and Ruch (2017) found which indicated that there was great affiliation between extroversion and resilience as a distinctive force. The findings are further in agreement with Ercan's (2017) findings that showed that extroversion had many qualities that enriched character strength and improved self-management. This positivity was further supported by observations by Ganu (2014) which proved that extroversion had the predisposition to character strengths that made it more appropriate for the development of resilience and stress management than the rest of the big five personality traits. These positive underlying powers enhanced the teacher counsellors' authority to educate school communities to work towards understanding climate change risks and taking to preventive behaviour change as Weinstein (1988) emphasized.

The data collected for this study indicated that teacher counsellors in secondary schools in Kakamega County, Kenya carried out their services successfully. The frequency results for successful counselling were found as indicated in table 3.

Table 3: Extroversion and Successful Counselling in School

Indicators for Successful School Counselling	VA	MA	IN	N/A	DK	Total
Counselling is highly valued by staff and students in my school	16	15	5	2	1	39
The school administration supports counselling in school	12	9	17	1	0	39
We've many success stories from our counselling department.	26	12	1	0	0	39
Personality traits are very significant for service delivery.	37	2	0	0	0	39
Stress resilience allows for unrestricted navigation of counselling activities.	33	3	2	0	1	39
Total	**114**	**41**	**25**	**3**	**2**	**--**

Source: Field data

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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The results of the analysed data revealed that teacher counsellors worked competently despite the poor support from the schools' administrations. Many of the teacher counsellors interviewed (26 out of 39) indicated that they had many success stories about the counselling done in their departments. This showed satisfaction from both the client and the therapist. The participants agreed that personality traits were significant in service delivery (37) and that resilience allowed them to carry out counselling activities without restriction (33). These teachers were satisfied with the counselling done in the schools despite the low support from the school administrations. Counselling is core for behaviour change which is basic for climate change.

Findings

This study came up with a number of findings.

1. Everyone has personality traits that enable them to be active. The big five personality traits are the major traits and individuals fall under one of the five. None of the five traits dominates the other.
2. Resilience is essential for the strengthening of the big five traits. Extroversion has strong underlying traits that make it resilient.
3. Resilient extroverts contribute positively to climate change. The extrovert teacher counsellors are very instrumental in addressing climate change issues in the school communities.
4. Psychology, through counselling plays an immense role in climate change.

Conclusions and Recommendations

This study that examined the relationship between extroversion personality traits for stress management and attitude towards climate change among teacher counsellors in secondary schools was carried out in Kakamega County, Kenya. After scrutiny of the results of the analysed data, several conclusions were made.

Extroversion personality trait has strong resilience that gives authority to influencing behaviour change and addressing climate change. The teacher counsellors with extraversion as their major personality trait are able to manipulate their positive supportive traits to achieve counselling prowess that will provide expertise for climate change. Personality dictates reactions. Counsellors with extraversion are able to change human behaviour that threatens climate change. Psychological peace that comes with successful counselling will dictate behaviour that contributes to positive climate change.

The teacher counsellors' self-awareness and the value of the individual's personality traits as evident from the results of this study will empower the counsellor and break the negative effects of overwhelming assignments. They will be able to surmount their responsibilities and take charge of the institutions' climate change activities. This awareness will serve as a call for more teachers to enrol as counsellors in secondary schools and ease the work load.

Secondary school counselling can be a channel for climate change propagation thus more support from the schools' administration is required. The results of the analysed data indicated that counselling in secondary schools is successful. Support from the school administration will generate self-belief and enhance performance. Counselling is behaviour change and behaviour change is climate change.

Climate change interventions require aggression and self-belief. With the synergy which can be easily prompted by resilient extroverts, school counselling can be used as the drive for climate change appraisals, prevention and orientation. They will empower themselves to create

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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self-belief in the learners and encourage them to work together with the global youth to mitigate climate change challenges.

Extroversion has resilience that enriches the individual towards positive climate change activities. This study came up with a number of recommendations that will enhance climate change mitigations. Climate change be tackled from the individual point of view. Through personal engagements such as counselling, the individual can be made to understand the role they play and the impact of the repercussions on the self. More counselling needs to be involved in climate change and disaster management, and counsellors ought to be encouraged to take charge of climate change situations. Climate change should be linked to psychological peace such that the people equate the danger in neglecting your psychological wellness to the danger of messing with climate change. Everybody should be made aware that climate change does not start with the wild fires from heat waves and El Nino floods but with the litter carelessly thrown from your doorstep. More research should be carried out on factors considered less significant but that contribute to climate change. These may include individual attitudes, family upbringing or emotion interrelation where emotions within the individual should be harnessed by the individual for self-discipline that benefits not just the individual but everybody.

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Response of Climate Change and Religion to Trans-sexuality Among University Students in Kenyan Universities: The Case of Laikipia University

Peterson Kabugi Thumi
Department of Social Studies, Laikipia University, Kenya

Abstract
The tension between religious freedoms and *trans-sexuality* rights has been an ongoing dilemma not only in the world but also in Kenya. *Trans-sexuality* also called *dysphoria*, is a condition an individual experiences a discrepancy between their gender identity and the sexuality. Trans sexuality is also an umbrella terms for persons whose gender identity, gender expression or behaviour does not conform to that typically associated with the sex to which they are actually biologically are. In other words, transsexual refers to people whose gender identity is different from their assigned sex. Further, *Trans-sexuality*, variant of gender identity in which the affected person believes that he or she should belong to the opposite sex. Climate change on the other hand is a gender issue with much research carried out on climate change effects such as droughts, floods, and extreme weather events on women and girls' marginalization and poverty and opportunities for adaptation. Yet little has been researched on the impact of climate change as exposing factor to poverty on the rate at which students changing to *trans-sexuality* occasioned by monetary support and opportunity promises from individuals and organizations championing *trans-sexuality* in the wider society. The extent to which religion has responded to *trans-sexuality* phenomenon as a safe buffer zone and its effect on climate change gender specific programmes is not adequately researched. The main objective of this investigation was to examine the response of climate change and religion as the conscious of the society to *trans-sexuality* among Laikipia university students in Kenya. The investigation used Yamene (1967) probability systematic sampling formula to determine the expected sample size. For rapid data collection, the investigator used a structured questionnaire administered online via Google Forms. Descriptive statistics and regression analysis techniques were used for quantitative data, while content analysis technique was used for qualitative data. The investigation established a positive significant response of climate change and religion as the conscious of the Society to *Trans-sexuality*. The findings from this investigation will expand the debate of religion and *trans-sexuality* among university students in Kenya. The study will further ground religious morality as a safe buffer zone as far as the debate of *trans-sexuality* is concerned in Kenya.

Keywords: Climate change, poverty, religion, transgender, trans-sexuality

Introduction

Women, particularly those living in rural and less-developed countries are disproportionately affected by climate change and its related impacts, which can exacerbate existing inequalities and create new ones. In many of these communities, women are often responsible for collecting water, firewood, and other resources necessary for survival, and as climate change exacerbates droughts,

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

floods, and other natural disasters, these tasks become even more difficult. In addition, women tend to have fewer economic resources and less political power than men, which can make it harder for them to adapt to changing conditions and advocate for their needs (Tripodi, 2023). Moreover, climate change impacts health, education, and livelihoods, which can all have cascading effects on women's well-being and that of their families. For example, in areas where agriculture is the primary means of subsistence, women may face decreased crop yields and loss of livestock due to climate change, leading to food insecurity and malnutrition.

Overall, climate change poses a significant threat to the livelihoods and well-being of women in rural and less-developed countries. Thus, addressing climate injustice will require a focus on gender-sensitive policies and programmes that take into account the unique challenges faced by women in these communities. Gender sensitive policies addressing gender in terms of women and men is prominent in modern research whereas the impact of climate change on the emerging *trans-sexual* experience in the society is a grey area in literature.

The core of this investigation was the connection between climate change, religion and *trans-sexuality* among university students. The question at the heart of these debates is about religion and climate change is whether religious commitments are the primary drivers of global action, or whether beliefs are embedded in larger systems of identity that combine secular and religious modalities. Religion is a moral driver that teaches on the sanctity of sexuality as given during creation. The societal changes have brought in new phenomena like trans-gender, *trans-sexuality*, LGBTQ which in view of religion is unacceptable. These societal changes are a dilemma to societal programmers especially climate change which have specific programmes designed to particular gender. For example, there are specific climate mitigation programmes targeting women and others targeting men. How *trans-sexuality* disrupts these programming is at the core of this investigation which is not adequately researched. The investigator therefore intended to get students religious leaders' perception on the connection between climate change, religion and *trans-sexuality*.

Review of Previous Studies

According to Berg (2022), climate change is a complex and multifaceted issue that is deeply intertwined with human society and culture, including religion. Religion shapes human values, attitudes, and behaviours towards the natural world, and as such, it can have a significant impact on our ability to address climate change. Many religious traditions have teachings that emphasize the sacredness of the natural world and the importance of stewardship and conservation. For example, in the Judeo-Christian tradition, the Book of Genesis describes humans as stewards of the earth, charged with caring for it and all its inhabitants. In Islam, the Qur'an describes the earth as a gift from God and emphasizes the importance of environmental protection. Similarly, many indigenous religions around the world view the natural world as a sacred and interconnected web of life, with humans as one part of this larger whole.

Given the complexity of the relationship between religion and climate change, it is important to engage with religious communities and leaders in efforts to address this issue. By drawing on the values and teachings of various religions, we can work towards building a more sustainable and just society that respects the natural world and supports the well-being of all its inhabitants. Although many religious traditions have teachings that emphasize the sacredness of the natural world and the importance of stewardship and conservation, few studies have been conducted to establish the impact of religion as the conscious of the society on *Trans-sexuality*

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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which as a sub-set of Lesbian, Gay, Bisexual, Transgender and Queer (LGBTQ) among university students as not been given adequate empirical investigations.

According to Md et al. (2022), climate change is a complex phenomenon that affects societies in various ways, including gender dynamics. Extreme climate events have become more frequent in Bangladesh because of climate change. These events have severely affected rural communities' livelihoods, agricultural productions and damaged properties; aggravating their existing economic and social conditions (Jakariya et al., 2020). Climate change will have disparate impacts on different groups in society, with the most socially and economically marginalized facing increased vulnerability (Thomas et al., 2019). Climate change has the potential to affect gender in the society, for example, in many societies, women are responsible for collecting water and firewood, which are becoming increasingly scarce due to climate change. This may place an increased burden on women and limit their ability to participate in other activities such as education or paid work. Girls and young women are often at a heightened risk of violence and exploitation during and after extreme weather events, including sexual and physical abuse as well as trafficking (Afridi et al., 2022).

Additionally, extreme weather events such as floods and droughts can cause crop failures, which can exacerbate food insecurity and economic hardship for households and also disproportionately affect women and girl. Whereas climate change has the potential to impact gender dynamics in various ways, including access to resources, roles and responsibilities, and cultural attitudes, the emerging *trans-sexual* gender in the modern society as gender dynamism is an area of interest with little studies. Habib (2021) established that gender relations, gender differentiated roles and responsibilities and gendered knowledge of climate change determine women's overall experience and practices to climate change.

According to Mishra and Mohapatra (2017), there are several factors that explain the differences between women and men in terms of their exposure and vulnerability to risks from climate change. Some of these factors include; Gender roles and responsibilities. In many societies, women are responsible for tasks such as collecting water and firewood, preparing food, and caring for children and the elderly. Climate change can exacerbate these responsibilities by making it harder to access clean water and fuel, increasing the time needed to gather resources, and leading to more frequent natural disasters that require additional care work.

Scholarship on the connections between religion and climate change includes social science research into how religious identity influences attitudes towards climate change; confessional and constructive engagements of religious thought with climate change from various communities and traditions; historical and anthropological analyses of how climate affects religion and religion interprets climate; and theories by which climate change can be interpreted as a religious phenomenon. The question at the heart of debates about religion and climate change is whether religious commitments are the primary drivers of global action, or whether beliefs are embedded in larger systems of identity that combine secular and religious modalities. Some political scientists, for example, have proposed that white American Evangelicals' antipathy towards the environment is linked to end times beliefs (Barker & Bearce, 2013).

Many indigenous communities around the world have developed deep connections with the natural world, and their religious and spiritual practices are often closely tied to the health of the environment. As climate change begins to impact these communities, their traditional practices may be threatened or altered in various ways, and this could lead to a stronger emphasis on the importance of those practices for understanding and responding to climate change (Berg, 2022). According to Hulme (2017), it would be strange if religion completely ignored the concept of

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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climate change because religious discourse constantly discusses the relationship between humans, God, the earth, and the other forms of life on it. Given that climate change is a global issue, one would expect religious organizations to try to incorporate it into their teachings and make it a relevant topic in religious discourse. As well as climate change is a global issue and that religious organizations to try to incorporate it into their teachings and make it a relevant topic in religious discourse, the impact of both climate change and religion on *trans-sexuality* is an area which require much investigations which was the motivation of the current investigation.

The Diagnostic and Statistical Manual of Mental Disorders (DSM)-5 defines Gender Dysphoria (GD) as 'an individual's affective or cognitive discontent with the assigned gender', with the addition that it may also refer to 'distress that may accompany the incongruence between one's experienced or expressed gender and one's assigned gender' (Ristori, & Steensma, 2018). According to Geibel (2012), same-sex relationships are commonly perceived as 'un-African' or contrary to cultural norms in Kenya, and are thought to be a behaviour or practice learned or 'imported' from outside cultures. *Trans-sexuality* on the other hand is a term used to describe individuals who identify as a gender that is different from the sex they were assigned at birth. This can include individuals who have undergone, or are considering undergoing, medical or surgical interventions to align their physical characteristics with their gender identity.

It is important to note that gender identity is distinct from biological sex and can exist on a spectrum, with individuals identifying as male, female, or non-binary, among other possibilities (Rostek, 2022). Many religious denominations have traditionally taken a conservative stance on issues related to sexuality and gender identity, based on their interpretation of biblical teachings. As a result, individuals who attend these churches may be more likely to hold orthodox views on these issues. *Trans-sexuality* research has been surprisingly scarce, with most studies focusing on the perceptions of transsexual individuals' parents (Elischberger et al., 2016).

Climate change has significant social, economic, and environmental implications for communities around the world, and these impacts affect women and men differently. Holvoet and Inberg (2018) argue that society imposes expectations on women and men roles affecting their individual vulnerability; hence, it is important to include a gender approach in the analysis of climate change adaption policies. Women often face greater vulnerabilities and risks due to their existing social and economic marginalization, as well as their gendered roles and responsibilities. For example, women are often responsible for securing food, water, and energy for their households, and these tasks can become more difficult in the face of climate change. In many contexts, women also have less access to education, resources, and decision-making power, which can limit their ability to adapt to and mitigate the impacts of climate change. Therefore, it is essential to recognize and address the gendered dimensions of climate change in order to ensure that climate policies and programmes are inclusive and equitable, and that they effectively address the needs and priorities of all members of society, regardless of gender (MacGregor, 2010).

Patriarchal structures provide men with more general adaptive capacity or capability to climate change for several reasons. While discussing the impact of climate change on women, studies highlight that discriminatory norms and rules, women's socioeconomic status and controlled mobility make them more vulnerable to climate change (Tanjeela & Rutherford, 2018). While women's vulnerability may increase in the absence of men, men migrating for survival as a result of climate and livelihood shocks frequently end up in urban slums, working hard in poor living and working conditions, and developing a range of health problems that may in fact increase male morbidity and mortality in the medium term (Mitra et al., 2015).

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Climate change is having a significant impact on food security and sovereignty. Weather patterns influence food availability, access to food, food utilization, food supply stability, and people's nutrition. Because of women's role in agriculture, access to resources, and the differentiated gender roles and responsibilities expected of them, all of these aspects of food security are gendered (Borquez et al., 2017). Despite previous gender and climate adaptation discourses that portrayed women as climate change victims and subjects more vulnerable than men, recent studies tend to challenge this generalization (Liru & Heinecken, 2021). The extent to which gender based climate programmes are executed by people of *trans-sexuality* orientation are some of the gender-related emerging issues in the society, yet not much research has been conducted.

Concerning religion, a recent report shows that non-religious communities are more likely to be more concerned about global warming and environmental protection than evangelicals (Zaleha & Szasz, 2015). More than 79 percent of atheists view stricter environmental laws and regulations as worth the cost (Pew Research, 2014). Religiously unaffiliated people are more likely to say that the earth is warming due to human activities (Pew Research, 2015). Atheists also tend to show greater support for social justice and civil rights issues, such as same-sex marriage, feminism, and racial equity (Bowman et al., 2017). Arli et al. (2022) results show that religious people are less committed to the environment and climate change and that atheism positively affects recycling and climate change identity. There is still a research gap on the response of climate change to the emerging phenomenon of *trans-sexuality* which the current investigation analysed and results presented.

Methodology

This study adopted a descriptive research design, which was helpful in summarizing the population characteristics of the study. The design enabled the researcher to use a structured questionnaire as the primary data collection instrument. The research was focused on describing the characteristics of the population under study, and this was achieved by collecting data and summarizing the findings. The descriptive research design is particularly useful in providing a comprehensive summary of the population's characteristics, including their demographics, attitudes, behaviours, and other relevant factors.

Descriptive research was therefore used to describe the impact of climate change and religion as the conscious of the society on *trans-sexuality* among university students since little is known about the topic leading to the investigator gather information used to test hypotheses. Descriptive research was also used to identify patterns or relationships among variables. The target population of the study was 100 student leaders serving in different positions in Laikipia University.

The study adopted sampling formula by Yamene (1967) to arrive at 80 sample size who gave the required information concerning the impact of climate change and religion as the conscious of the Society on *Trans-sexuality* among Students. For rapid data collection, the investigator used a structured questionnaire administered online via Google Forms. Descriptive statistics and regression analysis techniques were used for quantitative data, while content analysis technique was used for qualitative data. The quantitative data was coded, entered, and analysed by the researcher using the Statistical Package for Social Sciences (SPSS) version 23. Statistics was created to be both descriptive and inferential. The demographic data of study participants, as well as inferential statistics and all conclusions were presented using frequencies and percentages and summarized using tables.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Throughout the research process, the researcher encountered legal and ethical issues. These included obtaining all necessary authorization, providing a consent form to all participants, adhering to the principle of voluntary participation, ensuring the confidentiality of participants' information, ensuring the anonymity of participants during data collection, and acknowledging other people's ideas to avoid plagiarism and fraud. The researcher also informed all of the participants about the true purpose of the study.

Results and Discussions

This section presents the results of both the descriptive and inferential findings on the impact of climate change and religion as the conscious of the society on *trans-sexuality* among students in Kenyan universities. The descriptive statistics results are presented in terms of frequency tables whereas the inferential statistics results are presented based on beta coefficient tables.

Among the respondents under this investigation, slightly above half 51 percent were male whereas 49 percent were female indicating a balanced view on the results of the key variables under investigation with majority 87 percent from the Catholic Association, with 11 percent from Protestant Associations and 2 percent other Religious Associations with majority of them 64 percent having age bracket of 20 years and below. These results indicated that the respondents cut across the gender parity in the population under the study.

Concerning the respondent's awareness of the issues surrounding climate change, the results revealed that majority (91%) were aware and another majority (96%) were aware of the emerging issues surrounding *trans-sexuality*. The majority of the respondents (64%) observed that these emerging issues surrounding *trans-sexuality* are shaping humanity perception of climate change and gender roles. Majority of the respondents (95%) were aware of the role of religion in addressing the emerging issues of *trans-sexuality* in among university students. Majority of the respondents (56%) observed that religion play a role in handling the emerging issues of *trans-sexuality* in the universities to greater extent.

Results of Changing Trends associated with climate change and Emerging Issues of *Trans-sexuality*

Table 1 presents the results of the changing trends associated with climate change and emerging issues of *trans-sexuality* and gender that have an impact on afforestation, agriculture and finance.

Table 1: Changing Trends Associated with Climate Change and Emerging Issues of Trans-sexuality

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
Trans-sexuality is negatively affected by climate change	17	6	9	35	33
Agro-forestry initiative deteriorating	5	14	13	37	31
Gender specific participation in crop productivity	3	9	17	48	23
Gender specific participation in animal productivity	11	14	21	40	14
Gender specific climate change information flow s clarity	11	8	4	56	21
Gender specific climate change financing	6	8	11	52	23
Gender specific climate change training	7	10	14	55	14
Gender specific climate change related associations	8	13	41	27	11

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Findings concerning *trans-sexuality* is negatively affected by climate change revealed that majority (88%) of the respondents (35% who Agreed and 33% who Strongly Agreed) agreed that the emerging issue of *trans-sexuality* is contributed by climate change in the wider society because of lack of clarity on gender roles as far as climate change is concerned and that Agro-forestry initiative which was aligned to gender in the forestry deterioration has an impact on *trans-sexuality*. Findings concerning Gender specific participation in crop productivity that majority of respondents (71%) agreed that gender specific participation in crop productivity has an impact on emerging issue of *trans-sexuality* due to lack of gender roles clarity.

Concerning participation in animal production, the study established that majority of the respondents (81%) agreed that gender specific participation in animal productivity has an impact on emerging issue of *trans-sexuality* due to lack of gender roles clarity. Also on information flow, the results revealed that majority of respondents (77%) agreed that gender specific climate change information flow in the wider society is already challenged by the emerging issue of *trans-sexuality* due to lack of gender roles clarity. Further on climate change financing, the results revealed that majority of respondents (69%) agreed that gender specific climate change financing is already challenged by the emerging issue of *trans-sexuality* due to lack of gender roles clarity. Lastly, findings on climate change associations revealed that majority of respondents (41%) were not sure of gender specific climate change related associations that are already challenged by the emerging issue of *trans-sexuality* due to lack of gender roles clarity.

Results of the Role of Religion in Addressing the Emerging Issues of T*rans-sexuality*

Table 2 presents the descriptive statistics results of the role of religion in addressing emerging issues of trans-sexuality that include societal complexity, societal buffer systems, and counselling services among others discussed.

Table 2: The Role of Religion in Addressing the Emerging Issues of Trans-Sexuality

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
Religion is already addressing the complexity	8	4	12	45	31
Religions have re-defined their operations	6	3	13	50	28
strong buffer systems	2	11	21	43	23
strong rehabilitation systems	4	3	17	47	29
Used creation by God to remind	8	2	11	48	31
Used holy scriptures	9	1	14	54	32
Fighting prejudice and fundamentalism	24	0	14	41	21
Teaching by pointing to the penal code	7	2	16	43	32
Use counselling programme	12	8	4	51	25

Table 2 presents the descriptive statistics results of the impact of religion as the conscious of the society on *trans-sexuality*. Concerning complexity of social issues, the results reveal that majority of the respondents (76%) agreed that religion is already addressing the complex societal issues associated with the emerging issues of *trans-sexuality* in the wide society. At the same time, religious organizations have developed strong rehabilitation systems to address those already practicing *trans-sexuality* not only in their fellowship but the wider society. On the same results, religious organizations have counselling programme that rehabilitate those students already

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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practising *trans-sexuality*. On findings on re-definition of operations, the results reveal that majority of respondents (78%) agreed that religious organizations have re-defined their operations to address the issues of *trans-sexuality* in their programming.

Further findings on religion as a buffer reveals that majority of respondents (66%) agreed that religious organizations have developed strong buffer systems to prevent the infiltration of *trans-sexuality* into their fellowship. On rehabilitation, the results revealed that majority of respondents (66%) agreed that religious organizations have strong environmental rehabilitation systems compared to 17 percent who were not sure and 7 percent who disagreed. On teachings on creation, the results reveal that majority of respondents (79%) agreed that religious organizations use the original climate status as created by God to remind those practising *trans-sexuality* to go back to gender specific role in environmental conservations. Again, findings on use of scriptures reveal that religious organizations have made available their holy scriptures through different media to the wide society to teach against *trans-sexuality*.

Concerning fighting prejudice, the results reveal that majority of respondents (62%) agreed that religious organizations are fighting prejudice and fundamentalism against *trans-sexuality* as a means of creating acceptance for rehabilitation. Findings on teaching on the relevant penal code reveal that majority of respondents (75%) agreed that religious organizations in their teachings also point to the penal code Sections 162, 163, and 165 which criminalize 'carnal knowledge against the order of nature'.

Results of the Status of *Trans-sexuality* among Students in Kenyan Universities

Table 3 presents descriptive statistics results of the status of trans-sexuality among students in Kenyan universities. The results also show that trans-sexuality is as an emerging reality that is changing the societal structures and gender roles.

Table 3: The status of Trans-sexuality among Students in Kenyan Universities

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
Trans-sexuality is an emerging reality	2	0	4	58	36
Trans-sexuality has informal associations	3	5	12	44	36
Both male and female students are drifting	2	1	11	48	38
Opposite sex relationships are slowly decreasing	26	38	10	4	22
There are organizations heavily funding	11	3	15	39	32
The university administration creating awareness	3	6	17	48	26
There already disciplinary cases	39	19	28	6	8

Table 3 presents the results of the status of *trans-sexuality* among students in Kenyan universities. First, concerning *trans-sexuality* as an emerging issue, the results reveal that majority of respondents (94%) agreed that *trans-sexuality* is an emerging reality among students in Kenyan universities. Findings on *trans-sexuality* association reveal that majority of respondents (80%) agreed that *trans-sexual* students in Kenyan universities already have informal associations where they operate from. Concerning the drifting of students into the orientation, the results reveal that majority of the respondents (86%) agreed that both male and female students are slowly drifting to *trans-sexuality* in Kenyan universities. Further findings on decrease in opposite sex relationship

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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reveal that majority of the respondents (64%) disagreed that opposite sex relationships in public universities is slowly decreasing among university students.

Additionally, findings on *trans-sexuality* funding reveal that majority of the respondents (71%) agreed that there are organizations heavily funding those practising *Trans-sexuality* among students in Kenyan universities. Concerning awareness of *trans-sexuality*, the results reveal that majority of respondents (74%) agreed that the university administration is already creating awareness of existence of *trans-sexuality* in Kenyan universities as a way of managing the phenomenon. Lastly, concerning disciplinary action against *trans-sexuality*, the results reveal that majority of respondents (58%) disagreed that there already disciplinary cases being handled by the university administration on those practising *trans-sexuality*.

Climate Change, the Role of Religion and Trans-sexuality among Students

This section presents the inferential results of the impact of Climate Change and Religion as the conscious of the society on *Trans-sexuality* among students which was the main goal of this investigation. The researcher using regression results intended to establish whether there exists a nexus between the impact of climate change and religion as the conscious of the society on *trans-sexuality*. This is important to shade empirical light on whether climate change and status of religion in public universities are drivers to the emerging issues around *trans-sexuality* in the society. The findings should be able to advise policy on new approaches to climate change policies and religious strategies in as far as *trans-sexuality* emergency is concerned.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.834[a]	.696	.690	.57156

Results from Table 4 revealed that the R-value was 0.834 whereas R Square was 0.696, which indicated a high degree of correlation. The R^2 value indicates how much of the independent variables; that is impact of climate change and impact of religion as the conscious of the society to *trans-sexuality* among students in Kenyan universities. In this case, 69.6 percent was the R Squared, which was large indicating a high degree of correlation. The regression model also predicted the outcome variable significantly with p=0.000, which was less than 0.05, and indicated that; overall, the model statistically and significantly predicted the outcome variable. This finding implied that the data collected revealed high variability between the independent and dependent variables.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 5: Relationship between Climate Change, the Role of Religion and Trans-sexuality among Students

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.760	.075		10.103	.000
	Climate Change	.209	.048	.271	4.360	.000
	role of religion as the Conscious of the Society	.118	.038	.155	3.109	.002

First, the study established a positive significant impact of climate change on *Trans-sexuality* (β =0.209, p = 0.000<0.05). This significant positive impact made the researcher conclude that climate change had significant positive impact on *trans-sexuality* among students in Kenyan universities. Based on this finding, an increase of climate change by 1 unit will impact *trans-sexuality* among students in Kenyan universities by 0.209 multiple units (See Table 5). Second, the study established a positive significant impact of the role of religion as the conscious of the society on *trans-sexuality* (β =0.118, p = 0.002<0.05). This significant positive impact made the researcher conclude that religion as the conscious of the society had significant positive impact on *trans-sexuality* among students in Kenyan universities. Based on this finding, an increase of religion as the conscious of the society by 1 unit will impact *trans-sexuality* among students in Kenyan universities by 0.118 multiple units (also See Table 4).

Discussion

The positive significant impact of climate change on *Trans-sexuality* is supported Holvoet and Inberg (2018) who argue that society imposes expectations on women and men roles affecting their individual vulnerability. They further state that women often face greater vulnerabilities and risks due to their existing social and economic marginalization, as well as their gendered roles and responsibilities. Despite previous gender and climate adaptation discourses that portrayed women as climate change victims and subjects more vulnerable than men, recent studies tend to challenge this generalization (Liru & Heinecken, 2021). *Trans-sexual* gender is one of the new perspectives beyond the women that is likely to be an emerging area in research that needs to be investigated further.

The positive significant impact of the role of religion as the conscious of the society on *trans-sexuality* is supported by Hulme (2017) who opines that it would be strange if religion completely ignored the concept of climate change because religious discourse constantly discusses the relationship between humans, God, the earth, and the other forms of life on it. Given that climate change is a global issue, one would expect religious organizations to try to incorporate it into their teachings and make it a relevant topic in religious discourse. As well as climate change is a global issue and that religious organizations to try to incorporate it into their teachings and make it a relevant topic in religious discourse, the impact of both climate change and religion on *trans-sexuality* is an area which require much investigations.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Conclusion

The main aim of this investigation was to examine impact of climate change and religion as the conscious of the society on *Trans-sexuality* among students in Kenyan Universities and particularly Laikipia University students. This was done by empirically establishing how changes in climate impact gender roles especially the emerging *trans-sexual* gender roles in the wider society. The study was also meant to find out whether religion as the conscious of the society has an impact on gender roles especially the emerging *trans-sexual* gender roles. The study established a positive significant impact of climate change on *trans-sexuality* which made the researcher conclude that climate change had significant positive impact on *trans-sexuality* among students in Kenyan Universities. The study also established a positive significant impact of the role of religion as the conscious of the society on *trans-sexuality.* It was thus concluded that religion as the conscious of the society had significant positive impact on *trans-sexuality* among students in Kenyan universities.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Assessment of the Teaching of Climate Change Education in Kenya

Charity Chemnjor, [*] ***Peter Githae***
School of Education Laikipia University, Kenya
*Corresponding Author

Abstract
This paper is an examination of the assessment of the teaching of Climate Change Education (CCE) in Kenya through an audit of the Laikipia University teaching practice tool. The competencies demonstrated in CCE are learner centred and are closely related to the competencies expected from the competency based education reforms that Kenya is in the process of effecting. The assessment of teaching climate change requires a focus on evaluation of competencies in creativity, problem solving and collaboration, which are learner based and closely related to the competency based learning framework of the educational reforms on going in Kenya. This is a paradigm shift calling for a review not only in what is taught, but how to assess what is taught; this audit of the tool sought to address the gap of how to assess. The study question was on how effective the Laikipia University teaching practice tool is in evaluating the competencies in CCE and related competencies as proposed in the education reforms in Kenya. A survey was used from descriptive questions to collect data from lecturers who use the tool during teaching practice. The results indicated that the competencies as assessed by the current tool were more teacher centred than learner centred and that the tool requires revision to reflect the approach to teaching climate change which is competency based and therefore encourages assessment of creativity, innovativeness and reflective practice for sustainability.

Keywords: Assessment of climate change, climate change, climate change education, education, sustainable development

Introduction

This paper presents an audit of the tool used in the assessment of teaching practice in Laikipia University Kenya, and its effectiveness in assessing the competencies demonstrated in Climate Change Education (CCE). For CCE to be sustainable, assessment of learning what is taught, how it is taught and the importance of assessing what is taught is necessary for the sustainability of learning and its development into practice. The paper identifies the link between what is assessed and how it is assessed, in relation to competencies learnt and how they are acquired and retained. It is expected that the results may be used to assist student teachers reflect on their teaching, not only of CCE, but also other areas that may require a demonstration of related competencies. In addition, it is hoped that the paper will encourage a reflection of the expected competencies, emphasizing assessment methods that will encourage creativity and innovativeness right from preparation, classroom presentation as well as classroom practice and assessment. It is important to note that the tool can also be referred to as an instrument since it is used to evaluate the teaching practice and generate a report.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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Climate change and its impact on people and resources poses serious societal challenges. The actions taken today will influence the future as well as affect the ability of the nation to respond and adapt to change, and reduce the vulnerability of people and places to harm. The role of education is important in enlightening future generations about the causes and effects of global climate change. How to implement solutions depends on an informed public both for societal and individual actions (Stanford, 2012).

In focusing on teaching and learning, teachers are encouraged not just to lecture about climate change but to help the students: in their research; think critically and creatively; and form a worldview that looks into the future with action oriented thinking of teachers in all discipline areas beyond the traditional subjects of science or geography. Geography, Earth and Life Sciences are carrier subjects, which can be used to develop and integrate climate change. Non carrier subjects are more difficult to integrate; these include languages but they too have to be integrated in various diverse and effective ways (UNESCO, 2020). There is need for a transformative approach from the individual and the school, to the community, nation and global. Sustainable development requires that partnerships be built with everyone in the society, thus involving students, teachers and other staff while inspiring and encouraging one another. This is where and why the teaching, learning and assessment of what has been taught in CCE is important.

The assessment of teaching climate change requires that teachers are trained to assess learners' understanding using a range of strategies, how to use the assessment information to plan subsequent steps and keep records as well as how to teach learners to self-assess and peer assess their own work and investigation outcomes (Cartwright & Miller 2023). CCE presents assessment that focuses on evaluating skills and aptitudes such as creativity, curiosity, problem solving and the ability to work collaboratively with peers (The Organization for Economic Co-Operation & Development [OECD], 2019).

Climate change as presented in this study is the natural process where temperature, rainfall, wind and other elements may vary over decades or more. It refers to long term shifts in temperatures and weather patterns and can be due to natural or human activities (UNDP, 2023). CCE helps people understand and address the impact of the climate crisis, empowering them with the knowledge, skills, values and attitudes needed to act as agents of change (UNDP, 2023). The international community recognizes the importance of educational training to address climate change. The UN Framework convention on climate change, the Paris Agreement (2016) and associated Action for Climate Empowerment (ACE) call on governments to educate, empower and engage all stakeholders and major groups on policies and actions relating to climate change (UNESCO, 2020).

Climate Change Education Assessment is the assessment carried out on the teaching and learning of climate change to ensure that learning within the education system is carried out effectively with learners acquiring the knowledge, skills and attitudes needed to promote sustainable development goals (SDGs) (target 4.7). Effective Assessment of CCE education should encompass the key areas proposed in the SDGs, which are climate mitigation, adaptation, impact reduction and early warning. It should also strengthen the relationship between knowledge (Climate Science) and practice (Climate Action) in CCE both at a local and global level. In addition, CCE assessment should be able to assess the teaching and learning in relation to the SDG global indictors facilitating knowledge exchange and replication across contexts and countries (Sainz, et al., 2019).

Kenya is in the process of carrying out education reforms. These reforms are a move from the content based learning to a competency based learning framework. It is a massive reformation

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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from traditional time-based learning to learning-based learning with a focus on the following competencies; communication and collaboration, self-efficacy, critical thinking and problem solving, creativity and imagination, citizenship, digital literacy, and learning to learn (Kenya Institute of Curriculum Development [KICD], 2017) These skills are closely related to the skills needed to address climate change as proposed by the United Education Science and Cultural Organization (UNESCO) which are; information management, skills of critical thinking, skills of action, skills of interaction, future oriented skills and personal skills (Selby & Kagaway, 2013). These are competencies based on open-ended learning, which are skills that learners need to address climate change in relation to sustainable development. The education reforms in Kenya will extend not only to the preparation for teaching and the actual teaching but also the assessment of teaching and learning.

Traditionally, assessment has focused on an overloaded assessment system with the preparation of teachers and assessment of the teacher on teaching practice using a tool that addressed the competencies as planned for. The reforms in the education sector pose a paradigm and cultural shift in the outlook of both those responsible for education provision and the learners involved in this process; the intention is to reduce the theory to practice gap (Imbunya, 2021). This will involve a shift in the focus of how to evaluate and assess what is taught and how it is taught. The education reforms have raised the need for review of the curriculum across board for basic education, secondary education, and tertiary education up to university education. Faculties or Schools of Education in universities and institutions that are involved in teacher education are in the forefront in leading the review of their curricula, what is taught and how what is taught is evaluated. This review is important not only to evaluate the effectiveness of what is being taught in class, but equally important, is how to evaluate the learning that takes place.

Laikipia University is involved in teacher education, which includes the professional development and subject specialization of the student teachers. In reviewing the university curricula for the different programmes, the tools used in evaluating teaching practice cannot be overlooked. This is because the paradigm shift in classroom teaching will require a shift in the way assessment is carried out and the tools used. This study examined how the tool used for assessment of teaching practice captures the skills that learners need to address climate change in relation to sustainable development skills which are closely related to those advocated for in the education reforms in Kenya.

The Enquiry

The study sought to explore how effective the Laikipia University teaching practice tool is in evaluating the competences needed to address CCE and related competencies as proposed in the education reforms in Kenya.

The objectives of the study were to: examine the tool used in teaching practice assessment and how it assesses the teaching of CCE; evaluate the tool used for assessment in teaching practice in relation to the competencies proposed in the education reforms in Kenya; and determine what the implications of change are for assessment.

Literature Review

The literature reviewed is discussed as follows; the scope of climate change education (CCE) in Kenya, the role of universities in CCE, a discussion on the teaching and learning outcomes and competencies in CCE and how they relate to the education reforms in Kenya, and assessment of the teaching of CCE.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Climate change is associated with challenges including food security, mass migration and biodiversity change (Zurek et al., 2022). Climate Change Education (CCE) in schools in Kenya is sporadic and limited, in spite of the growing urgency of the issues as temperatures rise and weather patterns become more severe. Education is part of the set of tools needed to address the climate crises at whatever level. United Nations Education Scientific and Cultural Organization (UNESCO) has identified the professional development of teachers in education for sustainable development as the top priority in recognition of the transformative role that teachers and teacher education play in re-orienting education to help realize a sustainable future (Vavrus et al., 2011). In the UNESCO project 'Implementing a whole school approach to climate change', classroom learning was enforced by the formal and informal messages promoted by the school's values and actions. As action for reducing climate change is included across all aspects of school life, it becomes everyone's priority (UNESCO, 2020).

Universities have the potential to play a key role in combating climate change as advanced by (Moltham et al. (2019), through innovative teaching as well as pioneering new teaching and learning concepts and design and review of curriculum to address societal and market needs. The Teacher Education Programme in Laikipia University is no exception and has set out to examine how the teaching and learning of CCE can be evaluated, as well as determine what innovations can improve the effectiveness of the tool used in assessment of the teaching practice. The role that universities play in CCE is significant in addressing the scientific, social, environment and political challenges the world faces. The teaching and learning of CCE is influenced to a large extent by the emphasis on what is taught and how that which is taught is assessed. Teachers and educational practitioners are cognizant of the fact that what is measured in schools both informally through classroom assessment and formally in the end of year or end of phase examinations has a high impact on the content and approach to teaching in the classroom (Bermingham & Chainey, 2022). What is measured matters, so the tools used for measurement must be appropriate for the task and also be aligned to the task.

Teaching competencies in CCE are closely related to the reforms in the competency based education. Many countries in Africa, Kenya included, are in the process of reforming the teacher-centred curriculum method of teaching, thus seeking to promote creativity, critical thinking and problem solving skills. Open ended learning skills are based on a range of learning outcomes, which are broad and holistic in nature leading to lifelong skills. These skills require not only understanding of concepts but a demonstration of skills or application, based on mastery of learning outcomes. These reforms in education in Kenya are a shift from the historical content based approach to a broader competency based approach. In CCE the emphasis is on building a link between education and sustainable development, and building up skills for 'green jobs' leading to a skills development policy in the education sector (Jeppe & Mochizuki, 2015).

In an article on recent trends in national policy on education for sustainable development and climate change, Jeppe and Mochizuki (2015) expound on how Education for Sustainable Development (ESD) as a concept and term has been proposed by the United Nations. They note that a lot of effort has gone into mainstreaming of Education for Sustainable Development into internal policy and practice at different levels and in different types of education and learning. This mainstreaming of policies on sustainable development and the practice of education is what the education sector in Kenya is faced with and is working to accommodate in policy and practice.

A task team in UNESCO on climate change emphasizes the importance of climate change for transformative sustainable development. It shows how CCE and public awareness enables informed decision making and plays a big role in empowering sustainable lifestyles (UNESCO,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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2016). The ongoing education reforms in Kenya emphasizes change in competencies with a focus on practice, problem solving skills, critical thinking and creativity while showing how these competencies are closely related with the teaching of climate change. In addition, CCE is more effective when incorporated across the whole school curriculum, with innovative teaching concepts while providing new teaching and learning concepts (UNESCO, 2016).

In the assessment of the teaching of climate change education, this study seeks to promote a teaching learning process that stimulates and enhances learner's critical and reflective thinking skills centred on students' knowledge construction, discovery, and acquisition of skills and transfer of those skills and knowledge into real life thus translating into usefulness and applicability. The teaching of CCE focuses on two pillars of the twenty first century skills as presented in the competency based education reforms. One is the learning to know; students need to understand the causes and consequences of climate change as well as mitigation and tools. The other is learning to do; students need to develop cross-cutting skills such as being able to adapt to different situations and learning contexts as well as envisioning different solutions and future scenarios (Molthan et al., 2019). This can be done through a change in attitude towards teaching and learning as well as assessment of what is taught. In both the CCE and competency based education, assessment focusses on learners and learning as well as what the learners are interested in and their abilities, therefore putting ownership of learning into the hands of the learner (Imbunya, 2021).

The assessment of learning to **know** and learning to **do** hinges on assessment **as** learning and assessment **for** learning. This inculcates a culture of empowerment that stimulates and enhances the learner's critical and reflective thinking skills, with a philosophy of the promotion of the learner's knowledge construction, discovery acquisition of skills and transfer of those skills and knowledge into real life. The challenges of assessing these skills cannot be overlooked as student teachers are equipped in various disciplines of teacher education. These challenges have been captured succinctly by Vavrus et al. (2011) who group them into three; the first challenge being the way student teachers teach. They argue that teachers largely teach the way they were taught and if learner centred methods were not the practice, this may pose a challenge when adopting and adapting to the reforms in teacher education.

The second challenge as presented by Vavrus et al. (2011) is in the assessment model. If assessment is based on the model that most student teachers in sub-Saharan Africa utilize, which is the Technical Rationality Model, then this will involve transmitting knowledge about the content of their subject and the 'correct' ways for teaching it to student teachers. According to the Technical Rationality Model, there are some sort of uniformities in problems, so all professionals apply standardized knowledge to solve concrete problems (Ghajargar &Bardzell 2019). Student teachers, therefore, will be evaluated on the extent to which their lesson plans, methods and teaching demonstrate these technical skills as expected and taught. Vavrus et al. (2011) propose an improvement on this model, by the inculcation of the reflective practitioner model. This is where those in teacher education create conditions for student teachers to use active learning strategies and to think critically about the authoritative knowledge in their field. This makes the assessment more learner centred and appropriate because the student teacher will be reflecting on their practice and how to change or improve on it. Reflective practice is a part of participatory learning, which demands that those involved in the teaching and learning process reflect on their facilitation. Identifying what went well and what improvement could be integrated into their facilitation in future, is part of continuing practice. Part of being reflective is the creation of an open and enabling atmosphere for eliciting and receiving feedback (Selby & Kagaway, 2013).

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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The final argument presented by Vavrus et al. (2011) is that the faculty in schools that produce student teachers may not be trained as teacher educators, or they may have expertise in education, which includes theories of learning, materials development, and teaching methods but not in specific academic subjects. This may be a challenge in that though they have excellent knowledge of the content of their courses such as history or chemistry, they may have limited understanding of how to teach content using methods appropriate to their subjects and contexts, especially methods aligned to learner centred pedagogy. This happens across many universities where faculty teaching may be experts in specific content disciplines but not in the methodology, therefore, it would be important for the student teacher during assessment to be guided on reflective practice.

Reorientation of assessment from traditional time-based to learner-based calls for a change of attitude and retooling of skills. The implication for present and future climate change and sustainable development is influenced greatly by the learner, teacher and others' understandings of perceptions and personal experiences. In CCE for sustainable development, the authors capture reorientation of attitude and skills in assessment to be influenced largely by the learning processes employed Selby and Kagaway (2013). They recognize interactive, participatory and experiential learning, with an emphasis on values, and ways of being as well as ways of relating which are key for climate change and sustainable development. In this case, assessment will be seen to be effective if it responds to the particular needs and characteristics of the teacher or lecturer, students and the subject content. Both teachers and learners are encouraged to facilitate learner empowerment, and to promote critical and practical learning as well as participatory democracy. Assessment will be informed by changing the climate of the classroom, which include the 'medium' and the 'message'; in other words, the teacher and what is taught and what is assessed passes a message of what is important and therefore learned for CCE (Selby & Kagaway, 2013).

The participatory classroom calls for the use of a diverse range of carefully contrasted learning approaches and modalities. Not all approaches will appeal to all students; Assessment is context-specific and what works well in one class may not necessarily work in another. Therefore, in calling for learners and teachers to assess learning processes, reflective learning can be structured and included in the assessment process. This too is a way of assessment and enables improvement on the processes and skills that require change. Assessment and learning are inextricably linked with not only the learner, but the teacher's strategies and mode of delivery being assessed (Imbunya, 2020). This participatory learning will require structured facilitation of class discussion and reflection, which is a skill that can be encouraged and evaluated. The teacher educator needs to reflect on their facilitation and interrogate the learning experience to optimize learning (Selby & Kagaway, 2013).

Theoretical and Conceptual Framework

The theoretical framework underpinning this study is constructivism. The basic principle of constructivism states that learners develop new knowledge by building upon previous learning, and that they learn best when engaged in the learning experiences. Learners take part in a learning process and assemble the knowledge gained in a unique way with each learner constructing something distinct from the others. Social constructivism emphasizes the collaborative nature of learning. The major proponent of social constructivism is Lev Vygostsky who proposed that social interactions promote learning and that knowledge is co-constructed (Vygotsky, 1980). Learners can establish meaning with the information they visualize during learning and every learner may take part actively in the process before they can learn.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Learning is inherently a social process because it is embedded within a social context as learners and teachers work together to build knowledge (University of Buffalo, 2023). Engaging with the world around them can help learners to be active participants in their continued educational growth. Therefore, the constructivist theoretical framework was found to be most appropriate in the teaching, learning and assessment of CCE due to the social and co-construction nature of knowledge.

The constructivist approach emphasizes the active participation of those seeking change, and how they can work towards creating that change. According to Muni (2020), the principles of social constructivism preserve the interpersonal structure of learning. The principles assume that education is an outcome of shared communication process, with peer groups and members of the community possessing a significant impact on the perspective and education of a learner. Muni (2020) notes that constructivism enhances the assessment of CCE as a social process. Muni further maintains that constructivism can lead to the understanding of how certain meanings have emerged and been framed, while others have been obscured or understood differently. The argument is that the constructive perspective allows for a more dynamic notion of structure since it seeks to identify the nature of structure based on socially defined and intersubjective meanings.

Of importance is how the constructive framework emphasizes the construction of social structures as well as how these structures in turn influence and reconstruct agents resulting in mutually constituted knowledge and putting climate change in the respective historical and social context (Muni, 2020). As opposed to the traditional approach in teaching which focusses on delivering information, constructivists argue that one cannot directly impart this information; only experience can facilitate students to constitute their own knowledge, therefore the goal of teaching is to design these experiences. The use of this theoretical framework as a basis for the study, therefore, confirms the importance of focusing on applicable assessment in CCE as relates to creating these learning experiences.

On the conceptual framework, the key constructs in the study and how they relate to one another, as justified by the literature review on climate change, CCE and how it relates to the education reforms in Kenya, as well as in relation to assessment was presented. The literature review has focused on what climate change is, and how it affects both individuals and communities. Additionally, how best CCE can be delivered for sustainability and change was presented. This was done with an emphasis on effective assessment and the need to align CCE to appropriate assessment methods and tools. This, therefore, results in the need to examine the assessment tools, just like how the education reforms bring about a need for review of the curriculum, what is taught, how it is taught and evaluated, and the appropriateness of the tools used in assessment.

Methodology

The Survey method was used as a research design. Using questionnaires, primary data was collected from participants who are lecturers that participate in supervision of students during the Laikipia School Practice. Additionally, these were lecturers who had earlier attended the Laikipia University Teaching Practice Workshop of January 2023, The participants were drawn from all the four schools in the university; namely, School of Education (18 staff), School of Human and Development Studies (12 staff), School of Science (11 staff), and School of Commerce (4 staff).

Specifically, the interest of the study was in getting information about the participants' experiences while using the Teaching Practice tool for assessment in relation to the competencies identified. Additionally, secondary data was gathered in the literature review on climate change,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

CCE, assessment and the curriculum reforms in Kenya. The data gathered was relevant to the research question because the lecturers involved in the School Practice are supposed to carry out the assessment of the students' teaching and are guided by the assessment instrument, which is instrumental in developing a report that informs and evaluates the student teacher.

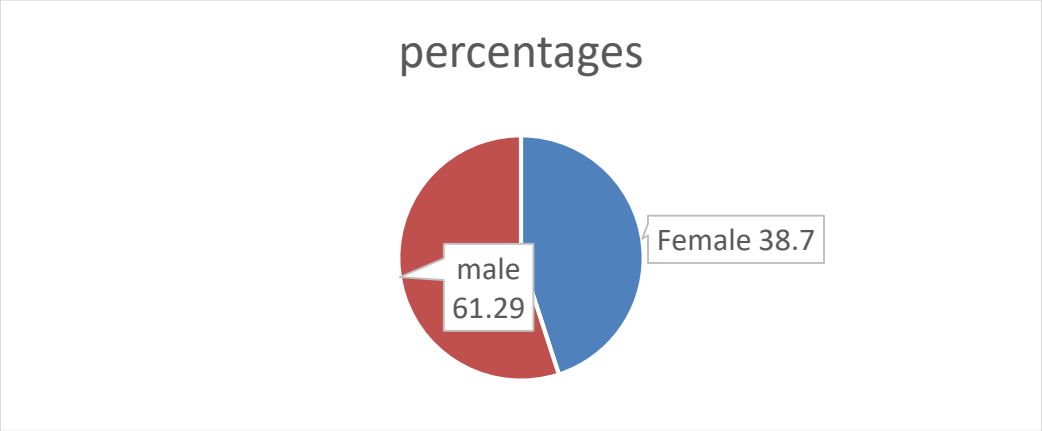

Fig. 1: Gender of Participants in the Study

The following were questions asked in the survey on use of the teaching practice tool in relationship to competency based assessment:

1. How can the tool used for assessment make the supervisory approach more creative and innovative
2. What on-site observation of student teachers' teaching performance can be assessed and informed by the tool
3. How can the tool be used to help student teachers develop lesson plans which encourage an activity-based approach.
4. How does the pre-established teacher performance standards influence assessment
5. What role does the tool play in the interactions with student teachers, their teaching experience and their progress
6. What needs to change in analyses of the whole of the student teacher's file

This approach was used to elicit participation from the different schools and disciplines who prepare the students for teaching practice, both in the professional aspect and the content or subject areas. The goal of this approach was to gather perspectives from the different disciplines and subject areas taught by the practising teachers. The responses received were similar from the different disciplines represented. Given that those who participated in the survey were limited to the lecturers who attended the teaching practice workshop and not all the lecturers who go out for teaching practice, the responses may not account for all perspectives. Future empirical work may probably require a quantitative study capturing a bigger scope in terms of audience.

The process of data collection involved a discussion on the following areas measured by the actual tool as seen in table 1.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 1: Areas Measured by the Assessment Tool

1	Lesson Preparation of schemes, objectives, format and layout
2	Lesson Presentation introduction, development and connection, style of teaching, learner involvement and motivation, questioning technique achievement of objective
3	Subject Matter, mastery of content, depth of coverage and appropriateness usefulness, applicability and relevance
4	Teaching Learning Resources relevance and suitability, creativity and use, proper use of chalkboard, legibility of letters
5	Teaching Personality time management and punctuality, interaction and disposition, confidence and voice projection, decency.
6	Class organization and management discipline, class environment, class control and supervision.
7	Assignment and Evaluation past and current assignment, students' records

The responses from the discussion elicited from these areas formed the data for the study which were used to address objective one and two of the study. Objective one was to evaluate the tool used for assessment in teaching practice in relation to the competencies proposed in the education reforms in Kenya. Objective two was to determine what the implications of change are for assessment.

Analysis of the data collected was informed by the need to understand the experiences of those who use the tool and how their experiences can be used to improve on assessment and evaluation of the competencies identified. The analysis was done by examining each of the areas of assessment against the expected competencies.

Findings and Discussion

The question the study sought to answer was the effectiveness of the Laikipia University teaching practice tool in measuring the competences needed to address climate change education and related competencies as proposed in the education reforms in Kenya. The general findings indicated that the teaching practice report developed from the tool would need to address the competencies captured in assessment, which would have to be in line with the transformative role of creativity, innovativeness, participatory and reflective practice.

Specifically, in the lesson preparation of schemes, objectives, format and layout, it was found that it was difficult to use the tool to encourage creativity and innovativeness. One participant said; '...the report is based on responses to sections that address specific competencies therefore it may be difficult to divert from the intended objective'. The use of the tool assessed specific competencies in each section which were inflexible, for example, in this section on Lesson Preparation, a participant expressed that '…learning objectives focus on what the teacher hopes to achieve by the end of the lesson…it would be better if this was replaced with the use of 'learning outcomes' since this was more learner centred'.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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The Lesson Presentation section focused on the competencies of the teacher. A participant indicated that the focus was on the teacher directed style and choice, as evidenced by terms such as 'mastery of content', and 'appropriateness to level of the class'. Yet another participant indicated that these terms reflected more of the teacher ability in relation to the content. This section on lesson presentation can be improved by more clarity and focus on learner directed rather than teacher directed styles of learning and choice of teaching learning activities, with the assessment focused on the promotion of interaction with the environment, other students and the teacher.

In the choice of the teaching or learning resources, a participant indicated that; '…this section, would be improved greatly by involving learner choices and an indication of their involvement in the learning process....' This observation was found to be very plausible if the whole process was to become learner centred. Further, the section on subject matter would benefit from reflection and recognition of prior knowledge.

The evaluation and assignment given would be improved by including learner choices and direction as well as direction on the rubrics used. This, a participant shared, '….would benefit the evaluation process especially if some of the learners would be encouraged to carry out some of the assignments outside the classroom and not all assignments would require marking and grading....'.This section would, therefore, require evidence of learner choices and direction, as well as rubrics used in assessment.

Generally, the participants indicated that competencies assessed in the current tool were more focused on teacher competencies and would need to be rethought. This would have implications for practice in view of the ongoing education reforms that focus on competency based learning which are competences based on open-ended learning skills that are desirable in addressing sustainable climate change. From the discussion, it emerged that, the tool requires revision to reflect the approach to teaching climate change which is a learner centred approach. It would be prudent to revise the tool to address creativity and innovativeness, for sustainability of what is learned and actions taken.

Conclusion and Implications for Future Research

In conclusion, the challenge to enhance the education response to climate change as well as making education and learning a proactive reality in addressing climate change can be addressed from different fronts. This study sought to address the response from assessment as a form of managing the learning process and education practice. It matters not only what is taught and the learning taking place, but also the assessment and its relevance to the maintenance and application of learning. This study argues that what is taught and how it is assessed matters in the quest for education and sustainable development. The role played by assessment in the process of the professional development of the teacher cannot be overemphasized and the transformative role that teacher education plays in reorienting education to help realize a sustainable future is not negotiable.

This study was limited to the audit of only one tool used in the assessment of teaching practice in the School of Education of Laikipia University. Further research can be extended to other tools used to assess industrial and field attachment in other schools of Laikipia University that have an impact on CCE as well as the ongoing education reforms. This study has concentrated on an audit of the assessment tool, but there is need to address the student preparation book so that student preparation may be in line with the assessment guided by the changes in the education reforms. Finally, this study was carried out with the lecturers who supervise teaching practice in

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

the School of Education. However, the study can be extended to include a larger group of faculty who teach students in teacher education, but do not go out for the assessment of teaching practice.

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Mainstreaming Climate Action Agenda Through Green Strategies Within State Corporations' Strategic Plans in Kenya

Fredrick Ephraim Khaunya Mukabi
Kenya School of Government, Embu Campus, Kenya

Abstract
Strategic planning is how organizations define their approaches and make decisions on allocation of resources to realize their strategic goals and hence their vision. In the Kenyan public sector, strategic plans must be aligned to the Constitution of Kenya 2010, Kenya Vision 2030, the Sustainable Development Goals, Medium Term Expenditure Framework III and relevant statutes. In the climate action agenda, the Strategic Plans must be aligned to SDG No. 13 (13.2, 13.3 and 13B), which lay emphasis of incorporating climate change measures in policy, strategy and planning. Like similar regional and global agencies, the Kenyan State Corporations are core in supporting the country's climate action development agenda and hence the need to set strategies for climate action. However, a study of the existing strategic plans depicts a general inaction by the State Corporations to clearly highlight and mainstream climate change as anticipated in the global, regional and national development agenda. This paper, therefore, seeks to assess the extent to which the State Corporations have incorporated the climate action agenda through a green strategy. Using desk research, information is based on thematic grouping and analysis is sought, analysed and compared to knowledge on the influence of these variables in the mainstreaming of the climate agenda in strategic plans. A sample of twenty (20) Kenyan State Corporations is conveniently drawn from the list of 250 State Corporations whose Strategic Plans are available on the website and data derived from analysis of their key results areas and strategic objectives of their respective strategic plans and inference drawn. The findings indicate that most State Corporations do not mainstream climate action change through green strategies within their strategic plans, have limited budget for the climate change agenda, and experience organizational inertia on this agenda. Appropriate change communication strategies on the climate agenda, resource prioritization and removing organizational inertia to mainstream climate action are proposed.

Keywords: Climate Action, climate change, green strategic planning, juxtaposing, resources, state corporations

Introduction

According to the World Bank report by De Kleine and Annette (2021) on state-owned enterprises and climate action, state-owned enterprises (SOEs) present a powerful and important policy lever for many governments to implement reforms to achieve their ambitious climate mitigation and adaptation targets. On the one hand, the report says that SOEs are major sources of carbon dioxide (CO2) emissions globally, and they are vulnerable to climate change impacts and low-carbon transition risks. On the other hand, SOEs are also some of the biggest investors in the world in

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

green technology, and among low-and middle-income countries (LMICs), they account for the majority share of infrastructure investment that is essential to both mitigation and adaption.

Given their ownership stakes, governments are well-positioned to directly influence SOE climate-relevant decisions through ownership, and regulatory and oversight policies, among other fiscal and public financial management reforms, for example, tax, expenditure, and investment policies. The report concludes that there is limited research on the opportunities provided by SOE policy reform to help tackle climate change.

Strategic Planning in Kenya

In 2001, the Kenyan government developed and launched a strategy for performance improvement in the public service which sought to increase productivity and improve service delivery. A key aspect of this strategy was Results Oriented Management which culminated into the Results Based Management in 2004. This was a deliberate policy to improve performance, service delivery and governance using several instruments such as strategic plans, service delivery standards, citizen service delivery charters, annual work plans, performance contracts, staff performance appraisals and merit-based promotions.

Of all these instruments, the strategic plan is the most pivotal since it links the national development blue-print to the respective Ministries, Departments, Agencies and Counties (MDACs) and hence supports service delivery as illustrated in Figure 1. They are prepared through strategic planning.

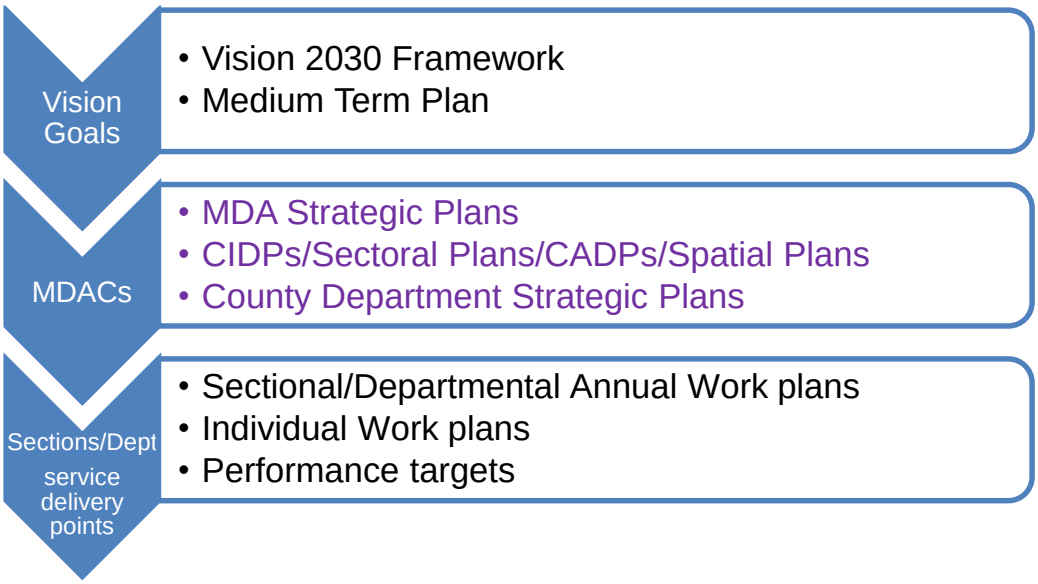

Fig. 1: Key Position of Strategic Plans in Kenya's National Development Blue-print

Strategic planning is an organization's process of defining its strategy direction, and making decisions on allocating its resources so as to attain strategic goals and includes control mechanisms for guiding the implementation of the strategy in a sequential manner so as to realize the overall organization's vision. It is the process of identifying and selecting the best ways to utilize an organization's resources so as to achieve specific goals while taking into account the external environment in which the organization operates (Webster et al., 1989).

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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In the Kenyan public service, strategic plans have to be in line with the Constitution of Kenya 2010, Kenya Vision 2030, the Global Sustainable Development Goals (SDGs), Medium Term Expenditure Framework III (MTEF) and the relevant statutes. In view of the Kenya Vision 2030, the public service is core in implementing the strategic plans as derived from the Medium Term Plans (MTP) and MTEF hence the need to prepare and implement the strategic plans to meet the goals. Hence Strategic plans become effective instruments that may be used to effectively alleviate climate change and its effects across all government sectors. This is according to the Revised Guidelines for Preparation of Fifth-Generation Strategic Plans, 2023-2027 issued in June 2023 by National Treasury and Planning.

Domesticating Climate Action in Kenya in the Context of Global Initiatives

The Sustainable Development Goal No. 13 on taking urgent action to combat climate change and its impacts is critical since according to the Sustainable Development Goals Report of 2022 on Goal No. 13, by 2030, an estimated 700 million people will be at risk of displacement by drought alone. Taking deliberate and urgent action to combat climate change and its devastating impacts is therefore an imperative to save lives and livelihood, and key to making the 2030 Agenda for Sustainable Development and its 17 Goals the blueprint for a better future a reality. Strategic plans therefore are pivotal in this realization. On 22 April 2016, Kenya joined other countries that signed the Paris Action that was adopted on 12 December 2015 and came into force in November 2016. The historic Paris Agreement provides an opportunity for countries like Kenya to strengthen the global response to the threat of climate change. But has Kenya made any significant strides?

The World Bank Group has made a commitment to align all its financing operations with the goals of the Paris Agreement in its Climate Change Action Plan 2021-2025. The Paris Alignment of the Bank Group's new financing flows is the most comprehensive institutional undertaking ever done by the Bank Group to reconcile development and climate. This is part of a broader multilateral development bank (MDB) vision to align financing flows with the objectives of the Paris Agreement (Rocha, 2013). The World Bank is on track to align 100 percent of new operations, starting from July 1, 2023. For IFC and MIGA, 85 percent of new operations will be aligned starting July 1, 2023, and 100 percent from July 1, 2025.

With the forthcoming UN Climate Change Conference (COP 27), Simon Stiell, Executive Secretary of UN Climate Change has called on governments to revisit their climate plans and make them stronger in order to close the gap between where emissions are heading and where science indicates they should be this decade (Stiell, 2022). He observed that 'COP 27 is the moment where global leaders can regain momentum on climate change, make the necessary pivot from negotiations to implementation and get moving on the massive transformation that must take place throughout all sectors of society to address the climate emergency'. Stiell urged national governments to come to COP 27 and showcase how they would put the Paris Agreement to work in their home countries through legislation, policies and programs, as well as how they would cooperate and provide support for implementation. He called for nations to make progress at COP 27 in four priority areas: mitigation, adaptation, loss and damage, and finance.

The Danish Government Approach

The Climate Act, approved by the Danish Parliament in June 2020, sets legally binding targets of a 70 percent reduction in GHG emissions by 2030 (compared with 1990) and climate neutrality by 2050 at the latest. In addition, the government must set sub-targets across sectors every five years. For 2025, experts recommend a reduction target of between 50 and 54 percent and a climate action plan, consisting of separate sectoral strategies; this is currently under development. In 2020, most of the strategies such as the strategies for energy and industry, waste, road transport, green

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

public procurement, sustainable construction and green research were already agreed upon. Furthermore, a comprehensive green tax reform has been proposed (Olsen et al. 2013). In 2021, further agreements were introduced, including the sector strategy for agriculture and forestry. Through these initiatives, Denmark aspires to become one of the most climate-friendly countries in the world. In June 2020, its Parliament overwhelmingly passed a new Climate Law that aims to reduce greenhouse gas emissions by 70 percent below 1990 levels by 2030, with net zero emissions targeted for 2050.

The Swedish Government Approach

Sweden has adopted a whole-of-government approach that is Integrating Paris and SDG targets into state ownership policy. According to the World Bank report by De Kleine and Annette (2021), Sweden has adopted a comprehensive set of climate reforms for the entire State-Owned Enterprises portfolio through its state ownership policy that explicitly tasks enterprises with achievement of the national environmental and climate objectives, including the 2030 Agenda for the SDGs. Enterprises must provide identification, assessment, management, and transparent reporting of climate-related financial risks and opportunities in their operations. Each enterprise is required to analyse the SDGs and identify goals that it has an impact on and can contribute to achieving through its operations. Enterprises identify targets that are then vetted to ensure they align with the Paris Declaration.

The African Climate Agenda

The Africa Union's Agenda 2063 makes it clear that climate-resilient communities and economies are an integral component of the continental vision for an integrated, prosperous and peaceful Africa, driven by its own citizens, representing a dynamic force in the international arena. Through the African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032), it supports the realization of this vision by setting out principles, priorities and action areas for enhanced climate cooperation and long term, climate resilient development. The Strategy provides an outline for harmonized and coordinated actions to respond to the impacts of climate change, thereby supporting planning for the continent's low-emission future.

The Strategy defines the main parameters and priorities in building African resilient capacities for adaptation and exploiting the benefits of the mitigation potential of the continent. It seeks to ensure that institutions, strategies, and decisions for climate risk management and climate-resilient development are integrated and implemented as a central aspect of achieving sustainable development, as framed by Agenda 2063 and the United Nations' Agenda 2030.

The Africa Climate Summit 2023 (ACS23) that took place from September 4th to 6th 2023 in Nairobi was a significant milestone in Africa's efforts to combat climate change. It aimed at bringing nations, organizations and individuals with a shared objective to promote green growth and climate finance solutions for Africa and the rest of the world. The ACS23 summit came against the backdrop of increasing environmental instability in the last 10 years arising from sharp increase in extreme weather events that have caused significant damage to economies (b, 2023). The summit was a platform for leaders to commit to taking action against climate change and served as a guide for establishing targets and deadlines.

Kenya's Global Ranking on Climate Change Vulnerability

The ND-GAIN Index ranks 181 countries using a score which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience. This index aims to help businesses and the public sector better identify vulnerability and readiness in order to better prioritize investment for more efficient responses to global challenges. Due to a

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

combination of political, geographic, and social factors, Kenya is recognized as highly vulnerable to climate change impacts, and is ranked 152 out of 181 countries in the 2019 ND-GAIN Index (Kee et al. 2010). The more vulnerable a country is, the lower their score, while the more ready a country is to improve its resilience, the higher it will be. Globally, Norway has the highest score and is ranked first. Figure 2 is a time-series plot of the ND-GAIN Index showing Kenya's progress.

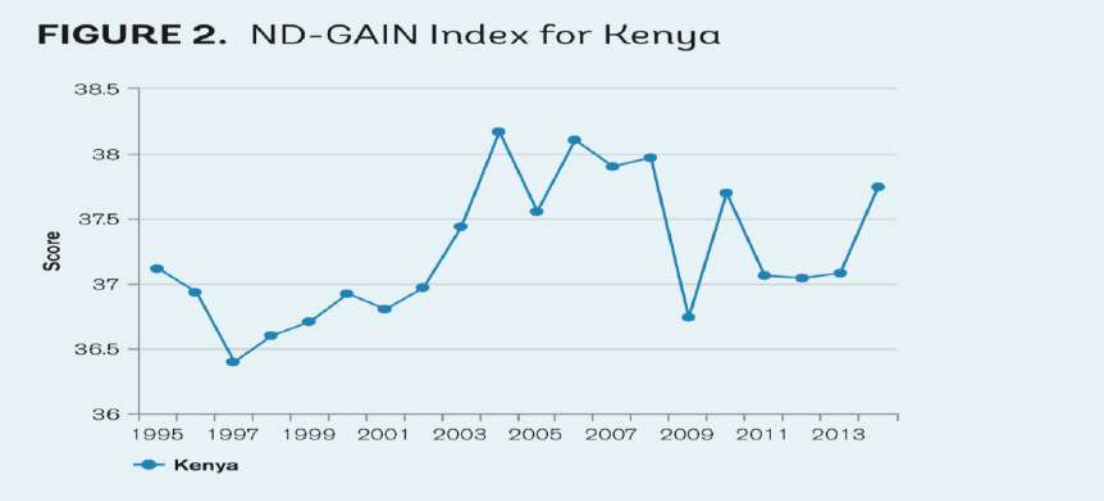

Fig. 2: ND-GAIN Index for Kenya

Kenya's Interventions

The Ministry of Environment and Natural Resources developed a National Adaptation Plan (NAP 2015-2030) which is a critical response to the climate change challenge facing the country. NAP is anchored in the Constitution of Kenya and Kenya Vision 2030. It also aligns itself with the Medium-Term Plan (MTP) and Medium-Term Expenditure Framework (MTEF) planning processes. The NAP is also aligned with the Climate Change Act that was enacted into law in May 2016. It is also Kenya's first plan on adaptation, and demonstrates its commitment to operationalize the National Climate Change Action Plan of 2016 by mainstreaming adaptation across all sectors in the national planning, budgeting and implementation processes.

It is in this planning through Strategic Plans that it was envisaged that matters climate action would be given prominence through a mainstreaming approach. This in turn would recognize that climate change is a cross-cutting sustainable development issue with economic, social and environmental impacts. This is reinforced by the second objective of the NAP which is to integrate climate change adaptation into national and county level development planning and budgeting processes.

Kenya's Institutional Framework for Adaptation

The Government of Kenya is developing a policy and institutional framework to support the country reach its low carbon, climate resilient goals. The government has implemented a number of actions in the National Climate Change Action Plan 2013-2017, including improved drought management and the promotion of renewable energy. The then Ministry of Planning and Devolution included indicators to track progress in mainstreaming climate change in its Second Handbook of National Reporting.

The National Climate Change Council, established in 2016 and housed in the Ministry of Environment and Forestry, is responsible for the coordination of climate change actions, including

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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mainstreaming climate change in national and county budgets, plans and programmes. The Kenya Meteorological Department is responsible for generating national and subnational information regarding forecasts, seasonal variability, early warnings and agrometeorological bulletins. This information is delivered to the general public and to the climate Change Council and key government institutions such as the Disaster Risk Management Authority. The drafted Climate Change Framework Policy and a National Policy on Climate Finance are expected to provide guidance on mainstreaming to national departments and country governments. To support climate change adaptation, mitigation and resilience pathways, the country can access climate financing through the National Environment Management Authority, which is a National Implementing Entity for the Adaptation Fund and accredited by the UNFCCC Green Climate Fund. Mbuthia. (2023) brings out the adverse consequences of not fully implementing the National Climate Change Action Plan 2013-2017.

The Bottom-Up Economic Transformation Agenda, which is the current government development priority strategy is committed to reduce greenhouse gas emissions by 32 percent by 2030 as contained in Kenya's Nationally Determined Contribution (NDC). The Ministry of Environment, Climate Change and Forestry, charged with the role of spearheading climate action through its Draft Strategic Plan of 2023-2027, therefore adopts a Bottom Up 3P solutions with greater focus on the people, planet and profit through prioritizations of biomass energy (wood fuel), agroforestry and solid waste management value chains. This initiative is reinforced by the articles of the Environmental Management and Co-ordination Act, No. 8, of 1999.

The strategic plan also considers the strategy involving modernizing and commercializing the charcoal value chain by adopting modern kilns, decriminalize the charcoal trade, supporting scaling up of clean cooking technologies and promoting youth-owned and operated briquette-making enterprises. To support the solid waste management value chain, the strategic plan also focuses on adopting the Extended Producer Responsibility (EPR) model based on household level separation, organize waste collectors into cooperatives and provide circular economy waste separation sites/infrastructure. Under the agroforestry value chain, the focus is on development of a policy and regulatory framework to attract climate finance funds to facilitate establishment of 5 million acres (20,000 km2) agroforestry woodlots in drylands. (MoECCF, SP, 2023).

Incorporating Climate Action through Green Strategic Planning

In the Guidelines on the Preparation of the 5th Generation Strategic Plans for MDACs, the State Department for Planning at the National Treasury stipulates that all the Strategic Plans should be aligned to the Fourth Medium Term Plan (2023-2027) of the Vision 2030 and other public priorities. The purpose of the guidelines is also to ensure alignment of MDACs Strategic Plans to the national development agenda and policy priorities as well as regional and international development frameworks such as the Paris Agreement on Climate Action which is now a priority in our national development agenda.

On the sidelines of the 36th Ordinary Session of the African Union, Heads of States and Government Summit in Addis Ababa on 17th February, 2023, President Ruto while holding bilateral talks with UN Secretary General António Guterres in Addis Ababa said, '…there is need to review the current financial system to serve its purpose. I don't think reform is the right word. We need a new architecture to respond to climate change'. This new architecture can only be interpreted as infusing climate action priorities within the states and their MDACs broad and specific plans including their strategic plans.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Theoretical Framework

This study is anchored on the Theory of Change (ToC). According to Anderson (2005), it is essentially an explanation of how a group of stakeholders expects to reach a commonly understood long-term goal. The theory of change approach is a process of project planning and evaluation which maps the relationship between a long-term goal of a project and the intermediate and early changes that are required to bring it about. It encourages a project team or group of stakeholders to explain how the project is understood to reach its goals, and the process through which changes will occur. The approach emphasizes the theory and assumptions underlying the pathway of change from the implementation of selected interventions and activities to intended outcomes.(Conservation International, 2013).

Bours et al. (2014) indicates that ToC is a useful tool for climate adaptation planning since it can connect diverse projects and programmes and enhance linkages across Climate Change Adaptation (CCA) sectors and scales. This is valuable given the multisector (read State Corporations from different sectors) nature of adaptation and the growing array of adaptation investments being made and hence the need for greening the sectoral strategic plans across state corporations.

Conceptual Model

The question this research poses therefore, is how strategic planning can be used as an effective tool in the realization of the National Climate Change Action Plan through the alignment of goals and strategies. This is summarized in Figure 3 whereby local and global climate action targets are incorporated in sectoral and regional strategic planning processes. This will in turn lead to multi-sectoral climate change interventions that will bring about responsive climate action development initiatives.

Fig. 3: Conceptual Model for Adoption and Adaptation of Climate Action Initiatives in Green Strategic Planning

Methods

Using desk review, a list of sources that provide relevant information for climate action and planning in government as an intervention was made and existing literature on this climate change incident and how it has been incorporated into planning was sought. This was through a systematic review of these reports and documents that had been accessed for purposes of this study. In this case, eleven (11) reviews were sought. These were reviews on: the various UNEP reports; World

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Bank reports; UN Vision 2030 Sustainable Development Goals; the Kenya Vision 2030 and all Kenyan plans relating to matters climate action; and various State Corporations' Strategic Plans. These reports are summarized in Tables 1 and 2. The research sources were collated and authentic internal and external data relevant to this research topic put in place to enable the researcher form a sound information base for analysis.

Table 1: Documents and Reports used to Review Relevant Literature

No.	Global/Regional/Local Report	Body	Publication year
1.	Paris Agreement in its Climate Change Action Plan 2021-2025.	UN	2021
2.	UN Vision 2030 Sustainable Development Goals	UN	2015
3.	Sustainable Development Goals Report of 2022 on Goal No. 13	UN	2015
4.	Climate Risk Profile: Kenya (2021): The World Bank Group	WB	2021
5.	African Union Climate Change and Resilient Development Strategy and Action Plan (2022-2032)	AU	2021
6.	The Africa Union's Agenda 2063	AU	2015
7.	Kenya Vision 2030	GOK	2008
8.	Kenya National Adaptation Plan: 2015-2030	GOK	2015
9.	The Ministry of Environment and Natural Resources developed a National Adaptation Plan (NAP 2015-2030)	GOK	2015
10.	Climate Change Framework Policy	GOK	2016
11.	National Policy on Climate Finance	GOK	2016

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Table 2: The Sampled State Corporations in the Desk Review

No.	Kenyan State Corporation	Classification	Ministry	Planning Cycle
1.	Kenya Tea Development Authority	Regional development authorities	Agriculture and Livestock Development	2023-2028
2.	Agricultural Development Corporation	Commercial/manufacturing	Agriculture and Livestock Development	2020-2024
3.	Kenya Power	Commercial/manufacturing	Energy	2023-2028
4.	Nuclear Power and Energy Agency (NUPEA)	Commercial/manufacturing	Energy	2020-2024
5.	Kenya National Highways Authority	Service	Roads and Transport	2020-2023
6.	Kenya Roads Board	Service	Roads and Transport	2023-2028
7.	Moi Teaching and Referral Hospital	Service	Health	2023-2028
8.	Kenya Medical Training College	Tertiary Education and Training	Health	2018-2023
9.	Commission for University Education	Regulatory	Education, Science and Technology	2019-2023
10.	Kibabii University	Public universities	Education Science and Technology	2020-2022
11.	Kenya Tourism Board	Service	Tourism and Wildlife	2018-2023
12.	Brand Kenya	Service	Tourism and Wildlife	2019-2022
13.	Kenya School of Government(KSG)	Service	Public service, youth and gender	2019-2023
14.	National Youth Service	Service	Public service, youth and gender	2019-2023
15.	Kenya Bureau of Standards (KBS)	Regulatory	Trade and Industrialization	2022-2027
16.	Competition Authority of Kenya (CAK)	Regulatory	Trade and Industrialization	2022-2024
17.	Kenya Accreditation Service (KENAS)	Regulatory	Trade and Industrialization	2020-2024
18.	Kenya Trade Network Agency (KenTrade)	Commercial/manufacturing	Trade and Industrialization	2024-2028
19.	Office of the Auditor General	Regulatory	The National Treasury	2021-2028
20.	Kenya Insurance Deposit Corporation	Financial	The National Treasury	2018-2023

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

There are approximately 250 State Corporations in Kenya. These corporations are classified in accordance with whether they provide services, involved in manufacturing, regional development bodies, regulatory, tertiary education institutions, public universities or if they are financial. For each of the categories, a sample was conveniently selected through stratified sampling (across the various classes of the corporations), since some of the State Corporations do not have the current strategic plans on their respective websites and yet the data was required to ascertain whether their current strategic plans gave climate action attention.

The information from these various sources was then collated and any duplication removed and then brought together into a summary table that is used for analysis. These various sources of data for review were then used to try and answer the research question as to whether the strategic planning among the MDACs in Kenya gives prominence to climate action as envisaged in the Sustainable Development Goal No. 13 or it is left to the concerned Ministry, Departments and Agencies to implement the proposals and targets in the goal.

Results and Discussion

Each of the identified State Corporations had their respective Strategic Plans reviewed to ascertain the degree of responsiveness to climate action interventions as envisaged in the SDG Goal 13 and subsequent global and local climate action initiatives. An analysis table of the strategic objectives within strategic plans of sampled state corporation is shown on Table 3.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Table 3: An Analysis of State Corporations' Inclusion of Climate Action in Current Strategic Plans

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
1.	Kenya Tea Development Authority	a. To promote climate change mitigation, adaptation and resilience among small holder tea farmers for sustainable tea production b. To improve the economic standards of the small holder tea farmers c. To improve the health of the small holder tea farmers and communities d. To improve access, quality of education and lifelong learning in the tea growing communities	From Programme Pillar No. a) a. To promote climate adaptation mechanisms among the small holder tea farmers b. To promote climate change mitigation to maximize tea production among the small holder tea farmers c. To promote the link between research and policy in climate change	Yes +
2.	Agricultural Development Corporation	a. To build a sustainable financial resource base b. To continuously improve customer satisfaction c. To increase productivity in all enterprises d. To strengthen institutional capacity to be able to achieve the mandate e. To institutionalize corporate governance mechanisms and culture f. To conduct our business in a manner that preserves and conserves environmental sustainability	From KRA No. f) a. To achieve 1% forest cover in all our farms by practicing agro forestry b. To protect riparian areas c. To adopt appropriate solid and affluent management practices d. To establish mechanisms for green energy	Yes +

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
3.	Kenya Tourist Board	a. Innovative culture b. Powerful magical brand c. Effective sales system d. Effective partnership with private sector e. Organizational change and performance f. Establishing sustainable funding	None	No
4.	Brand Kenya	a. To develop, diversify and brand Kenya's export products b. To develop and diversify Kenya's export markets c. To manage Image and reputation of the Kenya Brand d. To strengthen institutional capacity for Brand.KE to deliver on its mandate.	None	No
5.	Kenya Power	a. Improved energy generation mix that that is efficient, reliable and competitively priced b. Increased customer connectivity to a customer base of over 9 million customers c. To improve electricity supply quality that exceeds customer expectations, reduce cost of doing business and increase sales revenue d. A modern, efficient, and responsive electricity system infrastructure that encompasses electricity demand growth e. A robust distribution system that facilitates achievement of the 5,000+MW generation expansion plan f. Good corporate governance and management for enhanced efficiency and service g. Diversified business revenue leveraging on the existing assets and innovation h. To give reasonable return to shareholders for their investment	None	No
6.	Nuclear Power and Energy	a. To ensure readiness of key nuclear power infrastructure b. To have an adequate and supportive legal and regulatory framework c. To inculcate nuclear safety culture among the key stakeholders	None	No

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
	Agency(NUPEA)	d. To increase stakeholder's awareness and support of NuPEA's mandate e. To champion use of safe, efficient and sustainable energy systems f. To enhance uptake of new technologies and innovations in the energy and petroleum sectors g. To ensure availability of skilled and competent human capital in the Energy and Petroleum Sector h. To enhance good corporate governance i. To promote a positive corporate image j. To have a versatile, competent, highly performing and motivated workforce k. To enhance efficiency and effectiveness in service delivery l. To enhance financial sustainability of the Agency		
7.	Kenya National Highways Authority (KENHA)	a. Development of roads and enhancement of network capacity and quality b. Securing and Preservation of Road Assets c. Environment and Social Sustainability d. Enhancement of Institutional Framework and Capacity e. Effective Resource Mobilization f. Strengthen Corporate Governance	From KRA c): a. Strategic Objective: To ensure environmental sustainability and promote social interests b. Strategy: Promote environmental conservation and management	Yes +
8.	Kenya Medical Training College (KMTC)	a. Quality of training b. Staff development c. Research, innovation and consultancy d. Linkages, collaboration and partnerships e. Development of infrastructure and other facilities f. Information and Communications Technology (ICT) g. Income generation and resource mobilization	None	No

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
		h. Marketing, Communications and Brand recognition		
9.	Moi Teaching and Referral Hospital	a. Providing Responsive High Quality, Low-cost, Multi-Specialty Healthcare and Management Systems. b. Enabling Environment for Healthcare Training, Research and Development & Innovation. c. Strengthening Strategic Partnerships and Collaborations. d. Providing Excellent Care and Exceptional Customer Experience. e. Creating a Sustainable Revenue Base	None	No
10.	Commission for University Education (CUE)	a. Re-engineering quality assurance processes b. Enhancing quality monitoring of universities c. Providing evidence-based policy advisories d. Promoting corporate image and branding e. Institutionalizing the use of ICT f. Enhancing human resource management g. Enhancing resource mobilization and financial management h. Enhancing the institutional planning	None	No
11.	Kibabii University	a. Promote and Maintain Excellence in Teaching and Learning b. Support and Sustain Advancement in Research, Innovation, Partnerships and Linkages c. Enhance Administrative, Financial and Human Resource Management Systems d. Invest in Strategic Marketing and Public Relations e. Expand, Maintain and Improve Physical Facilities and Infrastructure f. Provide Quality Health Care Systems	None	No
12.	Kenya School of Government	a. To develop and implement relevant training programmes b. To promote research, scholarship and innovation c. To enhance evidence-based research advisory services. d. To expand consultancy services to support delivery of quality services e. To develop suitable infrastructure.	From all the strategic objectives aligned to the core mandate: a. Develop and implement Climate Change	Yes +

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
		f. To enhance corporate visibility and positioning of the school g. To enhance good corporate governance and management in the School h. To strengthen the human resource capacity of the school i. To ensure financial sustainability of the school	program for National and County Governments b. Develop and use in class case studies on climate change c. Organize conferences and symposia on Blue Economy d. Strive to continuously improve its processes and efficient waste management e. Develop and implement programs on Environmental Impact Assessment f. Disseminate knowledge and information on environmental conservation	
13.	Kenya Bureau of Standards (KEBS)	a. Promotion of MSMEs for enhancement of their competitiveness b. Establish and operationalize imports destination inspection c. Promote consumer protection from substandard products, protect the environment and create a level playing ground for economic operators d. Institutional Capacity: To strengthen KEBS institutional capacity to enhance productivity and ensure efficient and effective services delivery	From the KRA on Institutional capacity: Contribute to climate change mitigation and adaptation	Yes

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
14.	Competition Authority Of Kenya (CAK)	Strategic objectives: a. Delivering Effective Enforcement b. Research and Advocacy c. Visibility and Organizational Sustainability	None	No
15.	Kenya Trade Network Agency (KenTrade)	a. Improving trade environment and ease of doing business b. Solutions development and management c. Financial Sustainability d. Visibility and organizational strengthening e. Customer Service	None	No
16.	Office of the Auditor General (OAG)	a. Enhance the Quality of Audit Services for Improved Management of Public Resources. b. Position OAG for Greater Relevance and Credibility to Stakeholders c. Be a Model Organisation for Effective Service Delivery	None	No
17.	Kenya Insurance Deposit Corporation (KIDC)	a. Enhance early detection and timely intervention of risk exposure b. Increase the ratio of fund to total deposit from 2.7% in to 3.4% by 2023 c. Increase the value of deposits covered from 8.75% in 2018 to 16% by 2023	None	No
18.	Kenya Roads Board (KRB) Draft 5 Year Strategic Plan, 2023 – 2028	a. KRA 1: Management of the Road Fund. b. KRA 2: Oversight and Coordination of the Road Network. c. KRA 3: Strengthen Institutional Capacity	None	No
19.	Kenya Accreditation	a. Accreditation and Assessment b. Knowledge Transfer and Advisory	None	No

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

No.	State Corporation	Thematic/Priority area/Strategic Objectives/Strategies	Specific Strategies Outlined Towards Climate Action	Climate Action Alignment
	Service (KENAS)	c. Marketing, Communication and Advocacy d. Financial Sustainability e. Internal Business Processes f. Institutional Capacity and Governance		
20.	National Youth Service	a. Empower the youth b. Enhance sustainable socio-economic development c. Enhance stakeholder relations d. Creating an enabling environment and high-performance culture	None	No

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

The findings on which state corporations have included climate actions in their current strategic plans are summarized in Table 4.

Table 4: Degree of Alignment of State Corporations' Strategic Plans to Climate Action

No.	Degree of State Corporations' incorporation of climate action in Strategic Plans	No.	%
1.	Planning strategies **SIGNIFICANTLY ALIGNED** to climate action	3	15
2.	Strategic Planning **NOT SIGNIFICANTLY** aligned to climate action	5	25
3.	Strategic Planning **NOT ALIGNED** to climate action	12	60
4.	**Total**	**20**	**100**

Out of the 20 State Corporations sampled, only 5 had their planning strategies aligned to the climate action goals as captured in the UN Vision 2030 Sustainable Development Goals. This constitutes 25 percent of the State agencies. Out of the 20 agencies, only 3 (15%) had significantly incorporated climate action initiatives (that is Yes +) in their Key Results Areas, Thematic Areas and Strategic Objectives as well as aligned activities and work processes. The rest of the sampled corporations did not have evidence of introducing climate action activities in their processes, hence no evidence of green strategic planning.

These findings imply that there is no policy framework around greening the strategic plans and the decision to green the state corporations' strategic plans is purely at the discretion of these organizations. This leaves only the mandated Ministry of Environment, Climate Change and Forestry alongside its State Corporations such as NEMA the sole responsibility in addressing climate challenges as targeted in SGD No. 13. This may only be supported through Executive Orders and Policy guidelines that may not anchor the initiatives within the strategic plans of state corporations in Kenya.

Discussions

From these findings, the issue then is whether the government priorities on climate action through the Bottom-Up Economic Transformation Agenda, can be addressed under the current state where State Corporations are not supporting this agenda through the deliberate planning processes. Are they able to demonstrate that they are committed to reduce greenhouse gas emissions by 32 percent by 2030 as contained in Kenya's Nationally Determined Contribution (NDC)? Can the government through State Corporations therefore effectively adopt a Bottom Up 3P solutions with greater focus on the People, Planet and Profit through their prioritizations of in strategic planning actions? To what extent, for example, do these state corporations support the solid waste management value chain in their strategic plans and generate focus on adopting the Extended Producer Responsibility (EPR) model? This model should be based on organizational level waste separation and practice green and circular economy in their leadership, managerial and operational activities including establishment of green office plans and buildings alongside other infrastructure.

The agroforestry initiatives and value chain initiatives by these State Corporations should be guided through the development of a policy and regulatory framework on Strategic Planning.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

This should be able to help attract climate finance funds to support the establishment of 5 million acres agroforestry woodlots by these agencies in drylands.

These findings are corroborated through the World Bank research article on low- and middle-income nations by De Kleine and Annette (2021), which reports that with complex mandates, State Owned Enterprises' (State Corporations) incentive structures may not reflect government climate objectives. They generally often face a more complex governing structure and set of incentives than private sector companies and that SOEs are tasked with public service mandates that might overlook climate action initiatives. They argue that SOEs could play a major role in decarbonization and adaptation to climate change impacts since SOEs and their governments are positioned to directly influence climate-relevant decisions. This is especially so in the context of SOE public service delivery (PSD) mandates and corporate social responsibility (CSR) mandates.

Mayor. and Rajavuori (2017) also observe that the role that state owned enterprises (SOEs) play a limited role in climate action since their planning models are skewed towards their mandates. They can, therefore, play a role in promoting climate change mitigation which extends beyond the regulation of private actors. They observed that state-owned enterprises (SOEs) dominate sectors which are critical to a transition towards a carbon-neutral economy, particularly so in emerging economies. They said that states could use their ownership policies to induce efforts towards climate change mitigation and therefore should always use this opportunity to lead by example. The framework for non-market approaches to sustainable development should further explore and raise awareness on the role that state ownership policies play in climate change mitigation.

De Kleine and Annette (2021) further report that Sweden has adopted a comprehensive set of climate reforms for the entire state-owned enterprises portfolio through its state ownership policy that explicitly tasks enterprises with achievement of the national environmental and climate objectives. This includes the 2030 Agenda for the SDGs. This has greatly mainstreamed climate action activities across different sectors as represented by the state-owned enterprises.

Conclusion and Recommendation

From these findings, it can be concluded that most state corporations in Kenya do not infuse local, regional and global climate action proposals in their strategic plans and hence the phenomenon is given a peripheral slot in the plans, strategies and budgets. Green strategic planning is therefore not demonstrated in majority of the state corporations' plans. This is, therefore, left to the concerned Ministry or State Agency to request for incorporation into the annual performance contracts which is not sustainable for effective adoption and adaptation of climate change interventions. The state corporations may not have been obligated to do so but considering the adverse effects of climate change, there was need to infuse climate action targets as envisaged in the Africa Climate Summit 2023 in Nairobi.

It is, therefore, recommended that a performance management policy and productivity measurement framework to be reviewed. This should compel all state corporations in Kenya to incorporate climate action priorities applicable to their respective mandates and work environment through Green Strategic Planning. This in turn should be able to help mainstream climate change interventions across all sectors and regions in the country. This would ensure attraction of climate funding to state corporations across different sectors in line with the discussions and resolutions of the Africa Climate Summit 2023.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Emerging Environmental, Social and Corporate Governance Reporting by Listed Companies in the Post-Corona Pandemic in Kenya

Daniel Thuo Ndung'u[1], Samuel O. Onyuma[2*]
[1]School of Business & Economics, South Eastern Kenya University, Kenya
[2]School of Business & Economics, Laikipia University, Kenya
*Corresponding Author

Abstract
There is an emerging trend in which Kenyan securities market investors are closely scrutinizing listed firms' sustainability efforts, not only their financial performance but also shareholder disclosures. The environmental, social and corporate governance (ESG) reporting concerns are therefore issues that are of increasing concern, over and above financial returns provided by firms listed at the Nairobi Securities Exchange. Listed firms that aspire to keep their shareholders happy, attract new investors and boost demand for their products and services can often do so by acting more sustainably and socially responsible. This not only appeases investors but also helps improve financial performance of the listed firms. Existing shareholders need to become aware of the growing push for listed firms to improve sustainability reporting and implement more environmentally friendly activities. The recent Corona pandemic has also put firms' long-term viability and operational resilience to test. As a result, ESG issues have become even more important not just for corporate boards but also market regulators and other policymakers. This calls for an urgent need to understand how their actions affect the environment and society in order to maximize good effects and minimize negative ones. While many Kenyan listed firms have some ESG reporting initiatives, majority of them follow the limiting Global Reporting Initiative (GRI) requirements. Although the benefits of ESG reporting are well known on a global scale, doing so in Kenya is not without its difficulties. Listed firms that fail to address such hurdles risk missing out on some of the most important advantages of ESG reporting, such as opening up new capital sources from investors with a commitment to sustainability – such as from pension funds, development finance institutions, and private equity firms – as well as improving operational efficiency. Motivated by the emerging ESG corporate reporting concerns, and employing a multi-scenario documentary analysis approach, this paper first analyses the literature and examines the reasons behind the investors' concern for ESG reporting in the post Corona pandemic period. It then examines the theories underpinning ESG reporting. In addition, the paper explains the relevant sustainable financial disclosure regulation in Kenya. Moreover, it discusses the challenges and the future of ESG reporting. Finally, the paper makes key important recommendations aimed at promoting ESG reporting by listed firms as well as encouraging impact investing among stock investors in Kenya.

Keywords: Corona Pandemic, environmental reporting, governance reporting, global reporting initiative, impact investing, social reporting
JEL Classification: G38; M14; G01; G56

Journal of Social Sciences, Education and Humanities (JSSEH, 2023) Vol. 1, No. 1: ISSN 2791-190Xv

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Introduction

Businesses cannot function in a vacuum or as closed systems unless they interact with their surroundings. Because of their frequent engagement with their environment, they are likely to have some impact on the environment and society as a result of their actions. Companies that are listed on securities exchanges become more complicated and productive as they strive to gain a competitive advantage over their competitors-actions, which have an impact on the wider environment and society. Industrialization has also been linked to a variety of economic, social, and environmental risks, such as environmental degradation, air and water pollution, and increased deforestation and habitat loss for both aquatic and terrestrial species (Utile, 2016). Sustainability reporting is the most important tool for communicating sustainability performance and implications to investors as well as industry regulators. A sustainability report, in its most basic form, is a report on an organization's environmental and social performance (Huang et al., 2014).

Traditional financial reporting, according to Simnet et al. (2009), has been criticized in recent years for failing to reflect the various dimensions of a company's worth. Financial reporting criticism, combined with the economic crisis, has increased the demand on corporate accounting to capture and depict the various dimensions of a company's value (Utile, 2016). Furthermore, the increasing demand for non-financial disclosures, as well as various environmental consciousness and the push for sustainable economic growth, are drawing the attention of companies to the importance of making their operations environmentally conscious and sustainable. With growing concern for the global environment and the preservation of ecosystems in order to ensure their long-term viability, sustainability reporting has become critical for both developed and developing countries and their financial markets.

A move towards a more holistic approach to analysing a company's success, the environmental, social and governance (ESG) indicator is now universally recognized as a valuable metric for judging listed firms' non-financial performance. There is a global trend towards incorporating sustainability measures into business operations. This trend has been prompted by the widespread recognition that businesses must play a larger role in mitigating the negative social and environmental consequences of their operations. Furthermore, a growing body of evidence indicates that strong ESG performance is associated with higher returns and financial performance (Money Africa, 2022). These issues have also been prioritizing for economic development by the United Nations Agenda 2030 as goals on sustainable development, African Union Agenda 2063 as aspiration on governance and social justice, East African Community Vision 2050, and Kenya Vision 2030 pillars on environment and natural resource management.

Overview of Environmental, Social and Governance Reporting

The scope of environmental, social, and governance issues is broad and varies according to the listed firm and industry in which it operates. However, there are some key common areas that are typically covered in ESG reporting. Environmental issues include a firm's environmental impact, such as greenhouse gas emissions, energy and water consumption, and waste management practices (Kluwer, 2023). It also takes into account the effects on biodiversity, natural resources, and climate change (Green Business Bureau, 2022). Social issues category includes a company's societal impact, such as labour practices, human rights, and community involvement (PWC, 2021). It also considers the company's impact on its employees, customers, and suppliers, as well as the communities in which it operates. Whereas governance issues refer to a firm's management and leadership, such as board composition, executive compensation, and ethical behaviour, its risk management, compliance, and transparency are also included (Onyuma, 2023).

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Other areas covered by ESG reporting, according to Ernst and Young (2022), also include product responsibility, customer privacy and data security as well as political lobbying. Listed firms may also report on specific sustainability goals that they have set (KPMG, 2022). ESG reporting is becoming increasingly important as investors and other stakeholders seek to understand a company's long-term viability and impact on society and the environment.

The concerns for ESG are gaining importance among stock investors and other stakeholders as key indicators of a firms' overall health and long-term sustainability. Stock investors can identify firms that are well-positioned to manage risks and capitalize on opportunities over the long-term by considering these issues in investment decisions in an effort to undertake impact investing.

The practice of publicly disclosing information about a firm's environmental, social, and governance performance is referred to as ESG reporting. This type of reporting is becoming increasingly important as stock investors and other stakeholders seek to understand a listed firm's long-term viability and impact on society and the environment. Carbon emissions, water usage, labour practices, human rights, and board diversity are all covered in ESG reporting. Such ESG reporting aims to provide a comprehensive view of a firm's non-financial performance, allowing stock investors and other stakeholders to make informed impact investing decisions about the firm (Ndung'u & Onyuma, 2023).

Greenhouse gas emissions, energy, water, and waste management or recycling, biodiversity (environmental), health and safety, diversity and inclusion, human rights, data security, selling practices, product safety (social), and business ethics and culture (governance), are some key issues (Deloitte, 2022). The Business Roundtable has published Principles of Corporate Governance on a global scale since 1978. Every version of the report since 1997 has embraced shareholder primacy principles, and contends that businesses exist primarily to serve shareholders.

The forum's values were significantly revised in August 2019, expanding the scope of corporate social responsibility to include all stakeholders, including employees, community members, consumers, and suppliers, rather than just wealthy shareholders (Business Roundtable, 2019). Companies that take a strong stand on environmental, social, and governance issues, on the other hand, have higher equity returns and lower credit-related risk (Onyuma, 2023). As listed businesses enter this new era, they must actively seek out this specific group of investors (Ndung'u, 2021).

Firms that are dedicated to sustainability reporting and actively contribute to their communities can undoubtedly entice modern investors. As a result, transparent reporting on such efforts and their outcomes is critical. While conducting research on the relationship between corporate sustainability disclosure and firm financial performance on the Johannesburg Stock Exchange, Wasara and Ganda (2019) discovered a positive relationship between social disclosure and return on investment. According to their research, implementing corporate social disclosure can motivate listed firms to be socially responsible while also delivering financial returns.

Despite the fact that many large listed firms have set sustainability targets and disclosed ESG-related data for 2022, securities investors, regulators, and the general public are scrutinizing corporate sustainability initiatives and calling out what they perceive to be greenwashing. Much of this scepticism stems from fears that companies are using sustainability-related disclosures and labels on products and services as a marketing tool to appear more aggressive on these issues than they actually are. New global ESG-related standards will be introduced in 2023, and global standard-setting bodies such as the newly formed International Sustainability Standards Board

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

(ISSB) can assist in addressing what may be the most significant barrier to accountability; the lack of a common baseline for disclosure standards that are consistent across jurisdictions and industries (International Financial Reporting Standards (IFRS), 2023).

Given the demand by international investors with global investment portfolios, companies must provide high-quality, transparent, reliable, and comparable reporting on climate and other ESG issues. The goal of the ISSB is to establish a global baseline of sustainability-related disclosure standards that will inform securities investors and other capital market participants about listed firm's sustainability-related risks and opportunities, allowing them to make better decisions (ISSB, 2023).

The Link between ESG Disclosure and Corporate Social Responsibility

The ESG criteria, according to Antea Group (2022), are a set of principles used by potential investors to evaluate listed firms in which they may invest. The ESG standards investigate a firm's environmental impact (environmental), as well as its interactions with employees, suppliers, customers, and the larger society in which it operates (social). They investigate the leadership, executive compensation, shareholder rights, audits, and internal controls of a listed firm (governance). Corporate Social Responsibility (CSR), on the other hand, is a self-regulatory business paradigm in which listed firms are more conscious of their social impact, and includes the environment, the economy, and the people who comprise society.

Notably, CSR practitioners actively operate in ways that benefit society and the environment while also increasing accountability to themselves, their stakeholders, and the general public. While both ESG and CSR are concerned with a firm's impact on the environment and society, the primary distinction is that CSR is a business model used by individual firms, whereas ESG is a criterion used by stock investors to evaluate a firm and determine whether it is worth investing in (Business Leader, 2022).

Further, ESG and CSR are concepts that are related, but there are some key differences. Non-financial aspects of a firm's operations that can have an impact on its long-term sustainability and performance are referred to as ESG. Environmental, social, and governance issues are included as key indicators of a firm's overall health. ESG reporting is becoming increasingly important as stock investors and other stakeholders seek to understand a firm's long-term viability and impact on society and the environment (Novisto, 2022)

The CSR, on the other hand, refers to a firm's commitment to being socially responsible and accountable for its operations' impact on society and the environment. It therefore encompasses a wide range of activities, including charitable giving, community involvement, and environmental stewardship. In fact, CSR is frequently viewed as a way for businesses to go above and beyond their legal responsibilities and demonstrate their commitment to being good corporate citizens. While ESG is a reporting and measurement framework, CSR is a firm's broader philosophy and practices. Both concepts are becoming increasingly important to businesses and stakeholders as they seek to understand and assess a company's long-term viability.

Historical Development of Environmental, Social and Governance Reporting

The concept of ESG has evolved over time, with various turning points and key events shaping its evolution. Some key historical developments in the field of ESG have been discussed by Forbes (2020), Carbon View (2021), Preqin (2023), Corporate Finance Institute (2023), BakerTilly 2023, and Financial Times (2022). During the 1970s, the modern environmental movement gained traction with the first Earth Day held in 1970. This raised environmental awareness and the need

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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for firms to address their environmental impact. In the 1980s, the concept of socially responsible investing (SRI) emerged as stock investors began to consider social and environmental issues in their investment decisions. In the 1990s, the United Nations launched the Global Compact initiative, which encouraged firms to implement environmentally friendly and socially responsible policies and practices.

By the 2000s, CSR became widely used and listed firms began to publicly disclose information about their social and environmental performance. In the 2010s, ESG became more common, and firms began to report on a variety of non-financial performance indicators. Eventually, from the 2020 onwards, ESG investing is becoming mainstreamed, with many stock investors and asset managers incorporating ESG targets into their investment strategies. The outbreak of the Corona pandemic has accelerated the incorporation of ESG issues, as stock investors have grown concerned about firms' resilience in the face of various systemic risks.

Global Perspective of ESG Reporting

The Harvard Business Review (2019) interviewed 70 senior executives from 43 global institutional investing firms, including the world's three largest asset managers (BlackRock, Vanguard, and State Street) and massive asset owners such as the California Public Employees' Retirement System (CalPERS), the California State Teachers' Retirement System (CalSTRS), and Japan, Sweden, and the Netherlands' government pension funds. It found that ESG was almost universally imprinted on the minds of these executives. The majority of the investment leaders identified concrete efforts being made by their firms to incorporate sustainability concerns into their investment criteria. The implication is that issues underpinning ESG have become far more important for long-term securities investors, and if they have not done so already, company executives will be held accountable for their ESG performance by shareholders.

Global ESG investments increased by 15 percent in the previous two years, reaching $35.3 trillion in assets under management, according to a report by Global Sustainable Investment Alliance (GSIA). Such investments account for 36 percent of total assets in the United States, Canada, Japan, Australasia, and Europe, with a $53 trillion market capitalization expected by 2025. While Europe accounts for half of all ESG assets globally, Bloomberg Intelligence predicts that Asia, particularly Japan, will be the next growth engine. This is because green bond issuance has tripled this year, and has shown a large maturity in 2023 indicating plenty of room for new issuance (Forbes, 2021).

According to a 2022 global survey conducted by FTSE Russell, more than half of global asset owners are actively implementing or reviewing ESG concerns in their investment strategy. As a result of this evidence, investors are incorporating ESG into their investment decision-making process. Also, EY (2022) conducted a survey from 1,040 Chief Financial Officers (CFOs) and other finance executives and 320 institutional investors around the world to explore their expectations and goals regarding sustainability investing and reporting. The study found that 78 percent of investors expect their firms to focus on ESG activities, even if that means less profit in the short-term. Global investors have come to expect more comprehensive, meaningful reporting of key nonfinancial performance data, which they are increasingly using to assess long-term value development. These findings have been supported by independent research, such as those conducted by RBC Global Asset Management (2019) and HSBC (2019).

The IBM Impact is a new paradigm for a firm's ESG efforts, representing IBM's vision for a more sustainable, equitable, and ethical future. According to its 2021 ESG report released in April 2022, IBM Impact is comprised of three pillars; environmental impact, equitable impact, and

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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ethical impact. These principles have been ingrained in the DNA of IBM for over a century, guiding work for its people, stakeholders, and the world (IBM, 2022).

The ESG Market Trends in Kenya

Locally, ESG issues are the significant newcomer on the capital market scene that ever corporate investor wants to speak about. We are seeing an increase in the frequency with which ESG issues are discussed in boardrooms, factored into major management decisions, and negotiated into transaction documents. Listed firms are increasingly considering ESG issues in relation to their enterprises as a value-addition rather than a risk mitigation measure. Investors are prioritizing ESG and future sustainability challenges as major metrics when considering possible mergers and acquisitions (M&A), rather than a basic compliance tick-box exercise.

ESG is not a new trendy jargon; it has been around for quite some time. However, it has risen to prominence in recent years as a result of a number of factors, including firms becoming more socially and ethically conscious of the impact they want to make, investor pressure to develop long-term sustainable business models, increased pressure from customers and other stakeholders demanding increased accountability, and new domestic, regional, and global regulations requiring mandatory compliance (Bowmans, 2022a). The ESG issues and key developments in Kenya are discussed in the next sections.

Environmental Reporting

Kenya has always had a robust legislative and policy framework aimed at environmental protection and rehabilitation. Article 42 of Kenya's 2010 Constitution establishes the right to a clean and healthy environment as a basic right for all Kenyans. Furthermore, Article 69 imposes environmental obligations on the state, including the sustainable management of natural resources, the maintenance of a minimum tree cover, and the protection of biodiversity. In fact, the 13th November 2023 was declared a public holiday for Kenyans to plant trees. These requirements are carried out by several pieces of legislation, such as the Climate Change Act of 2016, which establishes the legal foundation for low-carbon climate development.

Another significant step taken by the Kenyan government in relation to climate change was when it became one of the first countries to ratify the Paris Climate Agreement, and in 2017, the Ministry of Environment and Natural Resources banned the use, manufacture, and importation of all plastic bags used for commercial and household packaging. As a result, manufacturers are continuously searching for sustainable environmentally friendly alternative packaging (UN Climate Change, 2017).

The Kenya Green Bond Programme (KGBP) was established in 2017 to encourage financial sector innovation by creating a domestic green bond market to boost green investments. The Kenya Bankers Association, Nairobi Securities Exchange (NSE), Climate Bonds Initiative, Financial Sector Deepening Africa, and FMO- Dutch Development Bank collaborated on the KGBP initiative (FSD Africa, 2017). Green bonds are those in which the issuer agrees to using the bond proceeds transparently and exclusively to finance or refinance green projects, assets, or commercial operations with an environmental impact (Onyuma, 2020). Following the KGBP, the Capital Markets Authority (CMA) issued a Policy Guidance Note on Green Bonds in February 2019, which was followed by the London Stock Exchange listing of the first shilling-denominated green bond in East and Central Africa. The bond funds were intended to be used to construct 5,000 environmentally friendly student housing units (CMA, 2017)

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

In 2021, the Central Bank of Kenya (CBK) issued a guidance on climate related risk management aimed at commercial banks and mortgage finance companies and informed them on how to manage their climate related risks by incorporating climate related management into their business decisions and activities (CBK, 2021)

Furthermore, at the recently concluded conferences of the parties to the United Nations Framework Convention on Climate Change or COP26/COP27, which took place in November 2021 in Scotland, and November 2022 in Egypt, Kenya's commitment to the environment was visible through the numerous pledges it made to the preservation, restoration, and promotion of environmental sustainability. These obligations include, among other things, ending deforestation by 2030, continuing investment in renewable energy so that Kenya achieves complete 100 percent renewable energy by 2030, and achieving 100 percent clean cooking by 2028, all as part of the global net zero carbon target.

Social Reporting

The recent Corona pandemic altered work life as it was previously perceived by both firms and their employees. Employees want more flexible work conditions. Potential employees are also interested in working for organizations that actively promote ESG in their workplace culture and practices (McKinsey, 2021). Taking into account changing labour trends, the Kenyan Employment (Amendment) Bill 2021 sought to reform employment laws. The Bill is intended to address growing employee burnout and promote work-life balance.

Because of recent legislative developments, manufacturers have had to adapt the way they sell their products and services to consumers. Consumers are driving change by demanding socially responsible behaviour from businesses, which goes beyond the conventional annual corporate social responsibility public relations event. With increased consumer activism in Kenya, and in this era of social media cancellation culture, companies have realized that consumers want to be associated with brands that are sensitive to climate change and sustainability concerns, but will quickly turn to brands that are found to be continuing practices that are on the wrong side of this trend (Forbes, 2020).

Gender equality, which is established in the Constitution, is another significant area of concern under the social umbrella. The CMA has issued Guidelines on Corporate Governance Practices by Publicly Traded Companies, which require boards of listed firms to develop procedures that ensure diversity in their composition, particularly gender diversity. The NSE has also set a target of having at least one-third of Kenya's 63 listed firms to have female board members (CMA, 2021).

Indigenous peoples' protection remains a prominent topic of focus for international investors in the ESG sector. Many land-related projects develop Indigenous Peoples Plans, which set mechanisms to ensure that the local population receives culturally relevant social and economic benefits. These policies uphold indigenous peoples' dignity, rights, and culture while ensuring that they receive culturally relevant benefits at par with other ethnic groups (Poyser & Daugaard, 2023).

Finally, in recent years, data privacy has moved to the top of consumer worries. Following global landmark data privacy breaches, governments have begun to regulate data protection, beginning with the European Union's landmark General Data Protection Regulations (European Council, 2022) as well as Kenya's Data Protection Act.

In Kenya, the Data Protection Act 2019 is being gradually implemented, with the issuance of numerous data protection regulations in 2021, which has influenced how Kenyan organizations

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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manage the data that they acquire. Organizations collecting personal data must examine the purpose, openness, involvement, usage restraints, and collection limitations.

Governance Reporting

Governance issues have become increasingly vital in order to generate and sustain economic progress. The Companies Act, 2015 (Section 655, 4 b), which in many cases places personal obligation on directors of listed firms to ensure compliance, is a basic framework for governance-related concerns. Additionally, according to Bowmans (2022b), several firms are adopting global industry best practices and joining standards and reporting indices such as the International Finance Coalition (IFC) Performance Standards, the Sustainability Accounting Standards Board (SASB), and the limiting Global Reporting Initiative (GRI).

As a result, the CBK and NSE have issued guidelines requiring the board of directors and senior management of listed firms to actively participate in developing and executing ESG strategies, policies, and reporting requirements. Together with the Companies Act, this imposes a stronger responsibility on firm directors to report on ESG issues. Additionally, listed firms were given one year to integrate and comply with the ESG reporting requirements based on the GRI criteria under the NSE ESG disclosure manual, which was issued in November 2021 (NSE, 2021). Furthermore, The CBK Guidance requires financial institutions to provide climate-related information to the Task Force on Climate-related Financial Disclosures with a timeframe of January 2023 to June 2023 has been provided (CBK, 2021).

These regulations, together with the broader interest in ESG, have resulted in extra requirements for listed firms when selecting top executives and board members. Thus, most blue chip firms are indicating categorically in job adverts that the prospective CEO should understand and be able to execute ESG best practices (Myjobmag, 2022; Career Associated, 2022).

What then is the Problem?

Securities investors are, of recent, paying closer attention to a firm's sustainability activities, both in terms of overall operations and shareholder transparency. Listed firms that wish to keep their current investors pleased while also attracting new ones to stimulate demand can frequently accomplish so by acting more sustainably. This not only appeases investors but also aids in performance improvement. Existing shareholders should be aware that there is an increasing effort to improve sustainability reporting and undertake more ecologically friendly operations. The Corona Pandemic outbreak has tested listed firms' long-term viability and operational resilience. The ESG issues have become more critical for legislators, boards and CEOs as a result of the Corona Pandemic. In collaboration with the GRI, the NSE established recommendations mandating listed firms to disclose how they deal with concerns such as community, employee number, corruption, customer data protection, and environmental effect. The guidelines were not mandatory, and the NSE only persuaded them to implement sustainability reporting methods in order to boost profitability and investment attractiveness to both domestic and foreign investors.

The ESG reporting was to be incorporated into regular annual reports as well as separate sustainability reports. However, despite the NSE directive, more than half of the listed firms have failed to comply with the NSE's new mandate requiring them to provide ESG disclosures ahead of the November 2023 deadline. Only 29 firms (46%) of those listed on the Exchange, among them Safaricom, East African Breweries, Nation Media Group, Bamburi Cement, KCB Bank Group, Kakuzi, and Standard Chartered Bank have included ESG disclosures in their financial reports. Most importantly, the disclosures are designed to increase transparency around listed firms,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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facilitating new investments, particularly from international investors. There is lack of information as to why there is reluctance among listed firms to incorporate ESG reporting into their regular annual reports or even as separate sustainability reports. Yet it was meant to boost their overall performance and open room for new impact investors.

As securities investor interest and activism grows globally, ESG reporting is gaining traction in Kenya. While a sizeable number of Kenyan corporations have reported GRI, it has been mainly skewed. Using desktop review of literature via documentary analysis, this study therefore sought to examine the reasons behind the emerging investors' concern for ESG reporting post-Corona Pandemic. It then evaluates the theories underpinning ESG reporting and explains the relevant sustainable financial disclosure regulation in Kenya. Moreover, it discusses the challenges and the future of ESG reporting. Finally, the paper makes key important recommendations aimed at promoting ESG reporting by listed firms in Kenya.

Theoretical Analysis of ESG Reporting

The field of ESG reporting is supported by several theories. The following is a discussion of the major theories underpinning the ESG reporting. In this study, we have used the Agency theory and the Risk Management theory, which are hereby discussed.

Agency Theory

Agency theory was propounded by Stephen Ross and Barry Mitnick in 1973, independently and roughly concurrently (Mitnick, 2019). According to agency theory, companies function as agents for their shareholders. That is, shareholders invest in corporate ownership and so entrust their resources to the management of the corporation's directors and officers. According to the theory, when it comes to ESG issues, management may not always act in the best interests of shareholders or owners, which can easily lead to problems such as moral hazard and adverse selection. Management, for example, may not prioritize environmental sustainability or social responsibility if it does not align with their short-term goals or is not rewarded by shareholders, thereby resulting in negative environmental or societal impacts. To address this potential misalignment, agency theory in the context of ESG suggests mechanisms such as performance-based compensation, board oversight, and shareholder monitoring. This should be able to align management and shareholder interests and ensure that the firm is taking appropriate ESG actions (CFA Institute, 2020).

Furthermore, investors can apply agency theory to ESG by incorporating ESG considerations into their investment decisions and engaging with companies on ESG issues to ensure that management is taking appropriate actions. In sum, agency theory in the context of ESG emphasizes the importance of aligning management and shareholder interests when it comes to ESG issues, as well as the use of mechanisms to ensure that management is taking appropriate actions to address those issues.

Risk Management Theory

Herbert Simon's decision-making theory was initially published in his well-known book, *Administrative Behaviour* in 1947. He claimed that decisions were crucial because if they were not made on time, they would have a detrimental impact on goal of an organization. Risk management theory is a set of principles and practices that guide organizations in identifying, assessing, and managing risks in a systematic and effective manner. In the context of ESG, risk management theory refers to the process of identifying, assessing, and mitigating the risks associated with a

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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business or investment that have an impact on the environment, society, or corporate governance. Changes in government regulations, shifts in consumer preferences, and physical risks from climate change are all examples of ESG risks. These risks can have a significant impact on a company's financial performance, reputation, and long-term viability.

According to ESG risk management theory, firms should identify and assess potential ESG risks associated with their operations before developing strategies to mitigate or manage those risks. This can include things like lowering emissions, investing in renewable energy, improving labour practices, and putting in place good corporate governance practices. Furthermore, by incorporating ESG considerations into their investment decisions, investors can apply risk management theory in the context of ESG. This can include assessing the environmental, social, and governance risks associated with a specific investment and factoring those risks into their overall risk management strategy.

It is important to note that incorporating ESG into risk management should be able to open up new opportunities for businesses and investors. Listed firms, for example, may be able to improve their reputation, build trust with stakeholders, and create new business opportunities by addressing ESG risks. Similarly, investors who consider ESG issues when making investment decisions may be better able to identify and capitalize on long-term sustainable investment opportunities.

Investors' Concern for ESG Reporting Post Corona Pandemic

The Corona Pandemic has highlighted the importance of securities investors considering environmental, social, and governance issues. The crisis has highlighted the vulnerabilities of businesses that do not have strong ESG practices, as well as the potential risks and opportunities associated with these issues.

Following the pandemic, securities investors have become more interested in ESG compliant investments as a way to manage risk and capitalize on long-term sustainable opportunities. Several factors are driving this trend, including (Karugu et al., 2023; Bowmans, 2022b): First, increased understanding of the financial risks and opportunities associated with ESG issues: The pandemic has brought to light the importance of issues like supply chain resilience, employee health and safety, and environmental sustainability. As a result, securities investors are becoming more aware of the risks and opportunities associated with these issues. Secondly, consumer preferences are shifting. The pandemic has accelerated a shift in consumer preferences toward products and services that promote health, well-being, and environmental and social responsibility. This has resulted in an increase in demand for ESG-friendly products and services, as well as new business opportunities for listed firms that can meet this demand.

Moreover, governments all over the world have been enacting new regulations and policies in order to promote sustainability and address the effects of the pandemic. This has introduced new risks and opportunities for businesses as well as prompted investors to consider the potential impact of these regulations on their investments. Lastly, the pandemic has highlighted the importance of long-term investments that can withstand short-term market fluctuations. ESG investments are frequently viewed as a means to accomplish this because they are focused on long-term, sustainable opportunities. Overall, the Corona Pandemic has highlighted the importance of ESG considerations for investors, resulting in increased demand for ESG investments as a means of risk management and capitalizing on long-term sustainable opportunities.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Challenges in Effective ESG Reporting In Kenya

There are four barriers to implementing an effective ESG reporting framework: Setting governance frameworks; understanding reporting boundaries; undertaking materiality analysis; and generating and releasing relevant ESG content (Intellecap, 2023; Bowmans, 2022b).

On setting governance framework, it is vital to establish an active governance framework to drive meaningful ESG reporting. The Kenya Companies Act of 2017 requires company directors to consider ESG issues that may affect the company's future performance. The board oversees the ESG reporting agenda, which is supported by the CEO and driven by the Sustainability Manager.

The lack of an active governance structure can have a significant impact on the implementation of ESG reporting by listed firms in Kenya. There are a number of ways in which this can occurs (Teigland, & Hobbs, 2022). The first one is that without an active governance structure in place, there may be limited accountability for ESG reporting within listed firms. This can make it difficult to ensure that firms are collecting and reporting accurate and comprehensive ESG data. The second one is limited transparency. Active governance structures can help promote transparency in ESG reporting by ensuring that information is shared in a timely and open manner. Without such structures, listed firms may be less likely to share ESG data with stakeholders or to report on their performance in a meaningful way.

In addition, there arises limited stakeholder engagement. Active governance structures can help facilitate stakeholder engagement around ESG issues that should generate support and drive positive change. Without such structures, however, listed firms may be less likely to engage with stakeholders around ESG issues or to use ESG reporting as a tool for driving positive change. Moreover, there is the possibility of limited capacity building. Active governance structures can help build capacity within listed firms around ESG reporting, including providing training and support to employees responsible for collecting and analysing ESG data. Without such structures, listed firms may be less equipped to implement robust ESG reporting systems, which can affect the necessary reporting.

On understanding reporting boundaries, think of all of the entities over which a firm has control (organizational boundary) as well as all of the entities over which it has influence (operational boundary) such as subsidiaries, suppliers, vendors, and contractors. The upstream and downstream must be considered, and the reporting boundary must be established accordingly. This may differ from one listed firm to another depending on the industry and type of information required for reporting. The understanding of the reporting boundaries is an important aspect of implementing a robust ESG reporting by listed firms in Kenya. Reporting boundaries refer to the specific activities or areas of a firm’s operations that are included or excluded from the scope of its ESG reporting (OECD, 2020).

Some of the reasons why understanding reporting boundaries is important include the following issues. Firstly, by clearly defining reporting boundaries, listed firms can ensure that their ESG reports accurately reflect the scope of their operations and the impacts of those operations on the environment, society, and governance. This should help promote transparency and credibility in ESG reporting. Secondly, it can also aid comparability. Understanding reporting boundaries can thus help ensure that ESG reports are comparable across different listed firms and industries. This is because different firms may have different reporting boundaries based on the nature and scope of their operations. In addition, such understanding should be able to promote prioritization in that it can help listed firms prioritize their ESG reporting efforts, by focusing on the most material issues within the scope of their operations. This can help them identify and address the most significant ESG risks and opportunities. Lastly, there is the issue of stakeholder engagement.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Understanding reporting boundaries can therefore help facilitate stakeholder engagement around ESG issues, by providing a clear and transparent view of the company's operations and their impacts. This should help build trust and support among stakeholders (Nduati-Mutero & Njoroge, 2022).

On undertaking materiality analysis, which refers to the principle that determines which topics are relevant enough to warrant reporting, disclosures about water waste and treatment, for example, may be more significant to a chemical producer than a furniture manufacturer. Materiality is defined within the reporting boundaries, and listed firms should do materiality analysis at least once a year. Undertaking materiality analysis is therefore another important aspect of implementing ESG reporting by listed firms in Kenya. Materiality analysis is the process of identifying and prioritizing the most significant ESG issues within the scope of a firm's operations, based on their potential impacts on the firm's financial performance and stakeholder interests.

Some of the reasons why undertaking materiality analysis is important include the following as explained by KPMG (2014): First, focus in which undertaking materiality analysis can help listed firms focus their ESG reporting efforts on the most significant issues within the scope of their operations. This should ensure that ESG reporting is relevant, credible, and useful to different stakeholders. Secondly, prioritization is key because materiality analysis can help listed firms prioritize their ESG reporting efforts based on the potential impacts of ESG issues on the its financial performance and stakeholder interests. This should help the firms identify and address the most significant ESG risks and opportunities. In addition, stakeholder engagement is paramount since materiality analysis can also help facilitate stakeholder engagement around ESG issues, by providing a clear and transparent view of the firm's most significant ESG risks and opportunities. This should help build trust and support among stakeholders. Lastly, undertaking materiality analysis can help listed firms comply with regulatory requirements around ESG reporting, by ensuring that their ESG reports address the most significant ESG issues within the scope of their operation (Ansarada, 2023).

Once the above three obstacles have been addressed, selecting the relevant data, generating and releasing relevant ESG content, should be simple. The sustainability manager, assisted by the CEO, will need to participate in stakeholder engagement, both internally and externally, in order to put up the necessary processes for data collection. At this point, the GRI also gives guidelines on how to pick the sustainable development goals applicable to the ESG reporting process. Therefore, listed firms must choose the SDGs that are most relevant to their operations rather than all of them (Tocchini & Cafagna, 2022). This is critical to prevent accusations of greenwashing and to disclose measurable and tangible annual progress towards the SDG targets. This will ensure that ESG practices and reporting is not seen as a mere PR exercise.

Furthermore, generating and releasing relevant ESG content should be another important aspect of implementing ESG reporting by listed firms in Kenya. Relevant ESG content refers to the specific information that such firms should include in their ESG reports, such as data, metrics, targets, policies, practices, and initiatives related to environmental, social, and governance issues. Some of the reasons why generating and releasing relevant ESG content is important, according to PWC (2021), include promoting transparency where the generation and releasing of relevant ESG content can help listed firms promote transparency and accountability around their ESG performance. By providing detailed information on their ESG practices and initiatives, listed firms should be able to build trust and credibility among their stakeholders.

Another reason is comparability where relevant ESG content can also help ensure that ESG reports are comparable across different firms, sectors and industries. This is because firms can use

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

standardized metrics and reporting frameworks to provide consistent and comparable data on their ESG performance by firms. In addition, generating and releasing relevant ESG content can help firms prioritize their ESG efforts, by identifying the most significant ESG risks and opportunities within the scope of their operations. This should help companies allocate resources more effectively to address these issues. Finally, generating relevant ESG content can also help facilitate stakeholder engagement around ESG issues, by providing a clear and transparent view of the company's ESG performance and initiatives. This should help build trust and support among stakeholders. It is therefore evident that reporting boundaries as well as generating relevant ESG content is at the heart of a firms ESG performance.

The Future of ESG Reporting in Kenya

It is evident that ESG is quickly becoming an integral part of good corporate governance practice. Thus, within ESG, a number of trends are emerging which will shape how the securities exchange listed firms sustain in their operational environments. The following are some notable trends that will generally develop in the near future in corporate arenas. If listed firm top management fail to act, they will likely suffer consequences. Going forward, there will be a convergence of governance and standards. In addition, sustainable products will become the norm in the future. Moreover, carbon offsetting will get better as firms become more responsible, and climate positivity will become the new net-zero by listed firms. Furthermore, organisations will have to disclose any climate risks they are responsible for (Conmy, 2023).

Similarly, greenwashing will be punished, and engendering of the board of listed firms will become the fashionable thing in corporate arena. ESG investing will continue to rise, renewable energy will become cheaper, and all these will define their future success, and impact investing concerns will grow among Kenyan securities investors,

The future of ESG reporting in Kenya looks promising, as there is a growing recognition among businesses, investors, regulators, and civil society of the importance of ESG issues for long-term sustainability and value creation. Some of the trends that are likely to shape the future of ESG reporting in Kenya, among others have been discussed by Butt and Nduba-Banja (2022) and Karugu et al. (2023). To begin with, there is likely to be regulatory developments as the Kenyan government is expected to introduce new regulations and guidelines around ESG reporting, which could help promote more consistent and standardized ESG reporting practices among listed firms. Secondly, there is a growing demand among local and international investors for ESG data and insights, as investors increasingly recognize the importance of ESG issues for long-term value creation and risk management.

Moreover, stakeholder engagement can be expected to increase given that there is a growing recognition among the listed firms that engaging with stakeholders on ESG issues is critical for building trust, reputation, and social license to operate. As such, listed firms are likely to increase their efforts to engage with stakeholders on ESG issues, and to report on their stakeholder engagement activities. In addition, advances in technology, such as Blockchain and Artificial Intelligence as well as Machine Learning are likely to play an increasing role in ESG reporting, by enabling more efficient and accurate data collection, analysis, and reporting. Finally, ESG reporting is likely to become more integrated with other reporting frameworks, such as financial reporting, sustainability reporting, and integrated reporting, as listed firms seek to provide a more holistic view of their performance and value creation.

Overall, the future of ESG reporting in Kenya looks promising, as firms, investors, and regulators increasingly recognize the importance of ESG issues for long-term sustainability and

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

value creation. By promoting more consistent, transparent, and relevant ESG reporting practices, listed firms can build trust, reputation, and social license to operate, while contributing to the achievement of sustainable development goals and other social and stewardship issues.

Conclusions and Recommendations

The field of ESG continues to face challenges, such as a lack of standardization and uniformity in reporting, a lack of regulation and oversight, difficulty measuring and reporting impact, a lack of data and information availability, as well as lack of understanding and awareness. Nevertheless, meaningful diversification potential in ESG investments was significantly observed globally during the recent Corona pandemic. Adopting an ESG policy by Kenyan listed firms therefore has the potential of enhancing the innovation capacity and innovative activities, value creation, financial performance, and future sustainability of the listed firms. It is important to note that firms cannot predict the effects of pandemics and other crises with certainty, and that the true impact is determined by a variety of factors outside of their control and expertise. Stock investors, on the other hand, have a right to this information as well as the sustainability fundamentals of the companies. Investors are better informed now, and as the Corona pandemic has shown, listed firms' businesses and operations will be scrutinized more closely. As a result, sustainability reporting would be an important tool for publicly listed firms to use in order to gain the trust and confidence of their investors and as well as other stakeholders.

Listed firms that want to stand out and be relevant in the future will need to make a quick transition from financial reporting to integrated reporting. Integrated reporting should enable such firms tell their story of positive societal and environmental impacts and contributions, intangible assets and competitive advantages related to ESG issues, and financial performance, including profitability and returns to their investors. These firms must now demonstrate the 'S' in ESG to investors, and those who want to stay relevant must reconcile the firms' worth beyond a balance sheet.

Firms' boards must empower management and their investor base to address information gaps related to ESG and integrated reporting in order to create long-term value that will last through some pandemic and other crises. Listed firms must also monitor the impact of any emerging pandemic or crisis on their business performance and operations, and provide timely and accurate information to investors and other stakeholders.

Overall, the environmental, social and governance performance can have a significant positive relationship with listed firms' sustainability, indicating that undertaking business activities, creating value for society by upholding environmental, social and governance principles are mutually dependent. The arguments fronted here are supported by existing literature such as those by Ahmad et al(2023) as well as Teigland and Hobbs (2022).

The following recommendations could be considered to overcome the current challenges facing ESG reporting in Kenya. To begin with, lack of an active governance structure can make it challenging for listed firms in Kenya to implement robust ESG reporting systems since it is not a legal requirement for them to do so. To address this, it may be necessary to develop and implement more comprehensive governance frameworks that can help promote transparency, accountability, and stakeholder engagement around ESG issues. Such frameworks could include requirements for ESG reporting and disclosures, as well as training and capacity-building programmes to support the implementation of ESG reporting systems.

Moreover, understanding reporting boundaries is an important aspect of implementing ESG reporting by listed firms in Kenya. Listed firms that take the time to define and communicate

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

their reporting boundaries can ensure that their ESG reports accurately reflect the scope of their operations and the impacts of those operations on the environment, society, and governance. This should help promote transparency, credibility, comparability, prioritization, and stakeholder engagement around ESG issues.

Furthermore, undertaking materiality analysis is an important aspect of implementing ESG reporting by listed firms in Kenya. Listed firms that take the time to identify and prioritize the most significant ESG issues within the scope of their operations can ensure that their ESG reports are relevant, credible, and useful to their stakeholders. This should help promote focus, prioritization, stakeholder engagement, and compliance around ESG issues.

In addition, generating and releasing relevant ESG content can be an important aspect of implementing ESG reporting by listed firms in Kenya. Firms that provide detailed information on their ESG performance, practices, and initiatives can promote transparency, comparability, prioritization, and stakeholder engagement around ESG issues. This should help build trust, credibility, and support among stakeholders, and ultimately contribute to the long-term sustainability of the firms and their operations.

In terms of recommendations aimed at improving investor knowledge of impact investing in Kenya, Kenyan stock investors should embrace sustainable investing since ESG investing has the potential to empower them to align their investment portfolios with responsible practices and positive societal impacts. Investors should therefore educate themselves about ESG investing and the key ESG factors that matter to them. This will enable the understanding of the impact of ESG considerations on investment performance and the positive change it can drive.

Moreover, stock investors need to research the available ESG-focused investment options in the market such as EFTs, mutual funds or other impact investing opportunities that align with ESG priorities by checking for ESG ratings and reports to understand a Fund's or company's ESG performance. Furthermore, investors should engage with listed firms on ESG matters, vote on shareholder resolutions, and ask questions about the firms' ESG initiatives. In addition, Kenyan stock investors should explore impact investing opportunities that aim to generate positive social and environmental outcomes alongside financial returns, thus allowing them to contribute directly to causes they care about. Lastly, stock investors should endeavour to diversify their ESG portfolios; as such, diversification remains crucial in ESG investing. This will help them spread their investments across different sectors and asset classes to manage investment risk efficiently. The arguments fronted herein, it is hoped, will help stimulate future research on ESG issues that influence corporate investments and their future sustainability.

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LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Climate Change, Natural Resource Depletion and Economic Growth of Kenya

Stella Isendi Muhanji
Department of Economics, Laikipia University, Kenya

Abstract
The adverse effects of climate change ravage more the growth trajectories of developing countries than developed countries. This is aggravated by random depletion of natural resources arising from rapid economic growth, consequences of civilization as well as existence of weak institutional infrastructure for environmental protection. The paper empirically investigates the nexus between climate change, natural resource depletion and economic growth of Kenya. The trend analysis demonstrates that depletion of forest cover as a percentage of gross national income moves in tandem with the cost of damage to the economy arising from carbon dioxide emissions. The depletion of forest cover also reduces the growth rate in gross domestic product. The empirical findings from regression analysis show that natural resource depletion increases the cost of damage arising from carbon dioxide emissions and this finding mimics the trend analysis. The increased cost of damage arising from carbon dioxide emissions in turn reduces savings, investments and ultimately reduces the growth rate in gross domestic product of Kenya. Agriculture sector in Kenya plays a pivotal role in GDP growth and is immensely affected by climate change. The paper also empirically examined the impact of the cost of carbon dioxide damage on agriculture crop production and livestock product. Results show that both livestock production and crop production reduce with increased carbon dioxide emissions. These findings point to the importance of implementation of policies or protocols for controlling carbon dioxide emissions and natural resource depletion because of their devastating effect on economic growth of Kenya.

Keywords: Agriculture Production, carbon dioxide emissions, climate change, economic growth, natural resource depletion

Introduction

The first economic debate on climate change started during the 1990s and the economic studies focussed on Brazil and India because these countries kept good records on agriculture (Mendelsohn & Dinar, 1999; Kumar & Parikh, 2001; Mendelsohn, 2008). These early studies on climate change used the Ricardian Method and findings revealed that agriculture in both countries was sensitive to modest warming. In fact, marginal increases in temperature resulted in reduction in average net revenue from agriculture.

Climate change is one of the most pressing threats confronting economies (Farajzadeh et al. (2022). Due to anthropogenic activities, the average temperature has risen by 0.9^{o}C since the 19th Century, mainly due to Green House Gas (GHG) emissions in the atmosphere. This rise is estimated to increase by 1.5^{o}C by 2050 as a result of deforestation (Arora, 2019). The unprecedented rise in temperatures has resulted in increased droughts especially in the Horn of Africa, floods in Pakistan, hurricanes in USA, irregular patterns of precipitation, and heatwaves in

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Europe and China. Emissions on their part have a direct impact on health and environmental degradation (De Angelis et al. 2019).

In the year 2018, natural disasters caused economic losses to the tune of USD 225 billion across the world (Arora, 2019). About 95 percent of these losses are attributed to weather related incidences of which cyclones, floods and droughts are the key players. During the year 2022, climate change caused heavy floods in Pakistan, heatwaves in China and Europe as well as drought in the horn of Africa. As of 8th May 2023, South East Asian countries recorded the worst heatwave ever experienced in the region that is compounded by an intense smoggy season that spiked pollution levels. In fact, Vietnam, Thailand and Laos recorded temperatures of 44.2^{o}C, 45.4^{o}C and 43.5^{o}C, respectively, and Philippines recorded temperatures of between 42^{o}C-51^{o}C. These high temperatures led to closure of schools and caused misery to many. Therefore, as is articulated by Duan et al. (2022), global warming not only affects the level of output, but also damages the ability of an economy to grow by damaging crops and increasing heat-related mortality.

Effects of climate change ravage more developing countries than developed countries. In fact, developed countries benefit from climate change because of its link to production and consumption whilst developing countries suffer the adverse effects of environmental pollution. Climate change is a civilization threatening consequence (Rezai et al., 2018) since exponential economic growth results from capital accumulation and the ever increasing use of natural resources such as energy and fossil fuels. Consumption of fossil fuels account for most emissions in the world (De Angelis et al., 2019). Emissions from climate change, especially carbon dioxide emissions, have a direct effect on environmental degradation (De Angelis et al., 2019). The study by Burke et al. (2015) indicate that climate change may cause over 77 percent of the world's economy to become poorer if no substantial control strategies are implemented to reduce emissions. The effects of climate change severely affect agriculture based productivity of poor countries while developed countries benefit because of the positive changes in their terms of trade.

Kenya relies heavily on hydropower generation and minimizing energy's contribution to climate change is a challenge. The need to address food security has led to increased Green House Emissions coupled with the depletion of forest cover as a results of rapid population growth. The question to ask is: does the depletion of natural resources, coupled with increased carbon dioxide emissions affect the growth rate of Kenya? This study's interest is to determine the linkage between depletion of natural resources, carbon dioxide emission and economic growth of Kenya.

Most studies on climate change and economic growth focus on the relationship between temperature change, carbon dioxide emissions, precipitation and economic growth using panel data analysis. The country specific macroeconomic studies revolve around Asian countries (Liu et al. 2020) and developed countries (Acaroglu & Güllü, 2022).

This research paper is a country specific empirical investigation focusing on Kenya, a country with low adaptation capacity and located in the tropics; a region that is persistently affected by climate change. The fact that Kenya is located in the tropics makes it experience the adverse effects of global warming and, therefore, a study that investigates the relationship between climate change and gross domestic product (GDP) growth provides insights into the possible environmental management policies to be adapted to mitigate climate change effects.

Additionally, this study includes depletion of natural resources to the nexus between climate change and economic growth which is an innovation to climate change debate. In Africa, studies on climate change focus on Sub Sahara Africa (Alagidede et al., 2014), on Africa (Abidoye & Odusola, 2015) and North Africa (Roson, 2012). These studies used temperature change and precipitation as the proxy for climate change. In this research paper, not only temperature is used

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

as a measure of climate change but also the cost of damage as a result of carbon dioxide emissions. The results of this paper provide evidence that climate change not only negatively affects economic growth and development of Kenya, it also affects savings and investments. It also reduces both crop and livestock production. Additionally, depletion of natural resources cannot be ignored as an important factor in the climate change-economic growth nexus.

The remainder of this paper is organised as follows: The first section provides some trend analysis on the nexus between climate change, natural resource depletion and economic growth. Section 2 provides extant literature on the relationship between climate change and economic growth. Section 3 develops an econometric model that is used for the analysis of data. Section 4 presents the descriptive and econometric estimation results of the study and the last section concludes the study and provides some policy implementations.

Nexus Between Carbon Dioxide Emission, Natural Resource Depletion and Economic Growth in Kenya

This section shows the trend analysis of the relationship that exists between carbon dioxide damage as a percentage of gross national income (GNI), natural resource depletion (measured using depletion of forest cover), temperature change, sectoral carbon dioxide emissions, sectoral output and economic growth of Kenya. The carbon dioxide damage is measured by the cost of damage resulting from carbon dioxide emissions. The unit cost of damage is calculated as US $40 per ton of carbon dioxide emission. Figure 1 shows the relationship between GDP growth and carbon dioxide damage as a percentage of GNI.

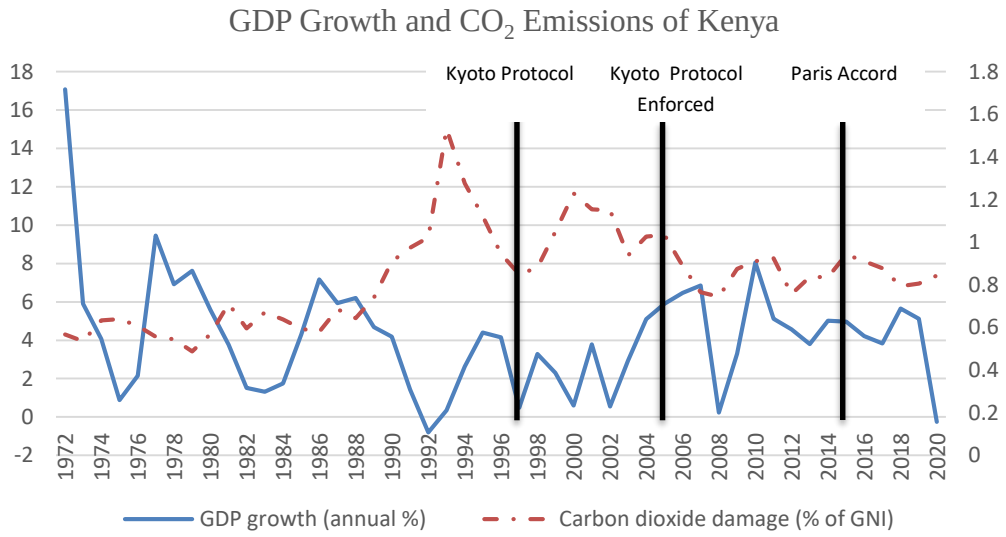

Fig. 1: Climate Change and Economic Growth

It is evident from Figure 1 that GDP growth and carbon dioxide damage move in opposite direction. Increases in cost of damage resulting from carbon dioxide emissions are accompanied by decreases in GDP growth of Kenya. Debate on how to combat climate change began in 1990s, a period in which carbon dioxide damage in Kenya surged and reached the highest level of about 1.5 percent in 1992. During this period, GDP growth slumped to the lowest level of about 1 percent. Cost of damage brought by carbon dioxide emissions (hence a decline in the cost of damage) declined from 1.5 percent of GNI in 1992 to 0.84 percent in 1997, the year the Kyoto

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Protocol was adopted. The Kyoto Protocol was the first legally binding climate change treaty in which countries committed towards reduction in carbon dioxide emissions. This period of declining in carbon dioxide emission was accompanied by increased GDP growth.

Without enforcement of the protocol, carbon dioxide emissions sharply increased and reached 1.2 percent in the year 2000. Prior to enforcement of the Kyoto protocol in 2005, carbon dioxide emissions recorded a steady decline. When Kyoto Protocol was adopted by countries, Kenya's GDP growth slightly improved before oscillating. As carbon dioxide emissions gradually declined, the GDP growth which had gone through a sudden slump in 2008 improved. The sudden slump was driven by the temporary political instability after announcement of general elections results. During the Paris Accord in 2015, countries strengthened climate change commitments on reducing greenhouse gas emissions but the amount of carbon dioxide keeps increasing. The relationship between carbon emission and GDP growth that is depicted by these diagrams lean towards the literature that asserts that environmental degradation reduces economic growth of less developing countries. In fact, Rezai et al. (2018) argue that climate change induced by greenhouse gas emissions lowers investments, profitability and cuts output in the short-run and long-run.

Climate change affects output from the agriculture sector; especially crop production and livestock production. Figure 2 shows the trend analysis of climate change (proxied by carbon dioxide damage as percent of GNI and temperature change).

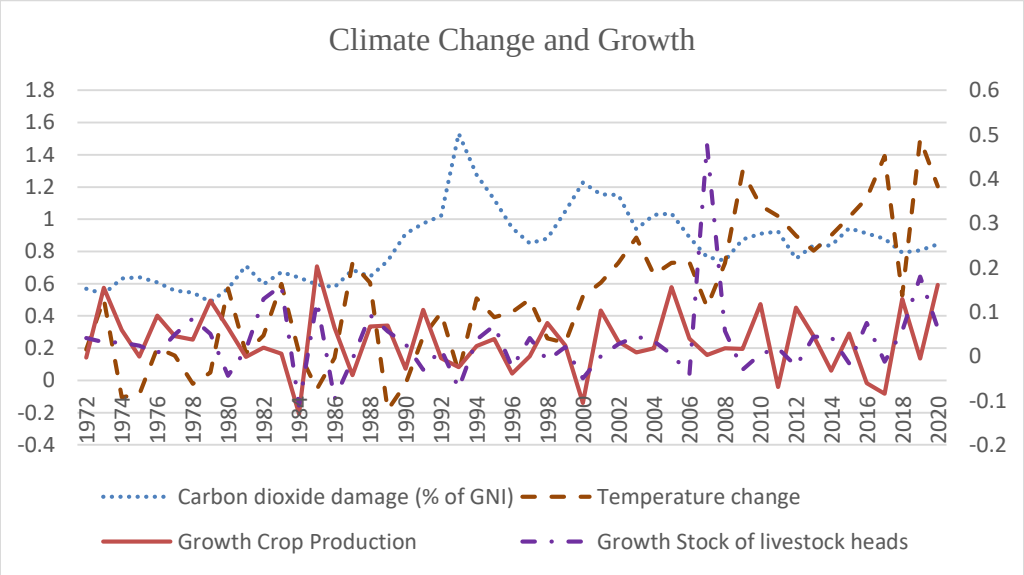

Fig. 2: Climate Change and Agriculture Output

From Figure 2, temperatures have gradually been rising with high temperatures recoded in the years 1980, 1983, 1987, 2003, 2009, 2017 and 2019. In fact, the years 2007 to 2009 as well as 2013 to 2017 recorded a rapid increase in temperatures. During these years, crop production and livestock production were at their lowest values; implying that perhaps the high temperatures contributed to the low production output in agriculture sector. In other words, temperature change and both crop and livestock production move in opposite direction; that is, positive changes in temperature lead to reduction in crop production and livestock production. A similar negative relationship is exhibited between carbon dioxide emissions and both crop and livestock production. The decrease in livestock production, during periods of high temperatures, can be explained by the

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

fact that the pastoralist community that lives in the northern part of Kenya lose most of their domestic animals during periods of drought.

Apart from the trend analysis provided above, the nexus between depletion of natural resources, GDP growth and carbon dioxide emissions confirm the proposition that the depletion of natural resources increases temperatures and carbon dioxide emissions. As a consequence, growth in GDP declines. Results are presented in Figure 3.

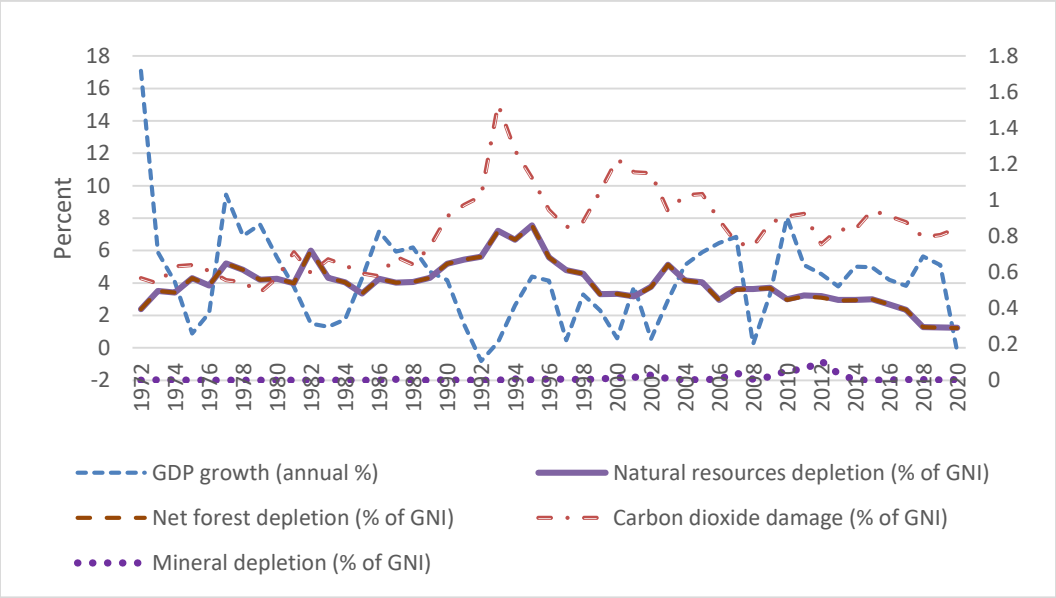

Fig. 3: GDP Growth, Natural Resource Depletion and Carbon Dioxide Emission

It is evident from Figure 3 that depletion of natural resources in Kenya is actually the depletion of forest cover. This depletion of the forest cover is accompanied by increases in carbon dioxide emissions. During the period in which Kenya experienced the highest carbon dioxide emissions, net forest depletion as a percent of GNI reached the all high point of about 7.55 percent of GNI. During 1989 to 1993, when there was logging and depletion of forest cover, carbon dioxide emissions tremendously increased in the atmosphere.

As from 1993, with the Green Belt Movement pushing for re-afforestation and protection of forests, depletion of forest cover reduced. The re-afforestation initiatives led to a decline in carbon dioxide emissions up to 1996, but emissions shot up again in 1999 as a result of increased consumption of liquid fuel as shown in Figure 4.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

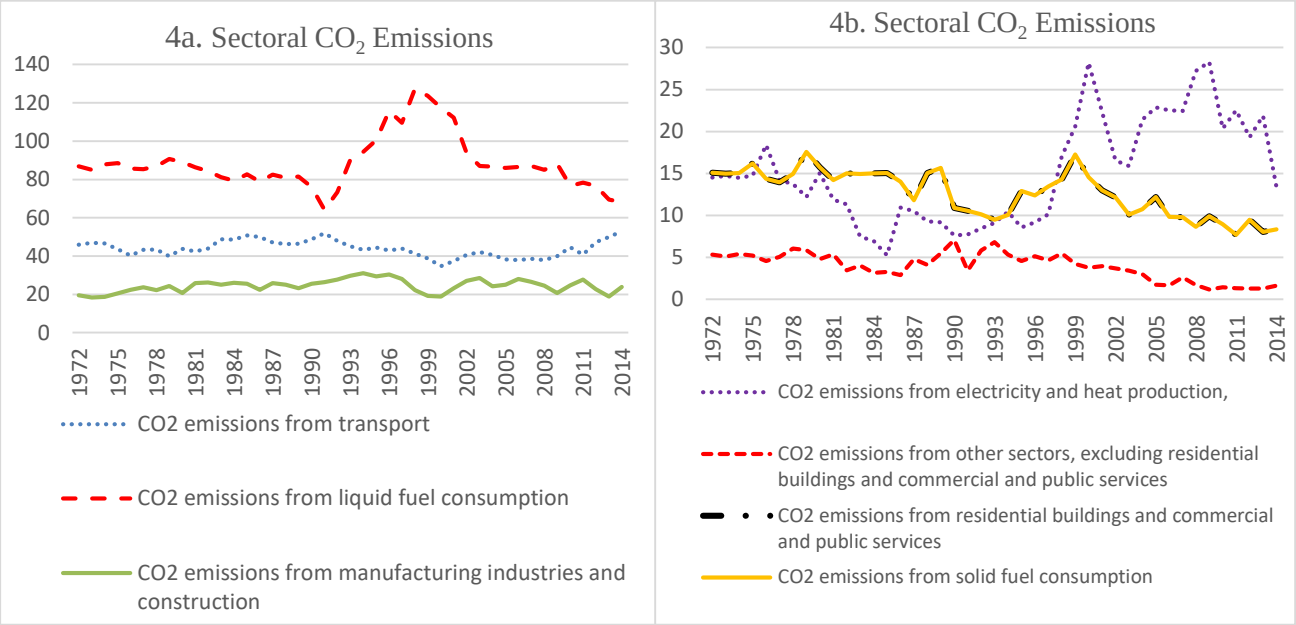

Fig. 4: Sectoral Carbon Dioxide Emissions

The results in Figure 4 (diagram 4a) show that carbon dioxide emissions from liquid fuel are the highest, with the peak in 1999, the year Kenya resulted in the use of fuel generators to supplement the supply from Uganda. The measures that the manufacturing sector put in place to address electricity shortages (such as switching to fuel generators for production) also led to increased emissions from electricity consumption as is evidenced by Figure 4 (diagram 4b). An interesting finding from the results in Figure 4 (diagram 4b) is that the carbon dioxide emissions from residential buildings, commercial and public services are equivalent to the carbon dioxide emissions from solid fuel consumption.

Literature on Climate Change and Economic Growth

There are multiple channels linking income to climate exposure such as adverse effects on health, labour productivity and possible reduction in human capital accumulation. Hsiang et al. (2017) found that low income USA Counties are more adversely affected by climate change than high income Counties. This finding confirms what Dell et al.(2009) found that higher temperatures have a substantial reducing effect on economic growth of poor countries but have little effect on rich countries. They also argue that higher temperatures reduce agricultural output, total investment, output from industrial sector and increases political instability.

In yet another study, Dell et al.(2012) sought to determine the relationship that exists between temperature shocks and economic growth. Their study demonstrated that hot countries tend to be poor, with national income falling by 8.5 percent per degree Celcius. They also found that a 1^{o}C rise in temperature in a given year reduces economic growth of poor countries by 1.3 percent. Additionally, in rich countries, changes in temperature do not have a robust observable effect on economic growth. Actually, temperature influences the level of output by affecting agricultural yields together with investments, consequently affecting the economy's ability to grow.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Eboli et al. (2010) explored the climate change feedback on economic growth using the dynamic general equilibrium model. They assessed the economic consequences of climate change on economic growth and the distribution of income in the world. Additionally, they verified if climate change feedback on economic scenarios brings about significant variations in estimates of greenhouse gas emissions. Their findings reveal that climate change works against income and equity convergence in the world. In fact, effects of climate change adjust productivity, resource endowment and consumption patterns of the world.

Prado, Jr. et al. (2016) reviewed Brazil's policies on energy security whilst accounting for uncertainty in prediction of economic growth and climate change. In consideration to the policies, they examined the role of climate change and the country's reliance on hydro-thermo in increasing socioeconomic and environmental risk. Their review demonstrated that when an electricity crisis happens, the political and economic consequences are large. For instance, when a drought occurs, there is severe rationing in the economy as a result of decreased production.

In a more recent study, Duan et al. (2022) empirically investigated the climate-economic relationship of 274 cities in China using a 27 year panel data. Their results show that a 1 degree temperature change is associated with 0.78 percent decrease in output. Additionally, their study reveals significant differences in the effects of climate change across regions. Specifically, the hotter southwest region of China suffers severely from an average warming whilst the cooler northeast China is non-significantly affected by global warming. Apart from temperature, Duan et al. (2022) also found that a 1 percent humidity is associated with 1.345 decrease in output.

Berg et al. (2023) added to the literature on climate change and economic growth by empirically exploring the responses of real GDP per capita growth from temperature variation. They used data for 137 countries spanning many years from 1960 to 2017. They decomposed country-level temperature into global and idiosyncratic temperature components. They found substantial heterogeneity across countries in the impulse responses of real GDP per capita growth to shocks in temperature. There are more negative than positive impulse responses of real GDP per capita growth to increases in idiosyncratic temperature. In fact, richer countries like the USA tends to experience negative impulse responses of real GDP per capita growth to increases in global temperature whilst some poorest countries experience positive responses.

Using panel data of MENA countries from 2000 to 2019, Amara et al. (2023) evaluated the relationship between carbon dioxide emissions and GDP. Their findings revealed a positive non-linear relationship between GDP and carbon dioxide emissions. Specifically, increases in GDP increased carbon dioxide emissions as well as eco-innovation activities. From this study, GDP is one of the main drivers of carbon dioxide emissions; this result mimics the findings by Amin et al. (2022) who confirmed that economic growth upsurge carbon emissions. Amara et al. (2023) also found that foreign direct investment (FDI) is linked to excess resource utilization and high pollution outputs.

Letta and Tol (2019) examined the impact of temperature change on total factor productivity (TFP) of a panel of 60 countries covering the period of 1960 to 2006. The findings show that temperature shocks negatively affect TFP growth rates. In fact, a $1^{o}C$ annual increase in temperature lowers growth rate of TFP by 0.49 percent.

Letta and Tol (2019) also interacted temperature change and a dummy for being poor (the dummy capturing poor is measured using observations that lie below the median of GDP per capita); the findings reveal that the negative effects of temperature on TFP are concentrated in poor countries. Their result on poor countries indicates that a $1^{o}C$ increase in temperature decreases TFP growth rates by about 1.5 percentage points. This finding corroborates the findings

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

by Henseler and Schumacher (2019) who also established that total factor productivity of low income countries is negatively affected by temperature change.

On climate change and agriculture, studies on Brazil and India by Mendelsohn (2008), Mendelsohn and Dinar (1999) along with Kumar and Parikh (2001) suggest that agriculture is sensitive to warming. Marginal increases in temperature result in reductions in average net revenue and land value. Their results also revealed that not every farm in these countries would be affected in the same way. In fact, the wet Eastern Region of India mildly benefits from warming whereas the dry Western Region of India suffers large damages. The South Eastern Region of Brazil benefits from warming whilst the Amazonian and North Eastern Region of Brazil would be hurt. Additionally, their findings show that small farms find it profitable to switch between livestock and crops depending on the temperature. In contrast, large farms reduce their stock of livestock as temperatures increase.

The argument by Hsiang and Kopp(2018) that agriculture revolutions have transformed forests into farmlands and years of forest clearance has added hundreds of billions of tons of carbon to the atmosphere. Actually, every home lit by coal or natural gas-fired power plant, every petrol powered train, plane and motor vehicle has contributed to the net of carbon dioxide in the atmosphere. The emissions of CO_2, together with other greenhouse gases distort the planet's energy balance. Under normal circumstances, the sunlight that makes it to the Earth's surface is absorbed and then re-radiated to Space as an equal quantity of heat (technically infrared light). The accumulation of greenhouse gases in the atmosphere blocks some of this re-radiation, redirecting energy back toward the Earth's surface. This redirected energy is about 27 trillion Watts (0.05 Watts per square meter) per 1 percent increase in atmospheric CO_2 concentrations, equivalent to the energy of one Hiroshima-Scale atomic bomb spread over the surface of the Earth every 2.3 seconds.

Methodology

The drivers of economic growth, as stipulated by Solow's growth model are capital accumulation and labour. Solow's growth model puts emphasis on capital accumulation as the driver of economic growth. Studies have shown that climate change affects the economy through consumption of goods and services, savings and investments. Therefore, following Solow's growth model, the simple reduced form production function can be presented as follows:

$$Y_t = f(K_t) \quad (1)$$

Where K_t is capital and Y_t is output. Equation 1 can be presented as a Cobb-Douglas production function of the form:

$$Y_t = A_t K_t^{\alpha_1} \quad (2)$$

Where A_t is technological progress. If we add climate change to the production function then Equation 2 becomes:

$$Y_t = e^{\sum_{i-2}^{3} \alpha_{it} CC_{it}} A_t k_t^{\alpha_1} \quad (3)$$

Where CC represents climate change. Economic growth and technological progress boosts standards of living and this is achieved through natural resource depletion and the use of energy.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

So long as energy is derived from carbon-emitting fossil fuels, concentration of atmospheric carbon dioxide and other greenhouse gas emissions increases thus climate change worsens. Climate change can thus be entered into the production function using carbon dioxide emission and temperature change (T). The production function thus becomes:

$$Y_t = A_t k_t^{\alpha_1} e^{\alpha_2 CO_{2t} \alpha_3 T_t} \quad (4)$$

Thus, log linearizing Equation (4) and adding the natural resource depletion and mineral resource depletion variables, the regression model takes the form:

$$y_t = \alpha_0 + \alpha_1 lnK_t + \alpha_2 CO_{2t} + \alpha_3 T_t + \alpha_4 DepNR_t + DepMineral_t + \mu_t \quad (5)$$

Where $y_t = LnY_t$ is growth rate in output, CO_{2t} is carbon dioxide emission, T_t represents temperature change, $DepNR_t$ is natural resource depletion measured using depletion of forest cover and $DepMineral_t$ is the depletion of mineral resources. This production function is an extension of the natural resources and land baseline model by Romer (2006, pp 38).

On the aggregate demand, capital accumulation occurs through consumption of goods and services in the economy. Therefore, it can be replaced by consumption. The estimated equation becomes:

$$y_t = \alpha_0 + \alpha_1 lnC_t + \alpha_2 CO_{2t} + \alpha_3 T_t + \alpha_4 DepNR_t + DepMineral_t + \mu_t \quad (6)$$

Where C_t represents household consumption. Agriculture sector has been recorded in various economic surveys of Kenya as the main contributor to GDP growth. Therefore, growth in crop production as well as growth in livestock production are included in the regression model. The regression model is:

$$y_t = \alpha_0 + \alpha_1 lnC_t + \alpha_2 CO_{2t} + \alpha_3 T_t + \alpha_4 DepNR_t + DepMineral_t + \alpha_5 Crop_t + \alpha_6 Livestock_t + \mu_t \quad (7)$$

Where Crop is growth in crop production and livestock represents growth in livestock production.

Dell et al. (2012) posits that temperature influences the level of output by affecting agricultural yields. It also influences an economy's ability to grow by affecting savings and investments. In the second set of regressions, Equation (6) is estimated by interchangeably replacing GDP growth as the dependent variable with crop production, livestock production, investment and savings.

Results and Discussion

This section presents the descriptive results of the variables, the correlation relationship between variables and the regression analysis.

Data and Descriptive Results

The dataset covers the period 1970 to 2020 defined by the availability of climate change data. The data on carbon dioxide damage, net forest depletion, mineral depletion and GDP growth are from World Bank's World Development Indicators (WDI) whilst data on growth in crop production,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

growth in livestock heads and temperature change are from Food and Agriculture Organisation (FAO) dataset. The descriptive statistics for the variables are presented in Table 1.

Table 1: Descriptive Statistics

Variables / Statistics	Mean	Standard Deviation	Median	Skewness	Kurtosis	Maximum	Minimum
CO_2 Damage	0.833	0.222	0.838	0.727	3.539	1.532	0.487
Temperature Change	0.526	0.418	0.51	0.364	2.440	1.498	-0.183
Net Forest Depletion	3.971	0.833	3.993	0.406	3.593	7.551	1.223
Mineral Depletion	0.010	0.020	0.003	3.226	14.254	0.108	0.000
Growth Crop Production	0.034	0.071	0.025	0.103	2.940	0.203	-0.130
Growth Livestock Production	0.0336	0.087	0.027	2.754	15.367	0.477	-0.111
GDP Growth	4.175	3.026	4.192	1.447	7.996	17.082	-0.799

NB: Kurtosis value <3 means distribution is Platykurtic, >3 is leptokurtic and a value =3 is mesokurtic

The average cost of carbon dioxide damage is 0.833 with a maximum of 1.532 and a minimum of 0.487. Temperature change has a mean of 0.526 with a maximum of 1.498 and a minimum of -0.183. The average forest depletion as a percentage of GDP is 3.971 with a maximum of 7.551 and a minimum of 1.223. The average growth in crop production is 0.034 whilst that of livestock production is 0.0336. The percentage change in GDP growth over the study period is 4.175 percent with a maximum of 17 percent recorded in 1972 (a time when the country experienced agriculture boom) and a minimum of -0.799 percent that was recorded in 1992 (a period of economic sanctions from World Bank and IMF). The year 1992 also marks the upsurge in CO_2 emissions that result from increased depletion of forest.

Correlation Analysis

The correlation analysis is presented in Table 2 and the results show no high correlations between the independent variables.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 2: Correlation Matrix

	GDP Growth	CO_2 Damage	Temperature Change	Forest Depletion	Mineral Depletion	Crop Production	Livestock Production
GDP Growth	1						
CO_2	-0.4145 (0.0031)	1					
Temperature Change	-0.0536 (0.7143)	0.2441 (0.0910)	1				
Forest Depletion	-0.2405 (0.0960)	0.2695 (0.0611)	-0.4984 (0.0003)	1			
Mineral Depletion	0.0662 (0.6512)	0.1284 (0.3791)	0.3545 (0.0125)	-0.2214 (0.1263)	1		
Crop Production	0.1560 (0.2843)	-0.2280 (0.1150)	-0.1232 (0.3989)	-0.1441 (0.3231)	0.0528 (0.7187)	1	
Livestock Production	0.1272 (0.3837)	-0.2059 (0.1559)	0.0387 (0.7919)	-0.1170 (0.4235)	0.0738 (0.6143)	0.0920 (0.5295)	1

The values in parenthesis are the *P*-values.

From the correlation analysis, GDP growth has a negative relationship with carbon dioxide damage, temperature change and forest depletion. Surprisingly, GDP growth has a weak positive relationship with crop production and livestock production. The correlation of GDP growth and temperature change along with forest depletion is very weak. Carbon dioxide damage also has a negative relationship with growth in crop production as well as growth in livestock production. Apparently, mineral depletion has a weak positive relationship with GDP growth.

Regression Analysis

Several regression models – with Newey-West Standard Errors – were estimated with different macroeconomic variables entering the regression model as dependent variables. Regression with Newey-West Standard Errors correct for autocorrelation in data. In fact, the results presented further down in Table 3 were similar to those analysed using heteroscedasticity consistent standard errors. In the first model (column 2), GDP per capita is the dependent variable and it is used as a proxy for economic development. In the second model, GDP growth enters as a dependent variable. The third and fourth models, whose results are presented in columns 4 and 5, use investments and savings as dependent variables, respectively. In the final models, the impact of climate change on crop and livestock production is estimated (using Equation 6) and these results are presented in columns 6 and 7 of Table 3.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Table 3: Regression Results of Climate Change, Natural Resource Depletion and Growth

Variables	GDP per Capita	GDP Growth	Investment	Savings	Crop Production	Livestock Production
CO_2 Damage	-0.176	-4.916	-2.088	-3.137	-0.050	-0.090
	(-3.65)***	(-2.96)***	(-6.73)***	(-5.10)***	(-0.75)	(-2.03)**
Temperature	-0.012	-0.529	0.559	0.496	-0.043	0.013
Change	(-0.42)	(-0.37)	(2.95)***	(1.68)*	(-1.19)	(0.38)
Net Forest	0.004	-0.340	-0.083	0.059	-0.009	-0.0003
Depletion	(0.56)	(0.66)	(-1.38)	(0.65)	(-0.83)	(-0.04)
Mineral	-0.807	15.677	1.265	-0.791	0.359	0.346
Depletion	(-2.21)**	(0.96)	(0.72)	(-0.28)	(0.67)	(0.31)
Growth Crop	-	1.610	-0.246	-0.004	-	-
Production		(0.24)	(-0.31)	(0.00)		
Growth	-	-	0.194	-0.267	-	-
Livestock			(0.60)	(-0.68)		
Production						
Household	0.213	-	-	-	0.008	-
Consumption	(9.01)***				(0.19)	
Constant	2.201	9.689	19.912	19.898	-0.052	0.100
	(4.06)***	(2.88)***	(63.07)***	(39.27)***	(-0.05)	(2.14)**
F	36.74)	3.58	15.04	5.83	1.20	1.40
	[0.000]	[0.0085]	[0.0000]	[0.0002]	[0.3271]	[0.2507]

The asterisks ***, **, and * represent significance at 1 percent, 5 percent and 10 percent, respectively. The values in parenthesis are the *t*-values whilst those in brackets are the *P*-values.

The results show that carbon dioxide emissions have a reducing effect on GDP per capita, GDP growth, investment, savings and crop production. A percentage increase in carbon dioxide reduces GDP per capita by 0.176 percent, GDP growth by 4.916 percent, investment by 2.088 percent, savings by 3.137 percent and livestock production by about 0.1 percent. The reduction of GDP by 4.9 percent slightly surpasses the projection by Simbanegavi and Arndt (2014) that climate change might cause a 4 percent loss of GDP in Africa; a continent that is hard hit by climate change. The net accumulation of carbon dioxide in the atmosphere is caused mainly by perhaps petrol powered trains, planes and motor vehicles together with greenhouse gases. This finding demonstrates the need to put up measures that reduce carbon dioxide emissions because of their resultant negative effect on the economy.

In being consistent with the study by Dell et al. (2012) and Duan et al. (2022), temperature change has a reducing effect on GDP growth. A $1^{o}C$ increase in temperature reduces Kenya's economic growth by about 0.53 percent. However, this temperature change has no discernible effect on economic growth given its insignificant nature. This insignificance contradicts the assertion by Dell et al. (2009) that temperature change only significantly reduces economic growth of poor countries but insignificantly reduces growth of developed countries. Perhaps the insignificance of temperature change on economic growth can be explained by the different climatic conditions in various regions of Kenya. Not all regions in Kenya are affected in the same way with warming. The Northern Region of the country, together with the Eastern side of Rift Valley are more affected with warming than the Western Region of the country. The Eastern side of the Rift Valley together with South Rift Region have recorded decreased forest cover and these

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

regions have embraced the use of greenhouses in addressing food insecurity. The Western part of Kenya together with the North Rift region boast of the Rain Forest and convectional rain from Lake Victoria. These regions are not affected by temperature change and are the food basket of the country.

Although studies by Mendelsohn (2008); Mendelsohn and Dinar (1999); and Kumar and Parikh (2001) show that climate change affects GDP growth through its effect on agriculture, this study found that climate change insignificantly reduces agriculture crop yield but significantly affects livestock production. In fact, during periods of drought, Kenya loses a lot of livestock due to lack of pasture for animals. The insignificance of climate change on crop production can be explained by the fact that the western highlands of the Rift Valley, which is the food basket of the country, typically records adequate rainfall for food production whilst the northern region, together with the eastern highlands of Rift Valley normally face severe drought.

Net depletion of forest has an interesting result although insignificant. It improves welfare which means that the depletion of forest goes towards economically benefiting those who trade in solid fuel (charcoal). Surprisingly it also improves savings. However, it has a negative effect on GDP growth, investment, crop production and livestock production.

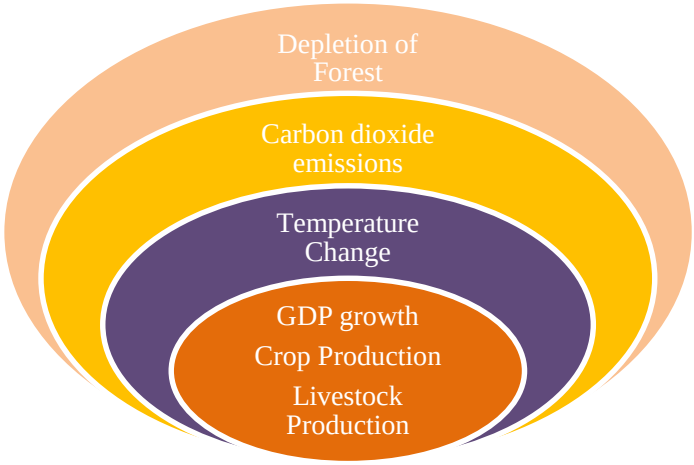

Fig. 5: Flow Chart of the Research Findings

Note: The flow chart is the author's elaboration of the research findings.

Conclusion

Climate change has become a thorn in the flesh for the world economy. It metamorphosises like a chameleon in the global arena. Using regression analysis with Newey-West standard errors, this study empirically investigated the impact of climate change and natural resource depletion on economic growth of Kenya. The inclusion of resource depletion is an important addition to the analysis of the impact of climate change on economic growth. The results show that carbon dioxide emissions are an important climate change variable that significantly affects economic growth and development of Kenya. It also affects investments, savings and livestock production.

Given the disruptive growth effect of carbon dioxide emissions, the use of renewable energy should be highly encouraged especially the wind generated energy and solar energy. Perhaps there is need for the government to impose carbon taxes as a measure of reducing carbon dioxide emissions from greenhouses. Alternatively, policies suggested by various climate change protocols for carbon premiums should be enforced in Kenya to compensate for greening the environment,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

especially regions with greenhouses. Additionally, measures should be put in place for greening urban cities as well as reduction of environmental damage through pollution should be the central pillar of green growth policy of Kenya.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Moderating Effect of Cost of Information Technology Adoption and Utilization on the Relationship Between Cost of Sugarcane and Food Production Among Farming Agribusinesses in Nyanza Region, Kenya

BenJack Otieno Ochieng,* Samuel O. Onyuma
Department of Commerce, Laikipia University, Kenya
*Corresponding Author

Abstract
Climate change has hampered the predictability of the weather patterns across the globe. This has occasioned lack of preparedness and better planning for coping and adaptability among farming agribusinesses. Inadequate farm output, low income and food insecurity are their outcome since drought and flood episodes are the dominant consequences of adverse climate change. Developing nations that have adopted and utilized information correctly such as India and Brazil have realized high yields and income through reduced costs of inputs, hence minimizing food insecurity. Although weather information is often disseminated to Kenyans and given the existing remarkable agricultural information dissemination channel through electronic media, Nyanza region still suffers from low agricultural output. It is unclear whether the problem is one of cost of adoptions and utilization of the media or it is the packaging of agricultural information. Literature is also scanty on how the cost of technology adoption and utilization moderates the relationship between sugarcane production costs and food production costs. Guided by the Cost Minimization Theory, this study used cross-sectional primary data collected from 317 sugarcane and food (maize) crop farmers selected through a multistage random sampling. Multinomial logit regression was used analyse any existing moderating effect within the study area. Findings show that only cost of technology adoption negatively and significantly influenced the cost of sugarcane production. Results further indicate that as a moderator, the cost of weather information adoption was not significant in influencing the factors of production in either maize or mixed production but was being absorbed negatively and significantly into the cost of land in sugarcane production. Since the adoption of agricultural information is usually hampered by a lack of logistics, downscaled information, and confidence, capacity-building of farmers must be mainstreamed. Hence, the need for extension services advocacy on the use of technology in agriculture.

Keywords: Cost of food production, cost of sugarcane production, information adoption, information utilization, multinomial logit regression

Introduction

Climate change is the protracted changes in temperatures and weather patterns over time (Human Rights Watch, 2023). The main causes of climatic change results from human activities or actions such as burning of coal, gas and oil. Emissions from these fossil fuels trap the heat from the sun resulting into high temperatures. When it happens, effects to humanity survival are dire since there emerges less or

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

no rainfall, food insecurity, famine, severe drought, urban displacements, flooding, air pollution, infrastructure destruction and injurious effects on health. Climate change is able to disorder food access, its availability as well as its quality especially when temperatures rise, precipitation patterns changes, drought emerges and also when weather events become extreme, (United States Environmental Protection Agency [EPA], 2023).

The Kenya Meteorological Department [KMD] (2020) has observed that such devastating effects from climatic changes, require proper adaptation and mitigation measures, given a bimodal seasonal rainfall pattern (short and long rains), agricultural production – a significant sector contributing to 26 percent of the Gross Domestic Product (GDP) and another 27 percent of GDP indirectly through linkages with other sectors – requires the long rains. Despite accessibility of early warning systems, information advances in science, data and technology; individuals, communities, governments, humanitarian organizations and international donor agencies, are reactive to climate change effects (Kenya Red Cross, 2020). Therefore, the provision of timely and accurate weather information can lower the susceptibility of farmers to climate change risks.

Given that climate change causes extreme weather patterns and drought, food security become doubtful. With information technology adoption and utilization, precision agriculture becomes a reality. Because sugarcane farming has a positive relationship to maize farming and such relationship is complementary (Wiggins et al., 2015), this study seek to establish whether information technology has an effect on this relationship from the perspective of the factors of production on both crops. These costs included the cost of technology gadget acquisition (adoption) and the cost of use (utilization) to acquire agricultural information on renting land, labour, planting, fertilizers, pesticides, seed(ling), transport, weather and machinery (Ochieng & Onyuma, 2023).

Information Communication and Technology (ICT) development has had significant relevance on individuals and families due to its incorporation into the family life and in work. This is because of their acquisition and ownership (adoption) and their subsequent use (utilization). Because of the importance of information technology adoption and utilization in agriculture, countries such as India and Bangladesh, who have adopted and utilized information, have seen remarkable improvements in their levels of income and yield; increasing by 15.2 percent and 15 percent respectively (Raj et al., 2011; UNCTAD, 2012). Although the levels of information channels in Kenya are incredible (KNBS, 2011), farming agribusinesses are still experiencing low productivity and grapples with limitations in management, technology as well as economic concerns (Mati & Thomas, 2019). Besides minimal studies on role of cost of information technology adoption and utilization in agricultural practices (Kwadwo & Mekonnen, 2012), it is not clear whether it is the cost of adoption or it is cost of utilization of information that is hindering agricultural information to increase agricultural production.

Adoption denotes the stage in an organization where a family or an individual selects a technology for use (Adeoye & Adeoye ,2010). From Bridges to Technology Corp (2005), technology adoption begins with the user becoming cognizant of the technology, and ends when the user embraces the technology and completely uses it. Anybody who embraces technology is likely to find innovative uses for it, replace it should it break and cannot envisage life without it. For any technology to be adopted, awareness must be produced and distributed through electronic media, radio and television (Nnadi et al., 2012). However, the absence of education, training and information will limit the level of technological adoption by farming agribusinesses especially in low-income countries (Springer, 2001; Wongsim et al., 2018). On the flipside, Akuegwu (2015) views technology utilization as the ability to use technological resources to achieve instructional

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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objectives in a given situation. In this study, information adoption and utilization involve the cost of acquisition and cost of use of television, internet, radios, geographical information services, computers and cell phones to acquire agricultural information meant towards increasing agricultural productivity.

Interest to study the cost of information adoption and utilization is based on the concept of utility theory that emphasizes on the need to have perfect information or full knowledge of all the relevant information for the theory to hold. Better still, adoption and utilization of information technology aid in precision agriculture (Agricultural Research Service [ARS], 2022). Satisfaction is often achieved when the marginal utilities are equal to the marginal rate of commodity substitution. This is only possible when marginal cost in the production process equals to the marginal revenue received from the sales per unit (Staff, 2016). Meanwhile, interest towards studying cost of sugarcane production and cost of food production stemmed from Wiggins et al. (2015) argument that sugarcane, an industrial crop, is complementary to food crops. Therefore, the system of organizing the factors of production between sugarcane and food crop production depends on the level of information at the behest of the farming agribusinesses (Riley, 2011).

This study was pegged on the cost minimization theory which states that the cost of a product is a combination of the cost of the physical output as well as the cost of the factor input that went into its production (Ebele & Nneamaka, 2018). Given that the focal point of this study targeted 2 products that can either be complementary or substitutes, the options at the behest of the farming agribusinesses greatly depend on the minimal cost of production and the profits that each output elicits. However, access to such costs depends on the information flow through information technologies.

Specifically, this study assessed how the costs of inputs varied between food production and sugarcane production on the assumption that cost was minimized through factor substitution and that the possibility of such substitution also depended upon the relative price level of the various factors. Based on the rationality of the household behaviour (Mausch et al., 2018), the general assumption was that there is a combination of both food production and sugarcane production that can be done simultaneously to make a farmer or society better off and beyond a certain point, any increase in the cost of sugarcane production led to a total shift towards food production and vice versa. Given this assumption, the study explored the role of information adoption and utilization to gauge whether such points can shift (moderate) because in the production possibility frontier, technology is always held constant while other factors of production are varied.

Literature Review

In the theory of production, a shift in the production possibility frontier is as a result of changes in the level of technology, influenced by the level of perfect information of the producer (Corporate Finance Institute[CFI], 2021). Information on improved technologies can only be availed to the farming agribusinesses (producers) through the information gadgets such as radios, televisions, mobile phones as well as computers (Alila & Atieno, 2006). Unless farmers adopt and make use of these technologies, they may therefore not be able to increase their agricultural productivity (Doss, 2006).

In context, this study views information adoption and utilization as a mixture of both soft and hardware and how they interact to permit the interchange, processing and control of knowledge and information through the use of radios, computers, televisions, cell phones, and the like (O'Farrell, 2015). In order to improve agricultural endeavours, there should be an improvement in

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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the use of computers, remote sensing, internet, cloud computing, GIS and GPS (Food and Agriculture Organization, 2016).

Incorporating information adoption and utilization in this study, was premised on the suggestion that the only way to address global challenge on food production is to adopt the digital or green revolution (Marke, 2014) to meet the ambitious food productivity targets. Marke, (2014) established that changes in climatic conditions, diminishing agricultural supply, increase in population, diminishing land and water supply coupled with changes in trade policies among the trading partners, are some of the major reasons why nations need to rethink their food production requirements. ICT penetration in Kenya, has expanded from 10 percent to 22 percent in 2017 and has contributed to 1.6 percent of GDP in 2018. Mobile phone adoption increased to 91 percent while penetration rate rose to 84 percent (Jumia, 2019). Given these statistics, Raj et al. (2011) observed that mobile phones intervention is capable of increasing the farmers' fortunes. The truism of this statement prompted the examination of the existence of the evidence on their moderating effect on the cost of sugarcane production and cost of maize production among farmers in Nyanza region in Kenya.

In China, Daoliang (2017) ascertained that provision of information serves to encourage the use of agricultural technology processing thus the provision of openings and platform for knowledge swapping among farmers. Besides, they also help in creating and promoting professional groups for agro-meteorological database development, livestock and crop modelling. While referencing Dike (2007), Gwang (2011) established those advances and globalization in technology in the 21st century helps in increasing the speeding and the exactness at which information is transferred, accessed, produced or even used in production. Besides, the author noticed that the use of information also elevates the position, the influence, the wealth and power of any given nation.

Abdul-Salam and Phimister (2015) studied the effect of information access efficiency on smallholder farming agribusinesses in Uganda. Their conclusion was that information access is significant in increasing agricultural productivity. However, Singh et al. (2019) observed that information is still lacking among farmers engaged in the production of vegetables and sugarcane in north-central India. As a result of this, most farmers still experience increase in costs of production given that they are still using the primitive equipment. However, with faster adoption and dissemination of new and improved technologies, sugarcane production can improve (Chauhan & Shanthy, 2021).

With changes in information technology in the agricultural sector, there may be improvements in the overall output in sugarcane production as well as food crop production. Ncoyini et al. (2022) observed that information relating to climate change are majorly used by the commercial sugarcane farming agribusinesses as opposed to the small scale farmers. According to Mileff (2015), computers alongside other telecommunication gadgets can be used in agriculture to store, retrieve, transmit or manipulate data in order to increase the level of efficiency in production. If information technologies are used well, then farming agribusinesses can make better decisions, plan better, realize agricultural breakthroughs and also improve community participation (IBID, 2015).

Similarly, myriad of challenges in the agricultural sector such as price fluctuations, deregulation of the agricultural market as well as volatility in the export market can be addressed through information use (Muriithi et al., 2009; Dobermann & Nelson, 2015). However, Jack and Tobias (2017) observed that information alone is not a cure to problems bedevilling farming agribusinesses. It is a means of helping agribusinesses to make informed decisions on agricultural

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

inputs, selection of the best practices as well as offer farmers a bargaining power when interacting with buyers-thus-transforming agricultural productivity. Kwadwo and Mekonnen (2012) also concluded that although very little has been done in terms of the impact of ICT in agriculture, its use in Africa has a potential of transforming the socio-economic environment.

Ali et al. (2016) studied the impact of ICTs on agricultural productivity in Kapiri Mposhi district of Central Province in Zambia. Using a multiple stage random sampling technique among 117 farmers as well as OLS method to generate results, it revealed that ICT usage was positive yet insignificant in affecting agricultural productivity. However, in the current paper, structural equation modelling (SEM)was applied to generate more robust results as opposed to ordinary least square (OLS)method of estimation. In addition, Raj et al. (2011) investigated the use of mobile phone short messaging service (SMS), voice call or web pages on the livelihoods of farmers in Nagapattinam district, Tamil Nadu state of India. They did this through customizing crop cultivation and nutrients management among the farmers. Their results showed that ICT use substantially reduced farmers' costs and also improved their farming practices. Compared to the control group, there was a 15.2 percent rise in income among the intervention group besides reduction of costs in terms of seeds, nutrient management, nursery preparation and weeding. Although their study focused on the pre-harvest stage, the current study focused on both pre-harvest and post-harvest stages.

In Kenya, apart from the traditional radio and television programmes that were used to disseminate information to farmers, other initiative such as 'Seeds4needs' was launched in 2009. This is an electronic farming method which was piloted in 2011 and used text messages to give advice to farmers on different hardy crop varieties, fertilizer use as well as crop management. The other available e-platform is the M-farm which has provided smallholder farmers with market pricing information through an SMS or mobile phone application. Since these initiatives began, only 5000 farmers have registered and the results have shown that farmers using them have realized a double rise in returns (Marke, 2014). However, the report noted that the adoption and utilization of such a technology can be low if no funds or resources are devoted to their implementation. The inclusion of information adoption and utilization that this study preferred was as a result of such e-platforms to gauge the platforms' level of use among farmers in Nyanza region.

Usman and Ahmad (2018) investigated the role of learning as a mediator in the relationship between social capital and the adoption of best crop management practices among farmers in Pakistan. This investigation was done on small scale farmers and a structural equation modelling as well as bootstrapping was used to test these relationships. From the results, it was evidenced that explorative and exploitative learning directly acted as mediators between social capital and adoption of best crop management practices but did not moderate between social capital and adoption of best crop management practices. According to IBID (2018), exploitative learning inferred the refinery of the existing practices, processes, products, technologies and competencies without changing their nature while explorative learning involved the search and experimentation of the existing practices, processes, products, technologies and competencies. Although this study adopted a similar methodology to that of IBID (2018), the point of divergence was that the current study investigated the costs related to the search for this knowledge. Besides, these costs were investigated against costs of two competing agricultural outputs.

Wang et al. (2018) examined how farmers' application of pesticides are influenced by the market returns and external pressure in China. They also investigated the moderating role of information acquisition into this mix. While using a multistage sampling method among 986

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

farmers, a hierarchical regression analysis was conducted to test the hypothesis. Their results indicated that there was a positive and significant effect on market returns, pesticide application and information acquisition. Similarly, there was also a positive effect between external pressure and application of information on pesticide acquisition. Although information acquisition and its moderating ability were investigated by Wang et al. (2018), this current study examined the cost of acquisition and the cost of utilization. Besides investigating how this information was used in the application of pesticides, an extension was done to cover other phenomena in agricultural production such as marketing and labour choices among others.

Ismail et al. (n.d) investigated the effect of economic indicators on agricultural productivity and the moderating role of support policies. Their main interest was to establish the relationship between agricultural input and output and the clear determinants of agricultural growth. This study was conducted in Malaysia and the ASEAN countries. The economic indicators investigated were the physical and human capital used in agriculture while support policies were proxied by farmer training, research and development as well as fertilizer subsidy. In their results, it emerged that support policy positively moderated the relationship between physical capital and agricultural productivity. Similarly, support policy also moderated the positive relationship between human capital and agricultural productivity. They recommended that future research should be done using primary data. They further recommended the inclusion of other variables that enhance agricultural productivity such as technology and innovations. Based on their recommendations, the current study incorporated primary data and investigated the moderating effect of cost of information adoption and utilization on the cost of sugarcane and maize crop production.

Methodology

This study was conducted in 3 agricultural areas (Kisumu, Homabay and Migori) of Nyanza region in Kenya. It adopted the correlational research design to determine the moderating effect of cost of information adoption and utilization on the relationship between the cost of sugarcane and food (maize) production. After assessing the mentioned crops separately, the study was amplified to cover the cost of mixed production. A multistage random sampling was adopted to select 317 farming households (both sugarcane and maize crop) who had an experience spanning above 5 years. Data collected through questionnaires were tested for heteroscedasticy, content validity and reliability using Levene's test, experts' opinion and Cronbach's alpha, respectively.

Through multinomial logit, farmer-type was coded as follows: 'Sugarcane only' farming was coded (1), mixed farming was coded (2) while 'maize only' farming was coded (3). Given the 3 farmer types, cost estimates were considered separately for the 3 outputs. The functional form of the equation without cost of adoption or cost of utilization was conceptualized in Equation 1:

$$\ln TC_{(S_i,F_i)} = \delta_0 + \delta_1 \sum_{(f,s)=1}^{n} \ln(L_{fi} + L_{si}) + \delta_2 \sum_{(f,s)=1}^{n} \ln(K_{fi} + K_{si}) + \delta_3 \sum_{(f,s)=1}^{n} \ln(D_{fi} + D_{si}) + u_{(f,s)i} \ldots\ldots(1)$$

Where;

$\ln TC_{(S_i,F_i)}$ = The total cost of sugarcane and maize crops production per yield from an individual farming agribusiness;

$\ln(L_{fi} + L_{si})$ = The overall labour cost in sugarcane and maize crops production;

$\ln(K_{fi} + K_{si})$ = The overall cost of capital in sugarcane and maize crop production;

$\ln(D_{fi} + D_{si})$ = The overall cost of land in sugarcane and maize crop production;

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

$\delta_1, \delta_{2,} \delta_3$ = The coefficients of costs of labour (wages), capital (input costs) and land (rents/purchase price) used in sugarcane production and maize production respectively;

$u_{(f,s)i} \sim N(0, \sigma^2{}_{u(f,s)})$ = The error term;

fi = Individual maize farming agribusiness;

si = Individual sugarcane farming agribusiness.

$fi + si$ = Mixed farming agribusiness

From Equation 1, in the absence of sugarcane, the cost is zero and vice versa. However, in the case of mixed production, the cost of sugarcane or maize crop production are added together. Operationalization of cost of information adoption and utilization as a moderator on the cost of sugarcane production and cost of maize production was done in 3 phases.

In the 1st phase, cost of information 'adoption only' was considered. The functional equation with cost of adoption was given by equation (2) whereas the functional with cost of information adoption introduced as a moderator transformed Equation 2 into Equation 3.

$$\ln TC_{(S,F)i} = \delta_0 + \delta_1 \sum_{(f,s)=1}^{n} \ln W_i + \delta_2 \sum_{(f,s)=1}^{n} \ln X_i + \delta_3 \sum_{(f,s)=1}^{n} \ln Y_i + \delta_4 \sum_{(f,s)=1}^{n} \ln A_i + v_{(f,s)i} \quad \ldots\ldots(2)$$

$$\ln TC_{(S,F)i} = \delta_0 + \delta_1 \sum_{(f,s)=1}^{n} \ln W_i + \delta_2 \sum_{(f,s)=1}^{n} \ln X_i + \delta_3 \sum_{(f,s)=1}^{n} \ln Y_i + \delta_4 \sum_{(f,s)=1}^{n} \ln A_i + \delta_5 \sum_{(f,s)=1}^{n} \ln(WA)_{i(s,f)}) +$$

$$\delta_6 \sum_{(f,s)=1}^{n} \ln(XA)_{i(s,f)} + \delta_7 \sum_{(f,s)=1}^{n} \ln(YA)_{i(s,f)} + v_{i(f,s)} \quad \ldots\ldots(3)$$

Where;

$\ln TC_{(s,f)i}$ = The total cost of sugarcane and maize crop production

$W_i = (L_{fi} + L_{si})$ = The sum of costs of labour used in maize production and in sugarcane production;

$X_i = (K_{fi} + K_{si})$ =The sum of cost of capital used in maize production and in sugarcane production;

$Y_i = (D_{fi} + D_{si})$ = The sum of cost of land used maize production and in sugarcane production

$L_{fi}; K_{fi}; D_{fi}$ = The cost of labour, cost of capital and cost of land on maize production;

$L_{si}; K_{si}; D_{si}$ = The cost of labour, cost of capital and cost of land on sugarcane production;

A = Cost of information adoption;

$(WA)_i$ = The cost of labour times the cost of information adoption used in sugarcane and maize production

$(XA)_i$ = The cost of capital times the cost of information adoption used in sugarcane and maize production;

$(YA)_i$ = The cost of land times the cost of information adoption used in sugarcane and maize production.

fi = Individual maize crop farming agribusiness;

si = Individual sugarcane farming agribusiness.

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$fi + si$ = Mixed farming agribusiness.

In the 2nd phase, the effect of cost of 'utilization' only was introduced into equation (1) thereby transforming it into a functional relationship as depicted by equation (4) below:

$$\ln TC_{(S,F)} = \delta_0 + \delta_{1i}\sum_{(f,s)=1}^{n}\ln W_i + \delta_{2i}\sum_{(f,s)=1}^{n}\ln X_i + \delta_{3i}\sum_{(f,s)=1}^{n}\ln Y_i + \delta_{4i}\sum_{(f,s)=1}^{n}\ln U_i + \mu_{(f,s)} \quad \ldots\ldots(4)$$

By injecting the cost of information as a mediator in Equation 4, the new functional relationship was given by Equation 5.

$$\ln TC_{(S,F)i} = \delta_0 + \delta_{1i}\sum_{(f,s)=1}^{n}\ln W_i + \delta_{2i}\sum_{(f,s)=1}^{n}\ln X_i + \delta_{3i}\sum_{(f,s)=1}^{n}\ln Y_i + \delta_{4i}\sum_{(f,s)=1}^{n}\ln U_i + \delta_{5i}\sum_{(f,s)=1}^{n}\ln(WU)_{i(s,f)}) +$$

$$\delta_{6i}\sum_{(f,s)=1}^{n}\ln(XU)_{i(s,f)} + \delta_{7i}\sum_{(f,s)=1}^{n}\ln(YU)_{i(s,f)} + v_{i(f,s)} \quad \ldots\ldots(5)$$

Where;

$W_i = (L_{fi} + L_{si})$ = The sum of costs of labour used in maize production and in sugarcane production;

$X_i = (K_{fi} + K_{si})$ =The sum of cost of capital used in maize production and in sugarcane production;

$Y_i = (D_{fi} + D_{si})$ = The sum of cost of land used maize production and in sugarcane production

$L_{fi}; K_{fi}; D_{fi}$ = The cost of labour, cost of capital and cost of land on maize production;

$L_{si}; K_{si}; D_{si}$ = The cost of labour, cost of capital and cost of land on sugarcane production;

U = Cost of information utilization

$\ln TC_{(S,F)i}$ = The farming agribusiness' total cost of production (either as a sugarcane farming agribusiness or maize crop farming agribusiness)

$(WU)_i$ = The cost of labour times the cost of information utilization used in sugarcane and maize production

$(XU)_i$ = The cost of capital times the cost of information utilization used in sugarcane and maize production

$(YU)_i$ = The cost of land times the cost of information utilization used in sugarcane and maize production

fi = Individual maize crop farming agribusiness;

si = Individual Sugarcane farming agribusiness.

$fi + si$ = Mixed farming agribusiness

In the 3rd phase, summation of the cost of adoption and the cost of utilization was generated. Used as a combined figure, and introduced into Equation 1, the equation transformed into Equation 6 as follows:

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$$\ln TC_{i(S,F)} = \delta_0 + \delta_{1i}\sum_{(f,s)=1}^{n}\ln W_i + \delta_{2i}\sum_{(f,s)=1}^{n}\ln X_i + \delta_{3i}\sum_{(f,s)=1}^{n}\ln Y_i + \delta_{4i}\sum_{(f,s)=1}^{n}\ln(AU)_i + \delta_{5i}\sum_{(f,s)=1}^{n}\ln(WAU)_{i(s,f)} +$$

$$\delta_{6i}\sum_{(f,s)=1}^{n}\ln(XAU)_{i(s,f)} + \delta_{7i}\sum_{(f,s)=1}^{n}\ln(YAU)_{i(s,f)} + v_{i(f,s)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where:

$W_i = (L_{fi} + L_{si})$ = The sum of costs of labour used in maize production and in sugarcane production;

$X_i = (K_{fi} + K_{si})$ =The sum of cost of capital used in maize production and in sugarcane production;

$Y_i = (D_{fi} + D_{si})$ = The sum of cost of land used maize production and in sugarcane production

$L_{fi}; K_{fi}; D_{fi}$ = The cost of labour, cost of capital and cost of land on maize production;

$L_{si}; K_{si}; D_{si}$ = The cost of labour, cost of capital and cost of land on sugarcane production;

$\ln TC_{(S,F)i}$ = The farming agribusinesses' total cost of production (either as a sugarcane farming agribusiness or maize crop farming agribusiness, or both)

δ_0 = The cost efficiency in production

$\delta_{1i}, \delta_{2i}, \delta_{3i}, \delta_{4i}$ = The coefficients of the main effect of labour, capital, land and information adoption on sugarcane production and maize production respectively;

$\delta_{5i}, \delta_{6i}, \delta_{7i}$ = The coefficients of the moderating effect of information adoption and utilization on the labour, capital and land constructs.

AU = The summation of the cost of information adoption and the cost of information utilization.

$(WAU)_i$ = The cost of labour times the cost of information adoption and utilization used in sugarcane and maize production

$(XAU)_i$ = The cost of capital times the cost of information adoption and utilization used in sugarcane and maize production

$(YAU)_i$ = The cost of land times the cost of information adoption and utilization used in sugarcane and maize production

fi = Individual maize crop farming agribusiness;

si = Individual Sugarcane farming agribusiness.

$fi + si$ = Mixed farming agribusiness

Results and Discussion

The constructs on the cost of adoption, cost of utilization, cost of sugarcane and cost of maize production were tested for their correlation and the results captured in Table 1.

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Table 1: Correlations Matrix of the Main Study Variables

		Total sugarcane cost	Total maize cost	Adoption cost	Utilization cost
Total sugarcane cost	P.Correl	1			
	Sig. (2-tailed)				
Total maize cost	P.Correl	.143*	1		
	Sig. (2-tailed)	.011			
Adoption cost	P.Correl	-.238**	-.025	1	
	Sig. (2-tailed)	.000	.662		
Utilization cost	P.Correl	.055	-.080	.321**	1
	Sig. (2-tailed)	.332	.156	.000	

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

In Table 1, there was a weak significant positive correlation between the cost of sugarcane production and cost of maize production ($r = 0.143$; $p = 0.011$). Similarly, there was a significant but weak negative association between cost of sugarcane production and cost of information adoption ($r = -0.238$; $p = 0.000$). However, there was an insignificant positive correlation between cost of information utilization and cost of sugarcane production. This agreed with (Chauhan & Shanthy, 2021) who also acknowledged a positive relationship. Furthermore, the cost of adoption was significant and positively correlated with the cost of information utilization ($r = 0.321$; $p = 0.000$). However, the degree of association was somewhat weak.

Effect of Cost of Information Adoption

Investigations on the role of cost of information adoption and utilization on cost of sugarcane production and on cost of maize production was conducted using a three-prong approach shown by equation (3, 5 and 6) and adopted a Stochastic Frontier Analysis (SFA). The first part of the analysis investigated the effect of cost of information adoption on the cost of maize production, cost of sugarcane production and cost of mixed production before the effect of the cost of information adoption and utilization was investigated for its moderation effect. The result showed that the cost of information adoption as an exogenous variable enters into the cost of maize production; cost of sugarcane production and on the cost of mixed production captured in Table 2.

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Table 2: Effect of Cost of Information Adoption

Panel 1: Cost of Information Adoption as a Variable in Pure Maize Crop Production				
Log likelihood = 67.0575				
lnoutputfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	4543.16			0.000
lnlandfd	.401	.029	13.92	0.000
lnlabourfd	.175	.023	7.72	0.000
lncapitalfd	.434	.016	27.10	0.000
lntcoa	-.013	.010	-1.35	0.177
Cons	1.128	.171	6.59	0.000
Panel 2: Information Adoption as a Variable in Pure Sugarcane Production				
Log likelihood = 24.4985				
lnoutputsc	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	8126.34			0.000
lnlandsc	.294	.034	8.65	0.000
lnlaboursc	.194	.058	3.36	0.001
lncapitalsc	.471	.034	13.73	0.000
lntcoasc	-.260	.090	-2.88	0.004
cons	4.357	1.073	4.06	0.000
Panel 3: Information Adoption as a Variable in Mixed Production				
Log likelihood = 5.8069				
lnoutputscfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	789.30			0.000
lnlandscfd	.089	.029	3.04	0.002
lnlabourscfd	.347	.027	13.06	0.000
lncapitalscfd	.529	.027	19.73	0.000
lntcoa	-.020	.019	-1.04	0.297
cons	1.829	.366	4.99	0.000

From Table 2, results indicate that the cost of information technology adoption negatively and significantly influenced the cost of sugarcane production $(\alpha_4 = -0.260; p = 0.004)$. This implies that the level of responsiveness of cost of sugarcane production to variations in the cost of information technology adoption was inelastic, negative and significant; that is, as the cost of information adoption changes by a given proportion, the cost of sugarcane production changes negatively but by less than the proportionate increase in the cost of information adoption. This is in consonance with (Singh, et al., 2019) who also discovered that there was low adoption of information technology in India consequently resulting into high cost of sugarcane production. On maize production and mixed production, the effect was insignificant.

Moderating Effect of Cost of Information Adoption

The cost of information adoption was introduced into the cost of maize, sugarcane and mixed production together with a moderator and the results summarized in Table 3.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 3: Moderation Effect of Cost of Information Adoption

Panel 1: Moderation Effect of Cost of Information Adoption in Maize Production				
Log likelihood = 67.0571				
lnoutputfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	4553.58			0.000
lnlandfd	.414	.029	14.33	0.000
lnlabourfd	.175	.023	7.73	0.000
lncapitalfd	.434	.016	27.13	0.000
lnlandfdtcoa	-.013	.010	-1.35	0.177
cons	1.128	.174	6.50	0.000
Panel 2: Information Adoption as a Moderator in Sugarcane Production				
Log likelihood = 24.4985				
lnoutputsc	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	8127.18			0.000
lnlandsc	.554	.105	5.27	0.000
lnlaboursc	.194	.058	3.36	0.001
lncapitalsc	.471	.034	13.73	0.000
lnlandtcoasc	-.260	.090	-2.88	0.004
cons	4.357	1.073	4.06	0.000
Panel 3: Information Adoption as a Moderator in Mixed Production				
Log likelihood = 5.8069				
lnoutputscfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	789.30			0.000
lnlandscfd	.109	.035	3.07	0.002
lnlabourscfd	.347	.027	13.06	0.000
lncapitalscfd	.529	.027	19.73	0.000
lnlandscfdtcoa	-.020	.019	-1.04	0.297
cons	1.829	.366	4.99	0.000

From Table 3, the introduction of the cost of information adoption is not significant in influencing the factors of production in either maize or mixed production but is being absorbed into the cost of land in sugarcane production. However, the coefficient on cost of land in sugarcane production is negative and significant $(\alpha_4 = -0.260; p = 0.004)$. Given this, the amplification of the cost of land affected the cost of sugarcane production negatively; that is, the level of responsiveness to sugarcane production due to variations in the moderated cost of land was inelastic, negative and significant.

This result corroborates findings by Ncoyini et al. (2022) which suggests that agricultural information adoption could be interacting with other input factors in influencing the production cost of sugarcane in South Africa, and that inaccessibility of climate information sources and lack of capacity to respond to the provided information greatly hinders also the access to and the use of climate information. In addition, introduced as a moderator into the cost of maize, sugarcane and mixed production, the moderating effect of cost of information utilization is summarized in the Table 4.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Table 4: Moderating Effect of Cost of Information Utilization on the Cost of Maize, Sugarcane and Mixed Production

Panel 1: Cost of Information Utilization as a Moderator in Maize Production				
Log likelihood =	67.2009			
lnoutputfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	4575.28			0.000
lnlandfd	.420	.030	14.20	0.000
lnlabourfd	.172	.022	7.70	0.000
lncapitalfd	.435	.016	27.20	0.000
lnlandfdtcou	-.015	.010	-1.46	0.144
cons	1.116	.169	6.59	0.000
Panel 2: Cost of Information Utilization as a Moderator in Sugarcane Production				
Log likelihood =	21.4247			
lnoutputsc	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	4863.43		0.000	
lnlandsc	.265	.042	6.26	0.000
lnlaboursc	.310	.054	5.78	0.000
lncapitalsc	.404	.032	12.48	0.000
lnlandtcousc	.006	.015	0.42	0.677
cons	1.250	.259	4.83	0.000
Panel 3: Cost of Information Utilization as a Variable in Mixed Production				
Log likelihood =	5.7055			
lnoutputscfd	Coef.	Std. Err.	z	P>|z|
Wald	787.05			0.000
lnlandscfd	.106	.035	3.03	0.002
lnlabourscfd	.342	.026	13.02	0.000
lncapitalscfd	.532	.027	19.82	0.000
lnlandscfdtcou	-.018	.019	-0.93	0.350
cons	1.803	.364	4.95	0.000

From Table 4, results indicate that the cost of information utilization neither moderates the cost of input factors in maize and sugarcane nor mixed production.

Moderating Effect of Cost of Adoption and Cost of Utilization on Cost of Maize, Sugarcane and Mixed Production

The results upon the introduction of the cost of information adoption and cost of utilization as a moderator into the cost of maize, sugarcane and mixed production are summarized in the Table 5.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Table 5: Moderating Effect of Cost of Adoption and Cost of Utilization on Cost of Maize, Sugarcane and Mixed Production

Panel 1: Moderating Effect of Cost of Utilization and Adoption on Maize Production				
Log likelihood =	67.4728			
lnoutputfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	4603.30			0.000
lnlandfd	.420	.029	14.26	0.000
lnlabourfd	.175	.023	7.75	0.000
lncapitalfd	.435	.016	27.29	0.000
lnlandfdtcou	-.011	.012	-0.91	0.360
lnlandfdtcoa	-.008	.011	-0.74	0.460
cons	1.158	.173	6.68	0.000
Panel 2: Moderating Effect of Cost of Adoption and Utilization on Sugarcane Production				
Log likelihood =	36.0084			
lnoutputsc	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	22153.70			0.000
lnlandsc	.386	.064	6.00	0.000
lnlaboursc	.280	.023	11.97	0.000
lncapitalsc	.377	.019	20.26	0.000
landtcousc	-5.51e-10	2.37e-10	-2.33	0.020
labourtcousc	8.66e-11	1.92e-10	0.45	0.653
capitaltcousc	5.45e-10	8.24e-11	6.62	0.000
lnlandtcoasc	-.088	.067	-1.32	0.187
cons	2.536355	.777	3.27	0.001
Panel 3: Moderation Effect of Cost of Adoption and Utilization on Mixed Production				
Log likelihood =	5.9627			
lnoutputscfd	Coef.	Std. Err.	z	P>|z|
Wald Chi 2(4)	788.80			0.000
lnlandscfd	.101	.036	2.81	0.005
lnlabourscfd	.345	.027	12.95	0.000
lncapitalscfd	.545	.033	16.72	0.000
lncapitalscfdtcoa	-.015	.021	-0.72	0.472
lnlandscfdtcou	-.012	.021	-0.56	0.577
cons	1.874	.376	4.99	0.000

From Table 5, the effect of cost of information adoption as a moderator was not significant in influencing the factors of production in either maize or mixed production but was being absorbed into the cost of land in sugarcane production.

Conclusion and Recommendation

On one hand, this study has found that the cost of information adoption negatively and significantly moderates the cost of land in sugarcane production. On the other hand, the cost of information utilization has no statistically significant effect on the input factors in maize, sugarcane or mixed production. When combined together, the total cost of information adoption and utilization has no

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

statistically significant effect on the factor inputs in maize, sugarcane or mixed production. This study, therefore, concludes that the cost of information adoption only acts to curtail the resources meant to acquire more land for sugarcane production. Even so, farming agribusinesses still undermine the kind and amount of information they can get through the various information gadgets, explaining the lethargy in their use.

It can, therefore, be concluded that information adoption, as opposed to information utilization, had a statistically significant effect on the cost of land in sugarcane production in the study area. Since the adoption of information is usually hampered by a lack of logistics, downscaled information, and confidence; capacity-building of the farming agribusinesses must be mainstreamed in order to promote efficient adoption and strengthening of information services for use by farming agribusinesses in the study area. Therefore, a lot of physical extension services and advocacy on use of technology to acquire agricultural information is required within the Nyanza region, if agricultural output is to be increased and input costs minimized.

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Role of Communication and Public Participation in Provision of Health, Food Security and Water Security in Kenya

Gertrude Musuruve Inimah,* Vincent Indasi Inimah
Jomo Kenyatta University of Agriculture and Technology, Kenya
*Corresponding Author

Abstract
Climate change refers to significant, long-term changes in the global climate. The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and savannas, and everything people do as well. This paper discusses climate change and the effects it posits. The paper specifically looks at food security, water security and health which are sustainable development goals 2, 6 and 3 respectively. This paper therefore argues that communication and public participation are independent variables and key players in ensuring people have needed information that may translate to the provision of food security, water security and health, all of which are dependent variables. The paper makes use of the media framing theory in bringing out pictures as a media communication strategy in explaining the adverse effects of climate change in order to call for intended action. The sustainable development goals discussed in this paper are among the socio-economic rights of every person as stipulated in article 43 of the Constitution of Kenya 2010. The constitution of Kenya 2010 allows for communication and public participation. The constitution of Kenya gives provision for public participation and leaders in Kenya need to give room for people to give their input in making key decisions on sustainable ways of dealing with climate change. Policies and key decisions that have stakeholders' input are more sustainable and pragmatic in implementation. The paper concludes by giving viable suggestions on how everyone can be involved in the conversation of climate change in order to make the environment and the world a better place to live in.

Keywords: Climate change, communication, Constitution of Kenya, public participation, sustainable development goals

Introduction

Climate change is a shift in the weather patterns, for instance, it may get too hot, too rainy, or too cold. The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and savannas as well as human activities. The climate of a place is reflected in different weather change. Sometimes it may be rainy, hot, cold and at other times, the rain can be so intense that it may cause havoc to human beings and plants. Other times it might be too hot for a long period of time and this may affect crops negatively. Whatever the case, public participation and communicating to the public in advance about weather changes is paramount in ensuring that people are weather informed for readiness in development matters or adjusting accordingly.

Shifts in climate change can be natural or manmade. Activities that man engages in day by day can be one of the major causes of climate change. For instance, deforestation happens in many parts of the world for different reasons. Harvesting trees for purpose of making charcoal and other

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

types of fuel typically reduces the number of trees. Harvesting trees can also be done in order to extract timber for multipurpose, for instance timber for constructing houses. Most houses are made of timber roofing glazed with iron sheets. Furniture such as seats, beds, stools are mainly made out of timber. When we consider the commercialization of timber and being a factor of production, it becomes overwhelmingly clear that timber harvesting is likely to happen. Where trees are harvested and not replaced, the land becomes bare and vulnerable to soil erosion during heavy downpour. Soil erosion is a big challenge to healthy farming.

Before discussing communication strategies in climate change conversation, this paper presents some data that gives a glimpse on the effects of climate change and hence justification for intervention by relevant authorities. Water security refers to a society's capacity to have enough water of sufficient quality for survival and to carry out different productive activities. The society is therefore in a position to reduce poverty and improve living conditions in a situation where there is sufficient water. The water security governance data helps to assess the performance of service delivery systems as they work toward the UHC targets and the SDGs. Proper water security management enhances enhance a multiplier effect to possibility of addressing effectively the issue of food security.

The United Nations Development programme (1998) gave summarised scientific audits that showed the state of the planet by then.20 countries suffered from water stress, having less than 1000 m3 per capita per year, and total water availability having dropped from 17000 to 7000 m3 per capita per year. This evidence had accumulated over the past 20 years, with acid rain damaging 60% percent of Europe's commercial forests and reducing crop yields by 25 percent in East Asia. There were 500 million people living on marginal lands which could not feed them; overfishing leading to lack of adequate fish protein; fast extinction of wild species, 50-100 times; and falling of world forest drastically.

A population consisting of 30 percent in developing countries lacked access to safe drinking water and 2 million died yearly from associated diseases; 90 percent of all wastewater was untreated in the developing countries. Nearly 30 percent of domestic solid waste was uncollected in third world cities. The mangrove swamps were not spared either and the world economic activity grew by 3 percent per year since 1950; and thus, would require a second planet to accommodate it if ecological burdens remain the same. To add trouble to water security, there was the issue of 2.2 million people who died every year from indoor pollution, mostly in rural areas. There was air pollution from cars and industrial exhausts.

Crosson (1997) states that about 500 children per day died because of lack of food, water, sanitation and basic healthcare. About 900 million people lived in circumstances where established means of producing food, gathering fuelwood and accessing clean water were no longer sufficient for bare subsistence basic level. Some 15 million people had been displaced from their homelands and there was loss of protective soil cover together with forest cover. This scenario was estimated to be summarised by land degradation annual loss of productivity at 0.1 percent and cumulative loss of around 4.5 percent since 1945.The population was growing rapidly, there was compulsory migration and landlessness were forced people to move. Omboto and Arogo (2013) on the dynamics of water resource management for socio-economic development in Kenya found that one major factor constraining access to water resource management information was attributed to low economic status. They noted that ways of enhancing water resource information in Kericho and Uasin Gishu Districts was mostly through education at 44.8 percent and 34.8 percent respectively.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Malabo (2018) states that climate change has caused extended droughts and increased erratic rainfall in Africa. The author further states that 62 percent of Africa's crops are currently rain-fed. The climate smart initiative seeks to improve the productivity of the country's farmers by providing access to water year-round. Price (2019) states that farmer production of smallholders increased by up to 75 percent in Mozambique as a result of bolstering their climate resilience with the establishment of irrigation and storage infrastructure; the Baixo Limpopo climate resilience pilot project (BLCRPP). South Africa has committed to increase the area of irrigated land by 50 percent over the next 10 to 20 years. This policy has already supported 32,000 smallholders to irrigate their fields.

Effects of Climate Change on Food Security

Changes in the climate and increases in extreme weather events are among the reasons behind a global rise in hunger and poor nutrition. Fisheries, crops, and livestock may be destroyed or become less productive. In many parts of the world including Kenya, farmers since time immemorial are able to predict when the heavy rains begin, short rains begin and the long dry spell seasons. For this matter, they prepare their lands accordingly so that when the rains are descending on the land, this find when farmers have tilled the land and planted their seeds. Farmers also are able to predict the appropriate time to weed their land and when to harvest. In some parts of Kenya like Vihiga and Kakamega, farmers are able to plant maize twice a year. This being the case, farmers can make a decision on which harvest to sell and meet their daily needs as well as other needs. They can also decide which harvest to store for family future use. In other parts of the country farmers are able to plant and harvest maize only once a year.

Currently, farmer predictions are no longer reliable because of the adverse climate change. The abrupt climate change has led to farmers wasting a lot of time, energy and capital on their land thus being disappointed and frustrated. It is therefore important for farmers to get appropriate information when the rains are about or if there are going to be any delays. Poor prediction of rains by farmers have led to great losses. A point in case; farmers in Lugari experienced frustration when they prepared their land anticipating that the rains would pour as usual. Some farmers planted their seeds only to be disappointed when there were no drops of rain for about three weeks. This had financial implications in that farmers had to replant when the seeds they earlier planted did not germinate.

How then can public participation be used to ameliorate such situations? Having farmers' associations in the counties and calling farmers for periodic meetings concerning weather forecasting can go a long way in ensuring that farmers are adequately prepared. Such meetings if well-coordinated can help in getting farmers talk about their fears, frustrations as well as thoughts. County governments need to have field officers working together with meteorologists in ensuring appropriate information is disseminated to farmers. During these meetings, farmers can be sensitized on food security and ways of diversifying in farming in order to have adequate food for their household(s).

Apart from the above scenario where farmers are uncertain of when to plant and harvest because of change in climate, many parts of the country witness the havoc that floods bring forth as a result of climate change. Sometimes people's houses and land are flooded and they are displaced. Displacement of families during such times have psychological distress on different family members. For instance, school children in affected areas are not able to go to school normally like their peers. Also, parents or household providers go through psychological distress especially when they are not able to provide for their families. People with disabilities in such

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

areas are more affected than everyone else, for instance, the visually impaired may not be able to see their way through. The wheelchair and crutch users may not be able to wade in the deep waters. The crawling persons may experience intense hardships and may be left to fate. Other than houses, there are instances when vehicles veer off the road and sink with people. In some cases, people die, others are brutally injured, and others acquire a disability. Some of these cases can be prevented when public participation is carried out before the heavy rains. People know too well the black spots and it is possible for county governments to get views from stakeholders on preventive measures, for instance, where to erect water drainage; which flood prone areas where people should be alerted to shift or helped to shift before the long rains and the floods. Public participation can also foretell which places need water harvesting, for instance, in social institutions and how this can be achieved for the common good of everyone else.

Climate Change Interventions and the Social Learning Theory

Climate change conversations need to be everyone's conversation and especially in the developing countries because the effects are intense and are profoundly life threatening. One person cannot be effective in climate change but everyone can make a significant impact. Involvement of everyone needs to begin from the school level, community and all the way to the national level. The social learning theory can be used to explain this intervention.

According to the theory, which was proposed by a psychologist, Albert Bandura, people can learn from each other through observation, imitation and modelling. In the context of this paper then, an inference can be made that for man-made climate change interventions, various social interaction platforms can be used to create awareness, sensitize people and have people seeing, observing and practically getting involved in environmental conservation measures. Some of the social interaction sessions may involve schools, clubs, colleges, churches, community and national functions among many others. The ensuing discourse gives some ways in which climate change may be done to involve everyone.

Involving children in climate change can begin as early as possible. For instance, the culture of tree planting can be introduced and nurtured in the learners during their formative years. This is because during the formative years, children's development occurs based on the child's response and the interaction between genetics, environment and experience. Planting of trees needs to be introduced in schools from an early age. As part of conserving the environment, tree planting can be taught as a topic in environment studies. Learners learn best through observation. For instance, in Kenya, the Competency Based Curriculum (CBC) can be used to engage learners in practical sessions that seek to conserve the environment. Practicals may involve learners being given time to plant trees, water trees until they are fully grown. They can also be taught practically on digging trenches to avoid floods.

County governments can be a great stakeholder in making climate change interventions in local areas. For instance, every county government needs to have an environment department with key objectives of addressing climate change issues. This department needs to also have a core department that is fully funded and charged to deal with communication, public participation and environmental conservation. Officers working in this department need to reach out to people and do sensitization on water harvesting, planting trees digging trenches. It is usually the case that when heavy rains set in, most people are ill prepared for the rains and instead of rains becoming a blessing, they cause a lot of havoc to people. People need to be sensitized on how to harvest rain water that can sustain them up to the next heavy rain period. County governments need to also ensure that well-built water drainage trenches are erected at water points to prevent soil erosion

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

and road floods. County governments can engage the public by ensuring that they are part of the key decision makers in the projects taking place in their designated areas. For instance, local labour can be sourced in situations where trees are being planted and trenches dug.

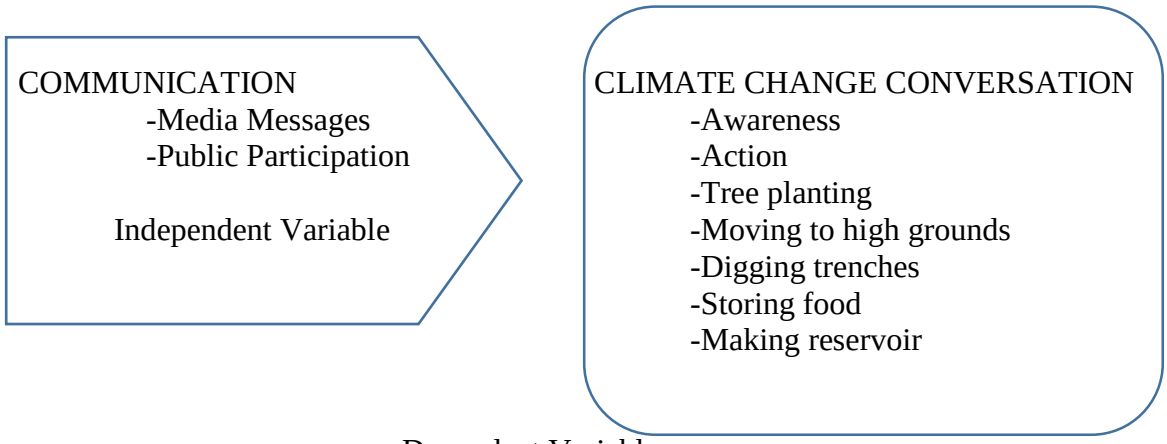
Communication Strategies in Climate Change Conversation

According to UNICEF (2019), communication is a prerequisite to development in communities. This then implies that there is a clear connection among community development and community communication. When adequately supported, engagement improves the likelihood that communities will take the lead on issues that affect them, access and use services, improve their well-being and build resilience to environmental change. Community suggestions on ways of adapting to climate change can help key decision makers come up with needful policies that address the impacts of climate change effectively. For this to be effective, there is need to come up with communication strategies that can help in reaching out to communities and people. This discussion leads us to the conceptual framework.

The Conceptual Frame Work

In this paper, the independent variable is communication, which has the attributes of media messages and public participation. The manner in which information on climate change is communicated and the way information is framed in the media has and impact on mitigating the adverse effects of climate change. The media can be used as a communication strategy to relay messages effectively. The effectiveness of media is explained by the media framing theory which states that rhetorical devices can be used to convince people of the value of any given position. In the same wave, the media can be used to sensitize people on awareness of conserving the environment and participating in climate change conservation. The diagram below shows the relationship between the independent and dependent variables:

Conceptual Framework



Dependent Variable

As depicted in the conceptual framework, the independent variable is communication which has the attributes of media messages and public participation. The dependent variable is climate change conversation. Through media messages, the public can be enlightened on salient issues regarding climate change. This can lead to awareness on the weather factors hence people can take action from informed perspectives. For instance, people living in low lands that are prone to be affected adversely with heavy rains can move or be helped to move to higher grounds. The

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

public can also be enlightened to take part in digging trenches to avoid stagnant water. Public participation can also be done as a communication strategy so that people are enlightened on ways of storing food for consumption during the dry spells.

Triangulation of Media and Public Participation as a Strategy of Communication

Media has a salient role to play in the society. They educate, inform, and entertain through news, features and analysis in the press. They also produce documentaries, dramas, current affairs programmes, public service announcements, magazines and other forms of programming for radio and television. The media acts as a gate-keeper for the society as well as watch dog. There are issues of concern that the media chooses to bring to the public eye. There are a number of theories that give an explanation on the public use of media.

From the onset of climate change conversation and media as a communication strategy, it needs to be clear that this paper evokes the theory of media framing. The theory of media framing states that rhetorical devices can be used to convince people of the value of any given position. Frames select certain aspects of a perceived reality to make them more noticeable, and often simplifying the message to mobilize support. The framing theory suggests how something is presented to the audience (called 'the frame') influences the choices people make about how to process that information. The pictures below are some depictions of how media has been used as a strategy of communicating the adverse effects of climate change.

Fig. 1: A Livestock Herder Counting His Loss as a Result of Drought in Kajiado County in Kenya

Source: The Star Newspaper

From figure 1, it is clear that the media has a salient role in communicating happenings that need attention. The media sets the agenda for public dialogue. In so doing, the media plays its watch dog role of obligating leaders and concerned authority to take necessary action. The fact that the media highlighted the drought issue in Kajiado then makes a solid statement that county governments need to engage more with the public in order to know how to effectively mitigate such occurrences. The fact that the water pans used for irrigation had dried out implies that there is need of coming up with sustainable water pans and that more needs to be done by the county government.

On the issue of water security, it is notable that there are parts of Kenya that are water insecure. The northern part of Kenya experiences long spells of real time drought. Pastoralists are

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

most affected by drought. Their livestock lack green pasture during drought and many livestock die. This takes the owners back to the poverty line. Many herders find themselves moving hundreds of kilometres away from their homes in search of pasture. Some herders helplessly watch as their livestock succumb to death. Other herders get desperate and sell off their livestock at a cost as low as Kes. 2,000 for fear of seeing them dead as a result of starvation. When media highlight such incidents, it creates awareness and agenda for public discourse. Public discourse catapults civil society and human rights organizations to voice and drum the issues of public concern further. This participation is important because it causes governments and concerned authorities to address the issues.

In as much as the media is a persuasive strategy of communication concerning the adverse effects of drought as has been depicted, public participation is also important the in climate change conversation. This is because it can help in getting the views of citizens from different parts of the country regarding the nature of climate change, effects and the appropriate intervention measures they think may work in their region.

Figure 2 shows media coverage depicting the adverse effects of climate change.

Fig. 2: A Health Facility in Nyando Sub County in Kenya Submerged in the Floods
Source: Citizen Television

This was a news item by the Citizen Media station. The dispensary in Nyando sub county was flooded. The implication of the floods was that patients could not be treated in this hospital at that particular time thus compromising service delivery. Figure 2 is a testimony that media can be used as a strategy for communicating issues of climate change in a way that is clear and impactful. In communicating such salient issues that need immediate intervention, the media framed this story as a news item and it was covered during prime news at 7pm and 9pm EAT. Covering information at such times catches the attention of key decision makers and other actors interested in voicing human rights issues. It also obligates leaders to act and deliver. In so doing, the media acts as a watch dog of the society. When the media uses pictures of real situations as they are on the ground, it helps in making people see the intensity of an issue and therefore the urgency of the matter to be resolved. Pictures speak louder than words and since they are visual, they are easier to remember and act on.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

The Place of Communication and Public Participation in the Constitution of Kenya

The Constitution of Kenya (2010) is very clear on the position of communication. In article 33 (1a), everyone has the right to freedom of expression which includes freedom to seek, receive or impart information or ideas. The constitution of Kenya (2010) encourages citizens to have a say in issues of governance and decision making. This then has implication that peoples' voice in legislation needs to take the centre stage.

COK (2010) article 37 further empowers citizens to communicate by stating,

'Every person has the right, peaceably and unarmed, to assemble, to demonstrate, to picket, and to present petitions to public authorities'. It is clear that the constitution of Kenya encourages citizens to communicate even on issues that are unpleasant before them. For instance, where citizens feel that service delivery is wanting in any public office, they can petition and also have a right to be heard. In this case, they can do it directly hence becoming the source of information or they can do it indirectly through their democratically elected leaders. Concerning the impact of climate change, citizens can petition directly or through their democratically elected leaders where climate change has adverse impact(s). Like in the flood prone areas, citizens can petition county governments to act appropriately before the heavy rains. Making water drainages in the black spot areas is appositive county intervention. Shifting citizens who live in risky areas and looking for sustainable ways of harvesting water are some of the commendable intervention measures. Support for communication in the context of sustainable development therefore involves promoting dialogue in which power-holders listen to, consider, respect and use the knowledge and views of the poor.

The County Governments Act No.17 of 2012 is very clear about public participation. The Act gives a framework on how public participation can be effected. Sections 87 to 92 and 115 outlines the principles of public participation and the logistics of facilitating. The act empowers citizens to have a voice and obligates the duty bearers to expeditiously address citizens' concerns. The act also entrusts county governments with the responsibility of ensuring that citizens have information on devolution and governance. Additionally, the act mandates county governments to leverage on media availability and ensure citizens get information. This act emphasizes on people communication. County governments are not restricted on financial expenditure on public participation. It is therefore the onus of county assemblies to ensure that money is allocated by counties during the financial yearly budget to address issues of climate change. Planting of trees, making water drainages, harvesting of water and food security measures for households need to be a preserve of county governments.

In this article, communication is the centre that holds climate change information and interventions since one has to communicate in order to express themselves. One also has to seek and impart knowledge as long as the information is not propaganda, hate speech, incitement to violence or unconstitutional. There is therefore an open window for conversation on climate change to take place at all levels. This then can lead to public participation where leaders can deliberately work around communicating issues of climate to their constituents and seeking input from them as a way of public participation.

It is important to mention that public participation is enshrined in the 2010 constitution, which is the law of the land. It is also enshrined in the County Governments' Act of 2012. Kenya is a devolved government and therefore both the constitution of Kenya and the County governments acts need to be defended in order to achieve efficient service delivery to the people of Kenya. It is therefore obligatory that county governments include public participation in their yearly budget development plan and give it a costing. Information about climate change need to

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

be disseminated to the public, their views sought on the type of climate change and its effect(s). The views of the public also need to be heard concerning how climate change intervention measures may be done effectively. All this information can help in making key decisions that affect people in climate change. And this is a positive move in good governance.

For instance, residents of Northern Kenya may talk about long spells of drought which may in turn cause their livestock to starve and die, hence causing poverty among them. Among the pastoralists, livestock is a sign of wealth and a lack of it denotes poverty. Drought also implies that planting food in the area may not yield results that can lead to food security. Given that they are fully aware of the problems they go through during climate change, they are in a better position to make propositions that can be used to develop sustainable policies that can help in coming up with useful decisions on drought mitigation and food security in the area.

Residents of Nyando and Kano plains and some parts of Homabay may have different views to give on the issue of climate change. For instance, there are usually heavy and unbearable floods in some parts of the country during heavy rains. In some cases, people's homes, schools and even hospitals and churches are flooded and swept away. This causes people to migrate to higher grounds or non-flooding areas. Migrating is however the only option during times of heavy rains but it is unfortunate that there are people who end up being refugees in their own country because they have nowhere to migrate. Proper public participation in these areas can help county governments come up with policies that see to it that people are not living in such black spot areas. County governments can mark those areas as non-human settlement. Those already living there can be relocated and county governments can use the land for other projects. County governments can also make drainages much earlier so that when heavy rains pour, there should be no stagnant water.

Conclusion

As this paper comes to a close, it is clear that climate change needs to be everyone's conversation. Everyone ought to participate in the conversation and adjust to climate change so that the effects are not hostile to mankind. This may happen if disaggregated information is communicated to people of different age brackets at the opportune time. For instance, in schools, it can be part of the lessons that learners get on environmental education, which then should be a core lesson in the school curriculum. Media can also deliberately have programmes that give information about climate change in form of prime news, televised programmes that are educative and sensitize viewers on how to conserve the environment. Apart from sensitizing people, media can also bring reality of the adverse effects of climate change in forms of pictures so that leaders are held accountable and take appropriate action to alleviate the sufferings that result in climate change. Most important, leaders need to take advantage of the constitutional provision of public participation and engage the public in disseminating information on climate change and getting views from the public on how the adverse effects of climate change can be avoided. Both levels of government, National and County governments should set money aside for public participation. Views from the public can be helpful in making key decisions on climate change mitigation and adaptations. Information from the public on climate change adaptations can help in coming up with policies that have stake holder input.

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

The Ecosystem Health Metaphor and COVID-19 Containment Measures as Constructed in the Kenyan *Daily Nation* Newspaper

Nancy C. Langat
Department of Literary and Communication Studies, Laikipia University, Kenya

Abstract
The media plays a substantial role in highlighting crises including COVID-19 and climate change. This paper sought to establish the construction of the ecosystem health metaphor in the Kenyan *Daily Nation* newspaper's reportage of COVID-19 between 12th of March 2020 and 12th of July 2020. The aim of the research was to established the metaphorical relationship between the ecosystem and COVID-19 containment measures. The ecosystem health metaphor represents the environment as a *body* and pollution as *a disease*. The study aimed at providing a novel perspective on pandemic response strategies, emphasizing the importance of holistic approaches and the interdependence of components for overall environmental health and resilience. Schema theory was employed as a framework. Corpus linguistics tools were used for data collection and analysis. The findings indicated that the COVID-19 mitigation measures posed both positive and negative impact on the health of the environment. The existing description of ecosystem health includes: *dying planet*, *healthy planet* and *unhealthy earth*. The pandemic influenced the ecosystem health through the mitigation measures such as *hand sanitizers*, *wearing protective gear* and *lockdowns*. The analysis brought out COVID-19 mitigation measures and climate change as similar threats to humanity. It was further established that the similar aggression performed by COVID-19 containment measures and climate change shows a relation between human health and environmental concerns.

Keywords*:* Climate, Ecosystem, human health, media, metaphor

Introduction

This study explored the metaphorical relationship between COVID-19 mitigation measures and ecosystem health, arguing that the strategies used to curb the spread of the virus can be likened to the mechanisms that maintain balance in an ecosystem. The COVID-19 pandemic has brought into sharp focus the interconnectedness of human health and the health of the environment in which we live (Epestein et al., 2020). The ecosystem health metaphor forms a framework through which researchers can address the complex interactions between human societies and the natural world. According to the ecosystem health metaphor, an ecosystem can be considered 'healthy' when it is stable and sustainable; that is, when its ecological processes are functioning normally, its structure is maintained, and it is resilient to disturbances. This metaphor suggests that just as an ecosystem can become degraded due to a combination of environmental stressors and human activities. In the same way, human societies can become vulnerable to disease and social disruption when faced with a combination of biological and societal stressors (Napier, 2020).

This study explored the use of the ecosystem health metaphor as a means of understanding the COVID-19 containment measures and its wider implications for human health. Drawing on the

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

media reportage of COVID-19 in Kenya, we sought to find out the similarities and differences between COVID-19 crisis and the concept of ecosystem health. By examining the ecosystem health metaphor in the context of the COVID-19 pandemic, we hoped to shed new light on the interconnectedness of the two domains. A metaphor is a figure of speech that is used to explain a concept or an idea by comparing it to something else that is more understood. According to Lakoff and Jonhson (2003), a metaphor is not just a linguistic phenomenon but a cognitive one as well. They argue that the way we understand and think about the world is based on our use of metaphorical expressions. In contemporary linguistics, metaphor is talked about from a cognitive point of view. It is acknowledged that the metaphor is an instrument of thinking and reasoning about the word (Kozlova, 2021).

In the context of language learning, metaphors play an important role in helping learners to understand new concepts. Kuo (2014) notes that the use of metaphors in language teaching can enhance students' understanding of abstract concepts by making them more concrete and relatable. Cameron (2003) has it that metaphors can be used to shape the way we think about certain issues or topics. It, therefore, can serve as a powerful tool for persuasion and influence. For the mass media communication, metaphoric effects are vital in the sense that metaphorical patterns become models of thought and behaviour of the recipients of information. This study focused on the metaphoric representation of the relationship between COVID-19 mitigation measures and the environment as constructed in the Kenyan *Daily Nation* newspaper. New articles published between 12th of March 2020 and 12th of July 2020 were purposively sampled and analysed using the tools of corpus linguistics.

This study sought to explore the ecosystem health metaphor in the context of COVID-19 pandemic as constructed in the Kenyan *Daily Nation* newspaper. News media is a key source of public's information on environmental health related issues. (O'Neill et al., 2012) The media influences our understanding of the world we live in (Yaghoobi, 2009). In addition, the media plays a key role in shaping and reinforcing how the public: defines environmental health; understand how environmental issues work; and explains the relationship between environmental issues and their personal experiences.

Newspapers employ different discursive strategies to achieve various communicative functions such as concealing actors, back grounding action, concealing a failure or malpractice by the government, supporting credibility of the government and highlighting or downgrading the action of the actor. Such discursive strategies include nominalization, negative lexicalization, thematization , metaphors and transitivity among others. This study limited itself to the use of lexical items in the Kenyan *Daily Nation* newspaper to bring out the ecosystem health metaphor amidst the deadly COVID-19 pandemic.

The Power of Metaphors in Communicating Issues

Metaphors for understanding human environment relationship exist. Ecologists have represented the ecosystem using multiple metaphors such as *machine*, as *an organism*, *a house* and as *an algorithm* (Raymond et al., 2013). They further draw attention to the fact that ecosystems can further be represented using a set of metaphors describing resistance, resilience and adaptability to change. According to Kozlova (2021) in his study on cognitive metaphors of COVID-19 in business news, Covid-19 has influenced the way we think and speak about the world, society and various spheres of life, particularly business and economy, environment and health issues.

Anderson (1999) asserts that meaning is achieved when the reader integrates personal background knowledge, purpose for reading, reading strategies and the text. This is the concept of

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

schema theory which is adopted in this study. Bartlett (1932) pioneered the schema theory in cognitive science. The theory has however been adopted in various disciplines including cognitive linguistics. This study will employ Schema theory as advanced by Rumelhart (1980) as an explanation of how readers use prior knowledge to comprehend and learn from a text. The background knowledge referred to in the theory is not limited to one's knowledge of the world or cultural experiences. It also refers to rhetorical organizational structure of the text and the reader's existing language proficiency. This knowledge is mentally packaged in units called schemata.

Lakoff and Johnson (2003) explain frames or conceptual frames as cognitive structures that shape the way we perceive, interpret and use language. These frames are composed of a set of cognitive elements such as attributes, actions and roles that are associated with a particular concept or situation. It then follows that when we encounter a new concept or situation such as the covid-19 pandemic, we activate the relevant frame and use it to make sense of the new information. For instance, the frame of going to a restaurant includes elements such as waiter, menu, order, food and paying the bill. When we enter a new restaurant, we use this frame to understand the roles of the people involved, the actions that take place, and the sequence of events.

This study aimed at finding out how the writers of the Kenyan *Daily Nation* newspaper helped their readers to understand the ecosystem health in relation to COVID-19 ways of transmission and how they could protect themselves against it. According to the theory, metaphors are often based on conceptual frames, where one frame is used to understand another. For example, terming the environment as *dying* necessitates approaches towards reviving it.

It was found that the language used in conveying the COVID-19 containment measures in the *Daily Nation* newspaper informed the readers' perception and behaviour toward the COVID-19 control measures as far as the conservation of the environment is concerned. This was possible through the information in the text; that is words and expressions (lexical items) which act as textual stimuli that signal the area for the reader to look and evoke the relevant schema from memory into the present text (An, 2013). The mention of 'plastic' for example can signal pollution schema.

Rumelharlt (1980) further gives three broad processes of schema learning which helped us in this study to understand how media consumers comprehend news on COVID-19 containment measures. The processes are: accretion, tuning, and restructuring. **Accretion** is the process of slowly adding new information to our existing mental frameworks or schemas based on our daily experiences. This allows for acquisition of large amounts of specific knowledge about a given topic. The existing knowledge helps the receivers understand the information given because they can easily integrate the new knowledge to what is already existing structure. Better recall is also expected in such a situation. **Tuning** is when we adjust or fine-tune our existing schemas to better fit the demands of a specific task or situation. **Restructuring** happens when we create a completely new schema to make sense of new information, which leads to a reorganization of our existing knowledge. These processes are crucial for learning and understanding the world around us.

Depending on the level of initial schema development, resistance to schema can happen. Restructuring follows resistance and hence formation of new schema. However, the more developed a schema is, the lesser the resistance Ambiguity in the incoming information leads to schema development resistance. Resistance is also a result of contradicting and conflicting new information. This study sought to establish the prior knowledge of environmental conservation accessed in order to reconstruct the readers, new knowledge. This knowledge is expected to form the basis for interpreting possible future pandemics control measures` influence on climate change.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Methodology

Corpus linguistics was used in the collection and analysis of the data in this study. Corpus Linguistics is a methodology concerned with examining language use in large corpora, where corpus refers to an electronic compilation of naturally-occurring texts (McEnery & Hardie, 2012). According to Ngula (2018), once compiled and stored electronically, a corpus can be subjected to all kinds of linguistic analysis. Corpus analysis reveals significant language patterns and associations that are not immediately visible to the naked eye, run counter to our intuition or are unexpected (Partington, 2014). Corpus analysis is possible through the use of corpus linguistics software analytic tools. This study used AntConc software, a free downloadable software, user friendly especially for beginners in corpus linguistics (Gomide, 2020).

The AntConc software comes as a package with many corpus analysis tools; selected for this study were **wordlist** and **Key-Word-In- Context** (KWIC). Wordli**st** is the basic tool of corpus linguistics which calculates the frequency of each word in data. Wordlist tool displays the highest recurrent lexical words in the corpus to display the focus of the news articles. On the other hand, KWIC is the most frequent word in a corpus. KWIC provide the level of saliency (Baker, 2006). The KWIC tool also helps to uncover the significant lexis in a corpus. KWIC are good indicators of the aboutness of a text and its register.

Data collection began with compilation of corpus of online newspapers published between 12th of March 2020 and 12th of July 2020. The news reports were accessed from official Nation media house website. The selected newspaper articles were converted into text files and downloaded into pdf to make possible for loading into the Antconc software. A token count of 25,847 was taken. The analysis of wordlist brought out *health*, *COVID*, *environmental* and *environment* as the most used content words in the corpus. Two wordlists were hand-picked; these were *health a*nd *environment* based on the research question of the study. The two words therefore formed the basis for analysing the KWIC hence bringing out the relationship between the COVID-19 containment measures and the environmental health. In the next section, we present the analysed data inform of wordlist and KWIC. This is followed by a discussion on the findings.

Data Presentation on Wordlist

Type	Rank	Freq	Range	NormFreq	NormRange
The	1	1026	14	39695.13	1
And	2	838	14	32421.56	1
To	3	684	14	26463.42	1
Of	4	665	14	25728.32	1
In	5	514	14	19886.25	1
A	6	306	14	11838.9	1
Health	7	255	14	9865.748	1
For	8	215	14	8318.18	1
Is	9	196	13	7583.085	0.929
On	10	178	14	6886.679	1
Covid	11	164	14	6345.03	1
S	12	162	14	6267.652	1
That	13	150	13	5803.381	0.929
As	14	144	14	5571.246	1

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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With	15	140	14	5416.489	1
Are	16	139	14	5377.8	1
We	17	132	14	5106.976	1
From	18	126	14	4874.84	1
By	19	112	14	4333.191	1
Environmental	20	110	9	4255.813	0.643
You	21	107	13	4139.745	0.929
At	22	106	14	4101.056	1
Waste	23	99	5	3830.232	0.357
Our	24	98	12	3791.543	0.857
Have	25	93	13	3598.096	0.929
This	26	91	14	3520.718	1
Nation	27	87	10	3365.961	0.714
An	28	86	14	3327.272	1
Water	29	85	11	3288.583	0.786
More	30	83	14	3211.204	1
News	30	83	13	3211.204	0.929
Air	32	82	6	3172.515	0.429
Africa	33	80	11	3095.137	0.786
Be	34	75	13	2901.691	0.929
World	34	75	13	2901.691	0.929
Pandemic	36	73	12	2824.312	0.857
Has	37	69	11	2669.555	0.786
Nairobi	37	69	10	2669.555	0.714
Other	37	69	14	2669.555	1
research	37	69	9	2669.555	0.643
Use	37	69	14	2669.555	1
It	42	68	14	2630.866	1
Or	42	68	14	2630.866	1
Can	44	67	14	2592.177	1
Kenya	45	66	10	2553.488	0.714
pollution	45	66	8	2553.488	0.571
Search	45	66	13	2553.488	0.929
change	48	62	14	2398.731	1
People	48	62	11	2398.731	0.786
Also	50	58	12	2243.974	0.857
Environment	50	58	9	2243.974	0.643

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Data Presentation on the Key-Word-In-Context: Health

Environmental health and strengthening resilience to pandemics.html	waste management is essential to minimise possible secondary impacts upon	**health**	*and the environment* from COVID-19. Large amounts of medical
Environmental health and strengthening resilience to pandemics.html	in order to ensure the minimisation of impacts upon human	**health**	*and the environment* from these potentially hazardous waste stream.
The COVID-19 Pandemic from a Global Environmental Health Perspective.html	expanding and accelerating its contributions to scientific knowledge of human	**health**	*and the environment,* and to the health and well-
Environmental health and strengthening resilience to pandemics.html	public service in order to minimise possible secondary impacts upon	**health**	*and the environment*. Effective waste management is essential to
Environmental health and strengthening resilience to pandemics.html	waste management is essential to minimise possible secondary impacts upon	**health**	*and the environment.* 1. The COVID-19 crisis has clearly demonstrated

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Data Presentation on the Key-Word-In-Context: Environment

Unep boss_ Covid-19 is a tragedy, but the world still faces bigger threats _ Nation 1.html	step up action in this decade, critical for progress on	**environment**	*and climate change.* A second achievement would be that
Out of order_ Careless disposal of masks poses new threat _ Nation.html	Ironically, they have also become the new destroyers of the	**environment**	*and disease avenue.* Everywhere you go, especially in cities
Out of order_ Careless disposal of masks poses new threat _ Nation.html	waste segregation. Kenyans have a very poor attitude towards the	**environment**	*and do not* do segregation of waste at household
From macaques to crabs, wildlife faces threat from face masks _ Nation.html	when we throw them away, these items can harm the	**environment**	*and the animals* who share our planet," Ashley Fruno
The COVID-19 Pandemic from a Global Environmental Health Perspective.html	its contributions to scientific knowledge of human health and the	**environment**,	*and to the* health and well-being of people
Fighting Covid-19 brings new danger _ Nation.html	report, this translates to 28.6 tonnes of plastic dumped in the	**environment**	*in a month.* And that is from masks alone!
Unep boss_ Covid-19 is a tragedy, but the world still faces bigger threats _ Nation 1.html	part of this support, Unep is supporting the Ministry of	**Environment**	*in Kenya to* develop a nature-recovery strategy that
The COVID-19 Pandemic from a Global Environmental Health Perspective.html	generate important knowledge about the interactions between COVID-19 and the	**environment**	*in the short term* and more broadly, the interactions
Covid-19_ Are we being too clean for our own good_ _ Nation.html	at times hysterical ways" in which people interact with the	**environment**,	*although this interaction* might help prevent some allergic diseases.
Environmental health and strengthening resilience to pandemics.html	essential to minimise possible secondary impacts upon health and the	**environment**	*from COVID-19. Large* amounts of medical and hazardous waste
Environmental impacts of the COVID-19 pandemic, as observed from space -- ScienceDaily.html	American Geophysical Union's 2020 fall meeting. They found that the	**environment**	*is quickly changing,* and the timing of those changes

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Environmental impacts of the COVID-19 pandemic, as observed from space -- ScienceDaily.html	its pre-pandemic ways. For more insight into how the	**environment**	*is responding to* changes in human behaviour during the
Environmental health and strengthening resilience to pandemics.html	essential to minimise possible secondary impacts upon health and the	**environment**.	*The COVID-19 crisis* has clearly demonstrated that societies need
Out of order_ Careless disposal of masks poses new threat _ Nation.html	air places because it is “both risky and pollutes the	**environment**”.	*The experts want* Kenyans to take personal responsibility on
Covid-19_ Are we being too clean for our own good_ _ Nation.html	diabetes and hypertension. “When a person is reconditioned to an	**environment**	*they are not* used to, the body immediately reacts
From macaques to crabs, wildlife faces threat from face masks _ Nation.html	Impact on ecosystems "When those plastics break down in the	**environment**,	*they form smaller* and smaller particles," he told AFP.
Out of order_ Careless disposal of masks poses new threat _ Nation.html	and other forms of PPEs have been dumped into the	**environment**	*after use. Surgical masks*, the most visible weapon in
Out of order_ Careless disposal of masks poses new threat _ Nation.html	YELLOW-CODED BAGS According to Nema guidelines, to keep the	**environment**	*clean and avoid* disease spread, medical waste should be
Out of order_ Careless disposal of masks poses new threat _ Nation.html	national guidelines have been sent to all county directors of	**environment**. “	*Counties should also* provide yellow-coded bags for disposal
Environmental health and strengthening resilience to pandemics.html	order to minimise possible secondary impacts upon health and the	**environment**.	*Effective waste management* is essential to minimise possible secondary
Unep boss_ Covid-19 is a tragedy, but the world still faces bigger threats _ Nation 1.html	but certainly not least, through projects financed by the Global	**Environment**	*Facility, we support* conservation initiatives such as the blue
Out of order_ Careless disposal of masks poses new threat _ Nation.html	These masks are non-biodegradable, and will remain in the	**environment**	*for a very* long time to come, considering their

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Environmental health and strengthening resilience to pandemics.html	in particular, through its relationship between animals and the natural	**environment,**	*has been a* major potential factor of disease (e.
Environmental health and strengthening resilience to pandemics.html	air pollution: Policy Highlights, OECD Publishing, https://www.oecd.org/	**environment/**	*indicators-modelling-outlooks/*Policy-Highlights-Economic-consequences-of-outdoor-
Fighting Covid-19 brings new danger _ Nation.html	constant repairs, with huge economic losses. Plastics in the aquatic	**environment**	*may be mistaken* for food and ingested by marine
Environmental health and strengthening resilience to pandemics.html	and Business Case for Action - report prepared for the G7	**Environment**	*Ministers' Meeting.[5] OECD (2016),* The economic consequences of outdoor air
Fighting Covid-19 brings new danger _ Nation.html	is, therefore, likely to increase accumulation of plastics in the	**environment,**	*more so since* most counties do not have proper
The COVID-19 Pandemic from a Global Environmental Health Perspective.html	more broadly, the interactions between diseases and the	**environment.**	*NIEHS participates in* the Group on Earth Observations

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Data Interpretation

The high frequency of the lexical items **COVID-19** and **health** is expected due to the pandemic's widespread influence on public health. The recurrent appearance of **environment** in conjunction with these terms suggests an extensive discourse about the environmental repercussions of COVID-19 containment strategies. This is consistent with the research conclusion that the strategies adopted to curb COVID-19 have had observable impacts on the environment

The analysis of the wordlist reveals that **health** is a KWIC that appears in the context of COVID-19 containment measures in the newspaper corpus. This suggests that there is a significant focus on the impact of the pandemic on public health. The frequent co-occurrence of 'health' with terms related to COVID-19 containment measures indicates a prevailing narrative that these strategies, while necessary to control the spread of the virus, have had substantial effects on public health. This refers to both the direct health impacts of the virus and the indirect effects of the containment measures on the ecosystem well-being.

There is a notable frequency of the term **environment** in the context of COVID-19 containment measures within the examined newspaper corpus. This points to a prevalent metaphorical association being made between the methods employed to manage the pandemic and the wellbeing of the ecosystem. The regular pairing of these concepts suggests a dominant narrative that compares the societal impact of COVID-19 containment measures to the effects of human activities on the environment. This metaphorical association underscores the interdependence of public health and environmental health, underlining the importance of sustainable practices in our approach to both.

Findings and Discussion

This section discusses the findings of the study. The ecosystem health metaphor comprises a wide variety of features which can be mapped to climate change or the environment as illustrated below (Auge, 2023).

1. Environment as a body
2. Environmental resources as body parts
3. Pollution as a disease
4. Polluted environment as a diseased body
5. Climatic events as symptoms
6. Climate solutions as treatment

The findings of this study indicated that COVID-19 containment measures produced both positive and negative effects on the environment. Three entities; that is *lockdowns*, *hand sanitizers* and the use of *protective gear* as ways to mitigate the pandemic were metaphorically mapped to climate change in the following ways:

a. **Increased use of single-use plastics**: The pandemic led to a surge in the use of single-use plastics, such as masks, gloves, and other personal protective equipment. This has resulted in increased plastic waste, which can harm ecosystems and wildlife.
b. **Contamination of aquatic environments**: Mitigation measures against COVID-19 resulted in contaminated aquatic environments due to the sewage carrying coronaviruses, disinfectants, and antiviral medicine.
c. **Increased medical and hazardous waste**: There was a sharp increase in the amount of medical and hazardous waste during the pandemic. This also threatened local ecosystems.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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While these impacts are significant, it is important to note that they are largely unintended consequences of necessary public health measures. It underscores the importance of considering environmental impacts in our response to crises. The lockdowns were associated with cleaner air. The lockdowns as COVID-19 mitigation measure offered a message for restoring the environmental as well as natural ecosystem stability (Bhat et. al., 2021). Vehicles and airplanes are generally considered to be important sources of emissions in the transportation sector, and each contributes over 72 percent and 11 percent respectively of the transportation sector's total greenhouse gases (GHG) emissions (Henriques, 2020). From the shutdown of various industries, businesses, and transportation, the sudden drop in greenhouse gas emissions occurred

Conclusion

The COVID-19 pandemic led to an increase in the use of plastics and hand sanitizers. These had an impact on the environment and climate change. The production of hand sanitizers and their packaging contributes to carbon emissions, which lead to global climate change. Also, single-use masks add to plastic pollution in our oceans. So, while masks and sanitizers are important for health during the pandemic, they do have environmental impacts. This paper establishes that COVID-19 containment measures is constructed in the news articles as part of the ecosystem health metaphor. This is to say that the COVID-19 mitigation measures have been applied to environmental issues. The hand sanitizers and wearing of protective gear are constructed as a warning about the dangers of pollution. The lockdowns during the COVID-19 pandemic led to a significant but temporary decrease in greenhouse gas emissions. However, once the lockdowns were lifted, emissions started to rise again. This shows that while we can change our behaviours to reduce our carbon footprint, temporary changes are not enough. We need long-term strategies to permanently reduce emissions. The way we recover from the pandemic could greatly influence our long-term impact on climate change.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Cattle Rustling and Banditry in the Rift Valley: Is It Culture or Food Security and Climate Change Adoptability?

Patrick Michael Ogeto
Department of Social Studies, Laikipia University, Kenya

Abstract
Cattle rustling in the Rift Valley has become endemic and pastoral areas, in particular, are among the most affected. This vice often overlaps with climate change and desertification. There have been constant conflicts among pastoral communities especially those occupying the arid and semi-arid regions of northern Kenya, mainly the Pokot, Turkana and Samburu. This paper seeks to establish whether cattle rustling and banditry is an expression of culture or an approach employed by these communities towards achieving food security and climate change adaptability. This paper is guided by two theories; the social conflict theory and social cubism theory. Social conflict theory argues that individuals and groups (social classes) within society interact on the basis of conflict rather than consensus. On the other hand, social cubism theory, originally designed for the analysis of international ethno-territorial conflict, is used in the analysis of micro-conflicts in other settings, such as the case of the conflict among the Pokot, Samburu and Turkana within the Rift Valley of Kenya. Social cubism directs the researcher to look at an issue from a multiplicity of perspectives and to acknowledge that at different times, under different circumstances and in different settings, the factors will interrelate in different ways. On methodology, this paper relies on both primary and secondary data. Primary data comprises archival materials and oral interviews, while secondary data is obtained from published materials such as books, journals and magazines. The collected data was analysed using three analytical frames; that is, content analysis, theoretical reflections and document analysis.
Keywords: Banditry, cattle rustling, climate change, food security, Rift Valley

Introduction

Cattle rustling or raiding to steal livestock has been a social-cultural practice among communities for the longest time. From Moses' Law in the book of Exodus, seemingly, it was a major societal practise that seemed to have been condemned. Cheserek et al. (2012) defines it as an act of forceful acquisition of cattle from one community by another using guns or other weapons and in turn leaving behind loss of lives and destruction of property.

In Australia, the act of stealing livestock is often referred to as duffing, and the perpetrator is referred to as a duffer (Baker, 1945) while in other places like Queensland, the practice is known as poddy-dodging with the perpetrator commonly referred to as a poddy-dodger (Anderson, 2018). Elsewhere in North America, especially in the Wild West cowboy culture, cattle theft is dubbed rustling, while an individual who engages in it is a rustler (Lincoln, 1976).

Banditry, on the other hand, is a type of organized crime committed by threatening victims or use of violence. A person who engages in banditry is known as a bandit and primarily commits crimes such as extortion, robbery, and murder, either individually or in groups. Banditry is a vague

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

concept of criminality and in modern usage, it can be synonymous with gangsterism, brigandage, marauding, terrorism, piracy and thievery. In modern usage, the word has become a synonym for 'thief', hence the term 'one-armed bandit' for gambling machines that can leave the gambler with no money. For cattle rustling to flourish, therefore, cattle rustlers have to employ banditry to the best of their tact and experience (Zmora, 1997).

Using desktop review as a study methodology, this paper examines the concept of cattle rustling and banditry, its historical origins, reasons for its practice by various communities and the nature. More significantly, the paper focuses on cattle rustling and banditry in the Rift Valley of Kenya with a view to establish whether cattle rustling and banditry is an expression of culture or an approach employed by the cattle rustling communities to achieve food security and climate change adaptability.

Theoretical Framework

This paper is guided by two theories; the social conflict theory and the social cubism theory. Social conflict theory was proposed by Karl Marx (1818-1883), a political theorist, philosopher and economist who criticised the capitalist system in most of his works. He advocated for socialist and communist societies hence being regarded as the father of social conflict theory. Marx looked at social conflict theory from a primarily economic perspective. This theory argues that individuals and groups (social classes) within society interact on the basis of conflict rather than consensus (Collins, 1974). In this paper, this theory is utilised to explain the existing struggle for wealth creation among the cattle rustling communities in the Rift Valley creating social hierarchy that effectively creates distinct classes based on wealth, power and prestige.

On the other hand, social cubism theory, originally designed by Byrne and Carter (1996) for the analysis of international ethno-territorial conflict, is used in the analysis of micro-conflicts in other settings, such as the case of the conflict among the Pokot, Samburu, Turkana and other communities within the Rift Valley of Kenya. Social cubism directs the researcher to look at an issue from a multiplicity of perspectives and to acknowledge that at different times, under different circumstances and in different settings, the factors will interrelate in different ways.

Origins of Cattle Rustling: A Global Survey

Cattle rustling dates from way back with the first attested case said to have taken place over seven thousand years ago. This is one of the oldest-known aspects of Proto-Indo-European culture, which is seen in inscriptions on artifacts such as the Norse Golden Horns of Gallehus, and in works such as the Old Irish, the *paṇis* of the *Rigveda*, the *Mahabharata* cattle raids and cattle rescues, and the Homeric Hymn to Hermes, who steals the cattle of Apollo (Lincoln, 1976).

In Central Asia, cattle rustling was practised by the Turco-Mongol an ethno-cultural synthesis that rose in Asia and attempted to raid their neighbouring communities in the 14th century. They conquered Timur, and a small band of followers raided travellers for goods, especially animals such as sheep, horses, and cattle. Marozzi (2004) described how this practice was conducted including a tactical kill that was employed.

Cattle rustling in Britain was practised in relation to an act of insult under the code of conduct or to keep the whole clan fed during a difficult winter. This was counted as a major achievement during war among the Irish clans which extended into the 18th century. These acts have been depicted in the stories from Irish mythology. At the Anglo-Scottish border, cattle-raiding and banditry by the Border reivers was a serious problem for many centuries on both sides of the warfare between Scottish clans. During the 17th and 18th centuries, many Scottish clan

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

chiefs would similarly operate an extra-legal watch over the cattle herds of the Lowland gentry in return for protection money, which Highland Chiefs similarly used to feed their tenants and clansmen. Any stolen cattle from herds under the Chiefs' Watch were either retrieved or paid for, in full (Murray, 1982).

Elsewhere in the Old West American region, the act of cattle stealing was seen as a serious crime to an extent that in some cases, it resulted in having vigilantes hanging or shooting cattle raiders and thieves found stealing (*Reinhold, 1987*). Additionally, it is argued that one of the major causes of tensions between Mexico and the American states in the years leading up to the Mexican–American War of 1846–1848 was the frequent cases of cattle raids and or rustling by Native Americans from north of the border who found flourishing cattle markets in Texas. These raids left thousands of people dead and devastated in northern Mexico. When American troops entered northern Mexico in 1846, they found a demoralized people and so got little resistance from the civilian population.

Cattle raiding and stealing in Chile and Argentina became a major issue at the end of the 19th century in Argentina, where cattle stolen during *malones* were taken through *Camino de los chilenos* across the Andes to Chile. Here, they were exchanged for alcoholic beverages and firearms. Several indigenous groups and outlaws, such as the Boroano and Ranquel peoples, ravaged the southern frontier of Argentina in search of cattle. To prevent the cattle raiding, the Argentine government built a system of trenches called Zanja de Alsina in the 1870s. Most cattle raids ended after the military campaigns of the Conquest of the Desert in the 1870s, and the following partition of Patagonia established by the Boundary Treaty of 1881 between Chile and Argentina.

Livestock theft In Israel, especially that of sheep, goats and cows along with tractors and irrigation equipment, has been in the recent past, one of the most difficult problems confronted by farmers. It is argued that more than 400 cases of cattle rustling and livestock theft are reported annually especially in the northern region of Israel. This leads to loss of millions of *shekels* annually. Most of the stolen livestock is taken to the West Bank, quickly slaughtered, then smuggled back into Israel, where it is sold by butchers to unsuspecting customers (*Bennet, 1976).*

In the continental Africa, the practice is not any different from the rest of the world. For instance, in Nigeria, cattle rustling has been a common practice for long. Cattle rustling activities have resulted in the theft of millions of cows as well as causing loss of lives and destruction of property. This has continued to create a security challenge to the civilians and seem to have become a major business involving the herders and heavily armed bandits.

In Sudan, the conflict over pastures and cattle raids has been happening more specifically between Dinka and Nuer as they battle for grazing grounds. For instance, in the state of Jonglei, cattle raids in August 2011 left around 600 people dead. Once again in January 2012, ethnic clashes related to cattle theft killed between 2,000 and 3,000 people and displaced as many as 34,500 in the area around Pibor (Diamond, 2012).

Is Raiding a Culture or an Organized Crime?

For centuries, cattle raiding among pastoralists in East Africa was a generally accepted cultural practice to acquire livestock to replenish decimated herds after periods of drought. Cattle raiding as an institution of mutual exchange among communities was governed by regulations established by elders to protect life. Warriors sought the blessings of elders and seers in order to successfully raid neighbouring communities.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Raiding was seen as the job of a warrior as it was used as a process through which young men (warriors) exhibited their bravery which is key to defending community property (livestock and territory). Raiding was also important for warriors as it was the only means to acquiring livestock for the payment of bride-wealth. Raids therefore involved combat between warriors from opposing communities. Women, children and the elderly were never targeted.

From a critical perspective, it seems like cattle raiding changed when communities started acquiring illicit firearms trafficked from neighbouring countries such as Ethiopia in the 1980s. Guns weaponised the conventional raiding and through force, enabled the acquisition of large herds of livestock, which precipitated commercialised cattle raiding. The use of automatic weapons such as AK47s and M16s saw the cultural practice of cattle raiding evolving into cattle rustling-a violent organised criminal enterprise aimed at acquiring cattle from pastoralists' lands for commercial gain.

> *Traditionally, small-scale stock theft was a way of balancing community wealth and power, but crime and capitalism have commercialised this practice, making it a significant economic threat. This practice has caused many deaths among rural communities and security forces in Kenya and South Sudan are concerned.* (Kurgat Rono, former Anti-Theft police officer).

In the northern Rift Valley of Kenya, cattle rustling has been a major concern. It is no longer a cultural practice, but a form of organised crime which results to deaths of people (including the police and military), destruction of property, and theft of hundreds of thousands of livestock.

Causes of Cattle Rustling in the Rift Valley: Is it Cultural, Climate Change or Food Shortage?

In Kenya, cattle rustling is the dominant cause of conflicts among the Pokot, Masaai, Marakwet and other pastoral community members. Cattle rustling in West Pokot County involves the Turkana, Sabaot, Samburu, Marakwet, Sabiny and Karamajong communities and it is a way of life for the pastoralists where pastoral communities like the 'Morans' organized raids and execution as a symbol of dominance. These raids are normally planned, guided and moderated by community elders. Usually, retaliatory attacks always taken place by the rival community elders at the most appropriate time, although fatalities do not occur. However, contemporary raids have become more frequent and fatal. This is attributed to the increase in extreme climatic events, particularly droughts and proliferation of arms respectively (Huho, 2012).

Most importantly, scholars associate cattle rustling with culture, illegal proliferation of arms, hunger, climate change, boundary disputes, insecurity, political issues, unemployment and economic gain and means of livelihood among others (Okoli and Okpaleke, 2014). Greiner (2013) in his analysis of cattle rustling in Kenya, notices that livestock raiding among the Northern Kenyan pastoralists has profoundly changed from what it used to be. It has been politicized in relation to claims over administrative boundaries, struggles for exclusive access to land, and attempts to establish or safeguard an ethnically homogeneous electoral base. These conflicts are part of Kenya's troubled politics of decentralization and as such, they must be viewed in the context of wider political developments in the country.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Based on ethnographic field work in East Pokot and surrounding areas in Kenya's Central Rift Valley Province, this also shows how cattle rustling has become a specific form of violent determining factor and as an adapted, dangerous, and powerful political weapon. Greiner, (2013) goes on to say that, in studying the patterns of cattle rustling in Kenya, the links between raiders and politicians often remain obscure. However, the violence in pastoralist areas is intimately linked to recent political developments in Kenya at large. Processes of democratization, particularly the re-establishment of multi-partyism in 1992, the end of the Moi regime in 2002, the post-election violence of 2007–2008, the current political administrative restructuring, as well as the ongoing land reforms have created windows of opportunity for violent negotiation of territorial claims in the pastoralist areas in Kenya's arid North. These cause and triggers cattle rustling in Kenya.

Based on the study, there are numerous causes of cattle rustling which include cultural causes, ecological causes, economic causes, and political and colonial antecedent. However, for the purposes of this paper, cultural factors, food security and climate change causes are discussed.

Cattle Rusting As a Culture

According to Ngaga (2012), the cultural practice of giving bride price before marriage is a major cause of cattle rustling. It is apparent that this factor has had a major impact on the spread and practice of the culture of cattle rustling and conflict in the North Rift part of Kenya. This cultural practice has made the Pokots, the Marakwet and the Masaai among others think that cattle rustling is a normal way of life.

It is also noted among the Pokots in Kenya that there exists the practice of 'Sapana' (a Pokot male traditional rite of passage from adolescence to elder hood), which influences cattle rustling. During 'sapana' ceremony, the man spears his favourite bull and serves meat to his friends and other elders, after which he is officially introduced to the elder hood club and is allowed to participate in community matters as an elder. Those who have not served 'sapana' meal have no say in community matters. The 'sapana' cultural rite encourage the young adults to acquire bulls by whatever means so that they could be respected in the community. Women are identified as one of the major factors that triggered the spread of cattle raid because they celebrate successful cattle raiders with songs while using mockery against those who did not participate in raids. The women respect men with huge herds of cattle, while those without cattle are seen as cowards and not respected. The women always had songs for each occasion when raids are conducted successfully (Cheserek et al., 2012).

Manu (2014) observes that traditionally, cattle rustling among the pastoral communities in other parts of the world are considered as a cultural practice which is sanctioned and controlled by the elders. This shows that in Eastern Africa, most especially among the herders in Kenya, Uganda, Ethiopia, Sudan and even other parts of Africa like Lesotho, have cultural rites and practices are the major causes of cattle rustling. One can argue that it is from the cultural practice over a period of time that the cultural raid developed new trends, tendencies and dynamics, leading to commercialization and internationalization of the practice, contrary to the views of early scholars who trivialized cattle rustling as a mere cultural practice. By way of inference, it could be deduced that the cause of cattle rustling among the Pokot and the Marakwet people of Kenya is largely attributed to cultural practices, traditions, customs, values and beliefs. Although there are other factors that cause cattle rustling among the Pokot and the Marakwet people, the major cause identified by the scholars is the culture and tradition of the Pokots and the Marakwet.

Okoli and Okpaleke (2014) also observe that cattle rustling is connected to political struggles as is evident in some parts of Africa. They illustrate that, in 2013, many people were

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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killed and wounded in a series of massive cattle raids perpetrated by rebels in Jonglei region of South Sudan. To them, the killing and massive cattle rustling took a political perspective. Similarly, in Nigeria, the spate of cattle rustling in the Northern part of the country in the recent years has sometimes been associated with the activities of the Boko Haram insurgence group. Based on this analysis, it seems that the views of Greiner (2013), Okoli and Okpaleke (2014), are similar in the way they analysed the causes of cattle rustling in relations to politics and political processes.

Cattle Rustling Due To Climate Change

It is no doubt that climate change has greatly contributed to shortage of rains with prolonged seasons of high temperatures across the East Africa region and beyond. This has led to a decrease in animal feeds, drinking water and grazing grounds, especially in the vast and expansive Rift Valley region. It is argued that 'high' season of cattle rustling in Kenya usually occurred at the onset of the rains, between August and October, when herders moved from dry-season pastures to community-owned pastures. As pastoralists moved back home, there was always a higher propensity for raids to enable the replacement of decimated herds.

In Africa, some 500-600 million people live in the arid and semi-arid parts of the world and 30-40 million of them depend entirely on animals for their livelihoods. Of these 30-40 million people, 50-60 percent of them are found in Africa. The Horn of Africa, where arid and semi-arid areas make up 70 percent of the total land area, contains the largest grouping of pastoralists in the world. These areas provide an average of 20 to 30 percent of Gross Domestic Product (GDP) for the Horn countries. At the local level, as much as 70 percent of cash income is generated from livestock. All aspects of pastoral social and economic life are ordered in relation to livestock and the environment in which they live (Mette, 2013).

In pastoral societies, cattle hold central value within society and are the basis of association in a complex of social, political and religious institutions. The system depends largely on the availability of water and its distribution as well as the quality of pasture and access to it. However, pastoralism is under threat due to a range of factors including: weak governance; inadequate land and resource management policies; political and economic marginalization of pastoral groups; and increasing insecurity resulting from cattle raiding fuelled by growing access by all sides to small arms and light weapons.

Cattle Rustling As a Means to Food Security

The third factor contributing to cattle rustling is food insecurity. Beef, sheep and goat are a sure source of protein which leads to resource based conflict in several parts of the country, especially in the northern region which is classified as Arid and Semi-Arid Land (ASAL). This is where communities who source for their livelihood are mainly pastoralists. Conflicts affect the entire ASAL region and the specific counties include Baringo, Laikipia, Marsabit, Samburu, Turkana and West Pokot.

Economic analysis of the outcome of conflicts shows that outbursts of violence between pastoralists affect milk and livestock prices. This also indirectly affects the prices of many other goods, as insecurity and low incomes influence both demand and supply. On the other hand, the loss of livestock usually induces herders to sell animals in order to buy food and to compensate for the fall in milk production (Keen, 2017).

Cattle rustling among various communities in the Rift Valley seem to be a resource-based type of conflict. For instance, the conflict among the Pokot and Turkana of Kenya has been

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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dynamic over time, especially since independence. Pastoralist groups in these areas have the highest poverty levels, lowest education levels with large numbers of school drop-outs, highest food insecurity, and the highest levels of civil insecurity. A significant number of members of these communities depend largely on animal husbandry and subsistence agriculture. Unreliable rainfall and cyclical drought impoverish them causing food scarcity, malnutrition, and high child mortality. Competition over scarce pasture and water is often severe and violent.

Cattle rustling, traditionally practised, has become more destructive with increasing poverty and proliferation of illicit arms and the influence of external political and economic motives. Land grabs and political incitement is contributing to growing ethnocentrism and violence. Lack of clarity and breach of rights related to boundaries, inheritance and land sales, user rights, evictions are the major concerns.

Among these communities, livelihoods are frequently disrupted, and unemployment among young pastorals is turning them into main perpetrators of conflicts. Welfare facilities are limited, and the existing few are destroyed, leaving children with no access to education and health services. The causes, mitigation or approaches to solving these resource-based conflicts, nature and dynamics and the impact of these conflicts have not been properly documented hence this study.

Conclusion

Traditionally, cattle rustling was a sport; a game and a form of cultural expression. In fact, small scale theft of livestock was a considered way of balancing communities' possessions, wealth and power. This was also highly recommended and blessed by elders. However, in the recent past, cattle raiding which is characterized by banditry, violence and crime and capitalism have commercialized this practice, making it a significant economic threat. It has caused many deaths and threatened peace and co-existence among communities leading to displacement of people especially women and children.

As to whether the practice is geared towards adaptability to food shortage due to climate change, the practice of cattle rustling does not significantly address food shortage since most stolen livestock, especially cattle, is said to be ferried for beef production by wealth merchants who are heavily funding it. Therefore, to address this crime requires a regional legislative and development approach and framework that addresses both security and the marginalisation of pastoralists. As a matter of fact, members of these communities should be equipped with alternative approaches towards livelihood.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Integrating Traditional Ecological Knowledge for Sustainable Environmental Management: An Eco-linguistic Analysis of Selected Kenyan Folklore

Jacquiline Ondimu,* Prisca Simotwo
Department of Literature, Linguistics, Foreign Languages & Film Studies, Moi University, Kenya
*Corresponding Author

Abstract
The current global concerns around the environment have raised the importance of finding sustainable solutions to mitigate the impacts of climate change on the environment and human beings. Environmental management practices have for long relied on science-based knowledge and western models, neglecting the vast wealth of environmental knowledge and practices embedded in Traditional Ecological Knowledge (TEK). This study employs an ecolinguistic approach to examine how TEK, as represented in selected folklore, can be incorporated into sustainable environmental management practices. The study analysed a narrative and a song purposively selected from the Kalenjin and Abagusii communities in Kenya. Ecological discourse analysis was used to identify linguistic structures that construct the communities' system of knowledge, values, and beliefs related to the environment. The findings indicate that linguistic structures such as declarative sentences, verbs, agency, emotive coercion, and lexical choices are used in the narrative and song to pass the communities' TEK. The paper concludes that the language used has the potential to shape the community's perceptions and influence their attitudes towards the environment, including forest protection, land use, and biodiversity protection. Consequently, incorporating TEK into environmental management practices can promote sustainability, conservation, and community participation in decision-making. The study recommends that environmental managers and policy makers should recognize the value of TEK, ensure its documentation, and incorporate it into environmental planning and decision-making processes in a complementary manner with science-based knowledge. This study contributes to the growing body of knowledge on integrating TEK into environmental conservation efforts and offers insights into the potential of ecolinguistic approaches for promoting sustainability in environmental management practices.

Keywords: Ecolinguistics, environmental conservation, folklore, linguistic structures, traditional ecological knowledge

Introduction

Environmental conservation has attracted global attention over the years. Concerns have been raised on ways of finding sustainable solutions to mitigate the effects of climate change on the environment, animals, and human beings. Most of the environmental conservation efforts currently in place make use of science-based knowledge and western knowledge. This has brought challenges in the conservation efforts as Guto (2020, p. 66) argues that the modern scientific

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

knowledge which is considered 'prestigious, specialized, centralized and systematic' is most times at odds with the social structures and practices of indigenous communities. This paper, through an ecolinguistic perspective, argues for a complementary approach in the use of traditional ecological knowledge (TEK) and science-based knowledge in environmental conservation management policies. The paper begins by giving a brief background on TEK, folklore and ecolinguistics.

TEK embodies a vast knowledge of ideas that can be incorporated into sustainable environmental conservation. TEK can be described as the knowledge base that is acquired by indigenous and local people over many years through direct contact with the environment (Berkes, 2012). It includes an intimate and detailed knowledge of local plants and animals together with their natural history and natural phenomena, the development and use of appropriate methods for hunting, fishing, trapping, agriculture, and forestry, and a holistic knowledge which parallels the scientific discipline of ecology. TEK is part of traditional knowledge and is similar in meaning with Indigenous ecological knowledge (IEK).

Traditionally, communities had practices they used in managing complex natural systems and the indigenous knowledge offered a holistic perspective of the natural world (Guto, 2020). This knowledge includes not only a deep understanding of the natural world, but also cultural, social, and spiritual values and beliefs that shape the relationship between humans and nature. In Kenya, many communities have relied on TEK to sustainably manage their natural resources for centuries. Ayaa and Waswa (2016) acknowledge the role of indigenous knowledge systems (IKS) as a significant resource which can contribute to an increase in environmental conservation in areas pertaining to food security, human and animal related and natural resource management. Similarly, Muhando (2005) in a study of sacred sites and environmental conservation, shows that the management of some of the sacred sites still remaining in Kenya is governed by the traditional rules passed down to generations through folklore.

Folklore has been recognized as a rich repository of TEK, reflecting the accumulated knowledge, beliefs and practices related to the environment within a given culture (Dasgupta, 2023; Mago & Anand, 2020; Saikia, 2008; Selim, 2019). Abrahams (1980) defines folklore as a means by which groups of people instruct and entertain each other. He further notes that folklore includes everyday expressions such as proverbs, jokes, riddles, narratives, superstitions, testimonials and rites that emerge during casual and ceremonial occasions. Consequently, TEK represents the ecological cultural ideas while folklore is the platform which supports the transmission of the ideas.

Amlor and Alidza (2016) point out that folklore have a didactic function since they serve in setting standards that regulate the behaviour and activities of members of a community as they interact with their environment and natural resources. This essentially means a study on folklore can bring to the fore a community's worldview on the issues addressed therein. As Khasandi-Telewa (2016) notes, folklore can be used to reshape a community's values thus helping in maintaining what is good and doing away with what does not currently benefit the society. Based on the Sapir-Whorf hypothesis on the relationship between language and culture, it is crucial to analyse the language used in folklore to understand the TEK expressed. An ecolinguistic approach that focuses on analysing the linguistic structures used in folklore, can reveal the underlying values, beliefs, and knowledge systems that shape communities' relationship with nature.

Ecolinguistics is an approach that seeks to understand the relationship between language and the environment and how they mutually influence each other (Stibbe, 2015). Ecolinguistics recognises the fact that human societies are embedded in larger natural systems-the complex interactions of humans, plants, animals, and the physical environment (Stibbe, 2015). It further

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

emphasises that relations of humans with other species and the physical environment are very important, since the continuity of life is dependent on these ecological relationships. The approach is thus about the impact that discourses have on the systems which support life.

There are two major approaches to the study of ecolinguistics; the Haugenian approach also known as 'language ecology' which looks at the effect of the environment on language and the Hallidayan approach also referred to as 'ecological linguistics' that studies the effect of language on the environment (Fill, 2001). This paper lends to the Hallidayan perspective, which highlights the importance of examining the linguistic structures used in the construction of the community's systems of knowledge, values, and beliefs about the environment. This will in turn provide a means of establishing the role of TEK in promoting positive perceptions of the environment which has been less explored from an Ecolinguistic perspective.

Despite the potential of TEK to inform and enhance sustainable environmental management practices, its incorporation into mainstream conservation efforts has been limited. This is partly due to the perceived lack of scientific rigor and the dominance of Western scientific paradigms in environmental decision-making. Using the ecological discourse analysis (EDA) framework, this study explored the ecolinguistic dimensions of TEK as represented in Kenyan folklore and its potential for incorporation into sustainable environmental management practices. Specifically, it examined the linguistic structures as used in a folk narrative and a song, examples of folklore, to convey complex ecological concepts and the TEK embedded therein.

The study contributes to the field of ecolinguistics by exploring the linguistic encoding of ecological concepts and values in the selected folklore. It is also significant as it contributes to a more inclusive and equitable approach to sustainable environmental development in Kenya and beyond through highlighting the importance of an ecolinguistic analysis in uncovering the hidden wisdom in traditional stories and the potential of TEK to inform and enhance sustainable environmental management practices. The findings of this paper will contribute to the debates around the incorporation of insights from TEK into mainstream environmental conservation policies.

Related Literature on TEK, Folklore and Environmental Management

There have been recent debates about the positive effects that folklore and TEK of indigenous cultures can have on ecological conservation. Some scholars have argued that the problem facing the world currently in relation to the protection of natural resources has been brought about by lack of information on how environmental resources were sustained through TEK in the past (Osemeobo, 1994). Mago and Anand (2022) also argue that the western idea of development has led to environmental degradation. They state that the solution lies in the population changing in line with the TEK as contained in folklore. They further state that folklore has rich cultural practices that propagate ecological values, ideas and environmental ethics which can help steer environmental conservation efforts. The UN convention on desertification, through the Intergovernmental Forum on Forests (IFF) acknowledges that there are traditional related practices that can be adopted into sustainable environmental mitigation and adaptation strategies. This shows that TEK is an important component in the conversations around environmental conservation. It is therefore important to first establish the relationship between folklore and TEK.

Scholars and researchers agree that folklore play an important role in bringing to the fore man's attitude towards ecology by illuminating the relationship between man and nature. For instance, Mago and Anand (2022) bring out the crucial relationship between nature and folklore stating that traditionally all measures to conserve the environment relied on folklore. Similarly,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Saikia (2008) observes that folklore offers an accumulation of traditional knowledge that can offer significant perspectives towards understanding ecology even in this era of technology. TEK is made up of belief systems which are crucial in getting to understand the underlying values of a culture. It is thus important to understand the belief systems of a community since they have a considerable effect on environmental attitudes, which in turn can play a major role in environmental conservational efforts (Schmonsky, 2012). This makes folklore a good source of data for this study when dealing with issues related to TEK and environmental conservation.

Kenyan folklore which encompasses narratives, proverbs, songs, riddles, and other cultural expressions is a reservoir of TEK which can be valuable in environmental conservation efforts. For example, Khasandi-Telewa (2016), in her study of folklore and environmental conservation, concludes that Swahili and Luhya proverbs are used to pass environmental conservation messages as part of the communities' daily activities. Similarly, Monanti et al. (2013) argue for the use of oral poetry in the form of songs as one of the ways of enhancing already existing environmental conservation efforts. This study takes a different approach in looking at the role of TEK, embedded in folklore, in environmental conservation by doing an ecolinguistic analysis. The analysis will identify the kinds of linguistic structures and strategies used in folklore that can help promote conservation efforts.

There are studies in Kenya that have explored different types of folklore from a variety of ecolinguistic perspectives (Khasandi-Telewa 2023a; 2023b, Simotwo 2019). Khasandi-Telewa, (2023b) gives an analysis of the ecofeminism and ecocentrism ecosophies in Luhya narratives, whereas Khasandi-Telewa, (2023a) and Simotwo (2019) use the critical discourse analysis (CDA) approach to examine stories from the Bukusu and Kalenjin communities respectively. This paper is different from the mentioned studies as it has used EDA which is a framework that analyses ecological discourses from a linguistic perspective. The emphasis is on the linguistic features in the discourse which help bring out an ecological orientation.

Ecological Discourse Analysis, Key Concepts and its Application in Ecolinguistic Research

Ecological Discourse Analysis (EDA) is a framework developed by He et al. (2021) from the Hallidayan approach. It is a paradigm that analyses ecological discourse based on an ecosophy from a linguistic perspective (Cheng, 2022). The theory builds on functional oriented linguistics, systemic functional linguistics (SFL), to establish the effects of language use on the environment. As Cheng (2022, p. 189) notes; 'it is designed to expose the effects of language use on the environment–eco-beneficial, eco-destructive, and eco-ambivalent–to enhance people's ecological awareness, improve their ecological behaviours, and finally promote the harmonious development of the ecosystem'.

Based on the ecosophy 'Diversity and Harmony, Interaction and co-existence', EDA extends the ideational, interpersonal, and textual metafunctions of the SFL framework using ecolinguisitcs perspectives. The theoretical systems of EDA are constructed from the ecolinguistic perspectives such as the transitivity, mood, appraisal, theme, cohesion and coherence and logical systems. EDA provides what Cheng (2022) terms as an ecological grammar that is general and applicable for the analysis of ecological texts.

Using an ecolinguistic procedure like what Stibbe (2015) suggests, EDA proposes a three-step analytical procedure which begins with choosing an analytical framework guided by the ecosophy, which combines with a linguistic theory. An ecosophy 'is the criterion for judgement of the ecological property and orientation of discourse' (Cheng 2022, P. 190). The second step is to identify the linguistic features in the discourse to find out the ecological orientation. As Cheng

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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(2022) states, the criterion for judging the orientation is based on the relationship between the ecosophy and the ecological characteristics of the discourse. When the ecological properties are in line with the ecosophy, then the discourse is said to be eco-beneficial; when contrary to the ecosophy, then it is eco-destructive; and when it has both aspects that align and those that oppose it, it is eco-ambivalent. They also add a neutral orientation when the properties neither follow nor violate the ecosophy. The final step involves considering the ecological measures in the discourse that can lead to the promotion of a balanced ecosystem.

Method of Data Collection

Data for this study was sourced from two Kenyan communities. A narrative from the Kalenjin community and a song from the Abagusii community were purposively selected to form the data set. The texts were chosen because they represented various cultural and ecological contents from within the two targeted communities. The folk narrative was collected through document analysis by examining the story as is told in the book *Oral Literature of the Kalenjin* by Chesaina (1991). The analysis in this paper is based on the English translated version in the book.

The data on the song was obtained through researcher recollection supplemented by interviews with two selected Abagusii resource persons. Researcher recollection is a method used to collect folklore through the researcher recalling childhood memories as illustrated by Khasandi-Telewa (2023a; 2023b). One of the authors recalled the song as one of the most popular songs from the community and had been performed severally at music and cultural festivals. Though with different renditions at the different occasions, the words of the song remain the same. The two resource persons also categorized the song among the top three songs from the community. Additionally, they confirmed the data as an accurate production from the community.

The song, collected in Ekegusii was translated into English taking care to preserve the original linguistic features as much as possible. A native speaker believed to be knowledgeable in the community's cultural matters and involved in translations of texts to and from English and Ekegusii was purposively identified to corroborate the translations to maintain a balance between the literal translations and culturally appropriate interpretations.

Analysis of Data

The analysis followed the three-step analytical procedure as proposed by EDA. We began by choosing an ecosophy to guide our study, which is 'Variety and Mutuality, Existence and Cooperation'. To analyse the data in a systematic manner, each data sample was analysed individually. We then categorized the data based on the ecosystem type presented in the folklore as either natural or social. We further analysed the texts based on the experiential and interpersonal metafunctions from an ecolinguistic perspective as proposed in the EDA framework.

The experiential metafunction, from an ecolinguistic perspective within EDA, is concerned with the relationships between nature and human, society and human and the relationships among the elements within nature and within society (Cheng, 2022). A transitivity analysis was used to judge the experiential meaning in the folklore. We used the transitivity system combined with the context and culture to examine if the process type, participant role and circumstantial role matched with our ecosophy as well as the four ecosophy maxims of quantity, quality, diversity, and interaction. This helped in finding out the ecological orientation of the folklore as being eco-beneficial, eco-ambivalent or eco-destructive.

The interpersonal metafunction was determined by analysing the mood system and appraisal system. EDA presents an ecolinguistic perspective of the metafunction which can be

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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used to represent the identity, status, relationship, attitude, and judgement of the speech roles in the ecosystem. To analyse the mood system in the folklore, we considered the speech roles, motivations and target based on our ecosophy. The data was examined for the declarative, interrogative, and imperative mood system.

Finally, we interpreted the analyses based on our ecosophy and categorised the data into; those that follow the ecosophy, those that both follow and violate it, and those that violate it. This categorization helped to inform the ecological orientation of each folklore as being eco-beneficial, eco-ambivalent or eco-destructive. The next section presents the findings and discussions.

The Narrative and the Song

The sampled folk narrative ***Korket nyi kiyip Kapkwomjit gaa*** (The woman who took the ogre home) and the song ***Obori bwa baba*** (Grandmother's finger millet), share a common theme of the relationship between humans and nature in the natural ecosystem. They both address environmental concerns and highlight the interdependence between human activities and the natural world. The original and translated versions of the narrative and song are presented below. The data is numbered for ease of illustration and interpretation in the discussion section.

Korket nyi kiyip Kapkwomjit gaa

[1]Kimite keny kapkwomjit nyikimenye [2]uiyet nyikinekite yipe nakamet. [3]Kiwechekei tionyi yomechei kwam chito. [4]Pesiet akenge kuwechekei kwek beindo. [5]Nde kas korket nyi kisemberisie, [6]Kosot kini ndes beindo man. [7]Konom borowet nyi tandan akurat benyito akwip ka. [8]Kingete mono kini kiyeku kapkwomjit benyito. [9]kobundo ka kukur nekoki tukun kubwa ko [10]akimwoji kusisio semenget piko kini mi chi gaa. [11]Kukar kurket akona mata kubene benyi chemoket. [12]Ndei mi kotioche beindo kusuiti ma, kuran chitake. [13]Kuwo kurkat akukatsa. Purio kakas chi. Njam kotie subak benyito. [14]Ndei meche kusuiti ma kukas ranet subak kubunune wonipebeindo. [15]Kuinda beindo ako potanik. [16]Njam kuwek beindo kwek kapkwomjit [17]akwam korket ako nekoki tukun.

Translation

The woman who took the ogre home

[1]Long ago there was an ogre [2]which lived in a forest near a mountain. [3]It used to change itself whenever it wanted to eat people. [4]One day it actually changed into meat [5]when it heard the woman who was weeding. [6]She thought it was real meat. [7]She took a thin rope and tied the meat and took it to her home. [8]She never knew the ogre had changed to meat. [9]When she arrived home, she called her children into the house [10]and told them to be silent so that nobody could know they were home. [11]She closed the door and lit the fire in order to roast the meat. [12]While she was untying the meat to put it on the fire, she heard a man cough. [13]She went to the door to check but there was nobody. It was the meat. [14]When she wanted to place the meat on the fire, she heard a cough again from the meat. [15]She dropped the meat trembling. [16]The meat turned into an ogre and [17]ate the woman together with all her children.

In its context, this folk narrative was used to discourage selfishness and teach the importance of generosity, mindfulness, and respect for the community's set practice of sharing and always cooperating with others.

Obori bwa Baba	**Grandmother's Finger Millet**
[1]Ekebwe ngiakura Manga inse	A fox wailed down the Manga escarpment.
[2]Ee Manga inse ekebwe ngiakura	Indeed down the Manga escarpment a fox wailed.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

[3]*Ekebwe ngiakura Manga inse*	A fox wailed down the Manga escarpment.
[4]*Ee Manga inse*	Indeed down the Manga escarpment.
[5]*Baba motengera enyangweso ndindindi*!	Grandmother dances for the locusts ndindindi!
[6]*Obori bwa baba keande*	Grandmother's finger millet is healthy/good.
[7]*Ee keande obori bwa baba*	Indeed healthy is grandmother's finger millet.
[8]*Obori bwa baba keande*	Grandmother's finger millet is healthy/good.
[9]*Ee keande*	Indeed healthy/good.
[10]*Baba motengera enyangweso ndindindi*!	Grandmother dances for the locusts ndindindi!
[11]*Amaemba a baba amatagoro*	Grandmother's sorghum is big and healthy.
[12]*Ee amatagoro amemba ba baba*	Indeed big and healthy is grandmother's sorghum.
[13]*Amaemba a baba amatagoro*	Grandmother's sorghum is big and healthy.
[14]*Ee matagoro*	Indeed big and healthy.
[15]*Baba motengera enyangweso ndindindi*!	Grandmother dances for the locusts ndindindi!
[16]*Enyangweso yacha yaboriaa*	Locusts came and devoured it.
[17]*Ee yaboria enyangweso*	Indeed locusts devoured it.
[18]*Enyangweso yacha yaboriaa*	Locusts came and devoured it.
[19]*Ee yaboria*	Indeed devoured it.
[20]*Baba motengera enyangweso ndindindi!*	Grandmother dances for the locusts ndindindi!
[21]Seri enyangweso teboria	Chase away the locusts so they don't devour it.
[22]Ee teboria seri enyangweso	Indeed they don't devour it chase away the locusts.
[23]Seri enyangweso teboria	Chase away the locusts so they don't devour it.
[24]Eh teboria	Indeed they don't devour it.
[25]*Baba motengera enyangweso ndindindi*!	Grandmother dances for the locusts ndindindi!

Note: 'Ndindindi' Is an expression illustrating the sound produced by the leg and ankle bells worn by Abagusii women as they dance.

In its context, the song was sung as a work song to remind the community about the historical locust invasion in Gusii land that destroyed a promising harvest leading to a disastrous famine. Whereas the story and song have limited explicit reference to environmental conservation, we could infer some TEK related to environmental conservation based on the linguistic features, context and themes present. An analysis of the linguistic features in the narrative and song can help unearth some of the TEK embedded therein.

Linguistic Features Employed in the Narrative and the Song

Linguistic features employed in the narrative and the song will include discussions on declarative sentences; verbs, agency, emotive coercion; and lexical choices.

1 Declarative Sentences

In the folk narrative, the speaker uses declarative sentences to inform the listeners about the unfolding events and present the argument that anyone who destroys forests is severely punished. The statements are objective and convey straightforward information about the events in the folk narrative. The introduction of the ogre in (1), the very first sentence of the story, highlights the narrative's objective, which is the punishment of an offender. From intertextual knowledge,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Chesaina (1991) indicates that amongst the Kalenjin, the ogre was used as a cane for punishing disobedient members of the community. In (2) of the story, we learn that the ogre lived in a forest near a mountain, the same place where the woman went to weed. This representation is important as it later gives us the reason to believe that the woman receives the punishment because of weeding, an act that presupposes clearing of land and digging. The narrator in (3) tells us about the ogre's habit of disguising itself whenever it wanted to eat up people. This is the composer's way of controlling events to ensure the inevitable punishment for the woman who was weeding in a forest.

Similarly, declarative sentences are also in the song. For example, in line 6, '*Grandmother's finger millet is healthy/good'* and line 11, '*Grandmother's sorghum is big and healthy'* the declarative sentences are used to show the perfect state of the crops. Additionally, in the declarative sentence in line 16,'Locusts came and devoured it' shows the damage done to the crop. These sentences are used to inform the listener about the natural ecological problem of insects destroying human crops. Furthermore, the singer who is the information giver has a strong subjective initiative signalling the community's view about the locusts. The song demonstrates the community's awareness of the presence and impact of locusts on their crops, which suggests a level of ecological knowledge about local pest dynamics. The speaker gives information to the listener in a positive manner thus representing the plague of locusts as a natural phenomenon since most of the time they arrived unexpectedly and were known to leave a devastating trail of destruction.

The song also uses a declarative sentence to show the community's ecological knowledge. In line 1, the singer states '*a fox wailed down the Manga escarpment',* a statement which can be interpreted as carrying an ecological message. As Monanti et al. (2013) point out, in the Abagusii community, a fox wailing was considered prelude of bad news, and in this case, the news concerned the destruction of the crops and the impending famine. The motivation of the speech is to encourage those whose plants are destroyed by migratory insects such as locusts. The community has no control over the invasion and can do little to protect their crops because the locusts are part of the natural environment. The insects anchor their survival on plants and from time immemorial, they have been known to create plagues and once they attack, nothing can be done. The only way out is controlling their breeding through understanding the weather conditions that favour their growth (Shower, 2013). This view, therefore, marks eco-beneficial mood elements. It conforms to our ecosophy 'Variety and mutuality', 'Existence and cooperation'.

2 Verbs, Agency, Emotive Coercion

Both the folk narrative and song use verbs to convey the actions taking place. In the folk narrative, the speaker marks process types, which are mainly action processes. They are concrete actions that have consequences. The action processes illustrated in (3) *'eat people'* by the ogre and in (5) *'was weeding'* by the woman reveal what the woman does and the consequences of that action hence showing the community's disapproval of harmful actions by human beings towards forests near mountains. There are also material processes such as illustrated in (17) *'and ate up the woman and all her children'*. In this example, the doer is the ogre while the circumstance or location is the woman and her children. Eating up all the family members leads to a concrete action of making the family extinct. This is a severe punishment which indicates that engaging in the act of cultivating forested areas near mountains, which by extension is an act of forest destruction, is punishable by death. We note that the speaker interprets events to advocate for environmental protection.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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There is also the use of agentive language in speaking of the actions of both the woman and the ogre. Foregrounding agency emphasizes the power and responsibility individuals possess. For instance, in (5) agency for weeding in the forest near a mountain is attributed to the woman. Digging in the said location may lead to environmental destruction because forests are water catchment areas which must be protected. In addition, the action destroys the vegetation that is a habitat for other living organisms. Foregrounding of the agent allows the speaker to reveal the woman's destructive actions setting grounds for her to be punished. Similarly, in (16) and (17), the agency for eating up the woman and her family is attributed to the ogre; an abstract being considered as a rod of punishment.

In the song, we note the use of the active voice thus pointing out the subject who performs the action. In line 16, the locusts are the agents responsible for the action process of devouring, grandmother the action of dancing as repeatedly shown in lines 5, 10, 15, 20 and 25 while in line 1, the fox performs the action of wailing. All these actions and their agents are important in passing some ecological message. On the surface, there seems to be a contradiction when grandmother dances for the locusts despite the destruction they cause to her finger millet. However, ecologically this can be interpreted as an understanding of the locust invasion as a natural phenomenon and that very little could be done once the locusts attacked the crops.

We further note an emotive mental process in the narrative. The power of the composer of the folk narrative to determine the information presented and how it transforms is seen through acting coercively. From (12) through to (15), the composer presents obstacles to ensure the woman does not roast the meat and instead makes it turn to an ogre who eats up the woman and her children in (16) and (17). Consequently, the animator influences the representations of reality that the listeners hold: if one digs in a forest near a mountain, they will be punished. This can be termed as emotive coercion in what Hart (2010) describes as an intention to affect the beliefs, emotions, and behaviours of others in a way that suits one's interests. The animator exerts some influence over the listeners and their actions to compel them to protect forests by making the ogre eat up the agents of destruction, that is, the woman and her whole family. Emotive coercion can thus be used to tap into the audience's emotions, fostering a personal connection and inspiring them to take concrete steps toward environmental conservation.

3 Lexical Choices

In the song and narrative, appropriate lexical choices are used in line with the ecological message being passed. For example, in the narrative we have the use of the word ‘meat’ in (4) which is a type of meal considered a delicacy in most communities. The composer turns the ogre into meat to make it tempting for the woman. In the Kalenjin community, meat was a meal to be shared with neighbours yet the woman decided to close the door and instruct her children to be silent demonstrating her selfishness. Additionally, we have the use of the word ‘ate’ at (17) when describing what the ogre did to the woman and her family. This shows the ogre did not just kill but it made the whole family extinct since no bodies would be found. This illustrates the punishment meted on the woman, something that any other member of the community would dread consequently discouraging digging in forested areas.

Similarly, the lexical items used in the song aid in passing the message. For instance, in lines 6 and 11 the words ‘healthy’, ‘good’ and ‘big’ are used to describe the state of the finger millet and sorghum in the farm. These words positively appraise the crop and insinuate a promising bumper harvest. Later, in lines 16, 17 and 18, the verb ‘devour’ is used to describe the actions of the locusts consequently bringing out the extensive damage done to the crops. The song also uses

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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the word ‘dances’ in lines 5, 10, 15, 20 and 15 to describe grandmother’s reaction to the invasion on her crops. This is used to demonstrate the community’s ecological knowledge about locust invasion. Grandmother’s reaction of dancing to wade off the locusts instead of going for insecticides demonstrates an ecocentric attitude.

Ecocentrism emphasizes the intrinsic value of all living and non-living things and their natural environment while de-emphasizing human importance. By choosing to preserve the environment through letting the locusts be, at the expense of losing the healthy crop meant for human consumption grandmother can be said to have aligned to the ecocentrism philosophy. The narrative and song thus conform to our ecosophy ‘Variety and mutuality, Existence and cooperation’. It is therefore eco-beneficial as it arouses people's consciousness of environmental protection.

TEK Embedded in the Narrative and Song

In traditional communities, folklores were repositories of a large accumulation of traditional values, beliefs, attitudes, knowledge, and experiences about the environment that the communities acquired from contact with their environment. In the narrative, we note the TEK of preserving forests and water catchment areas through severe punishment of those who engage in unacceptable practices. Farming in the forests was discouraged through the belief that those were special sites and creatures such as ogres, which were considered as rods of punishment and were to be feared by human beings, inhabited the forests. This belief helped prevent human encroachment and human activities in the forests, consequently helping in the preservation of the trees, plants and animal species that existed there.

The community also had values and beliefs in relation to designated areas for human activity. The community required people not to farm in forested areas and mountains, as supported by Snell (2005, p. 46), who states that ‘*mbar* as the cultivated land was called, was supposed to be adjacent to people's homes or was to be the *kokwet* (allotments) which were farmed according to what may be described as 'a primitive system of group farming'. These, he states, were about one to two kilometres from the homesteads. So, it can be said that cultivation in a forest or near a mountain was considered an act of disobeying the set practices and thus punished severely through extinction. This belief helped deter such practices as no family wished to be extinct. In the end, the traditions aided in the conservation of the forests consequently having a positive impact on the environment.

The song embeds TEK about the existence of various players in the natural environment. It has a mention of human beings, plants, insects, and animals. They all have a role to play and a right to exist. Locusts anchor their survival on plants and despite their destructive actions on crops meant to feed human beings, man is supposed to get a natural way of eliminating them. The community seems to have the knowledge that once a locust attack happens, man has very little to do, and that explains why grandmother simply dances. This is in line with the scientific argument that preventive and pro-active methods that have as little as possible disruptions to the environment are the ideal methods for locust control (Shower, 2013). Shower does not advocate for anti-locust insecticides which he states negatively affect the human handlers and the environment.

Traditionally communities also recognized the role of animals in passing ecological messages. For instance, in the song, the wailing of the fox is mentioned because the community considered the fox as a carrier of bad news as earlier mentioned. They could predict seasons as in this case where the fox can be said to have predicted a season of famine. In this way, animals assisted in solving human problems by communicating important information that helped them

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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find coping mechanisms. It was through such communication, facilitated by their good knowledge of the land, that indigenous people noticed a change in the quality of the environment as soon as it occurred.

There is also traditional knowledge on the existence of different seasons whether bountiful or meagre. The Abagusii demonstrate an understanding of different seasons and the cyclical nature of resources, which sometimes resulted in poor harvests such as when locust attacks occurred. The main actor's reaction in the song shows the acknowledgement and acceptance of the natural phenomenon. This knowledge helped reinforce the importance of sustainable resource management to ensure long-term food security. Such knowledge can help the community practice proper utilization of available resources.

The folk narrative and song carry TEK that emphasizes the intrinsic value and interconnectedness of all elements within the ecosystem. The communities recognize that every living and non-living thing, regardless of its utility to humans, is an integral part of the ecosystem with an inherent worth thus deserving of respect and protection. These biocentric (recognizing value of all living things) and ecocentric (value of both living and non- living things) worldview acknowledges the immense value of biodiversity that can lead to environmental protection. The folk narrative and song discourage the anthropocentric attitude whereby humans put their interests first at the expense of other living organisms.

Conclusion and Recommendation

Whereas the folk narrative and song under analysis were generally meant to entertain, warn and teach certain virtues, their ecolinguistic analysis indicates further lessons on protection of the environment. The analysis aided by the EDA framework shows that verbs represented the doing action processes and declarative sentences were used to represent the speaker's identity as an environmental conservationist, and modality which commits the speaker to the truthfulness of the statements used to promote the protection of the environment. Additionally, foregrounding of agency ensured that the agents of destructive practices are identified and punished to curtail the bad deeds. Further, emotive coercion was used to influence the listeners' representations of reality about the environment. In this way, the community's teachings contained values and social beliefs that promote an ecocentric view in relation to the environment. It emphasizes the need to move away from what Fill (2000, p. 49) calls the 'anthropocentric and mechanistic worldview, which perpetuates the separation of humans from the rest of the creation and the embracing of the biocentric and ecocentric worldview'.

The study concludes that the linguistic structures used in folklore have the potential to shape the community's perceptions of the environment, influence their attitudes towards the environment and be used to promote sustainable environmental practices. The findings further indicate that narratives and songs embed TEK which can promote sustainable environmental practices such as forest and biodiversity protection. Thus, folklore can be used to raise people's ecological awareness and improve their behaviours towards the environment making it possible for human beings to mutually co-exist with other organisms in the environment.

This study, therefore, recommends that environmental managers and policy makers should recognize the value of TEK, ensure its documentation, and incorporate it into environmental planning and decision-making processes in a complementary manner with science-based knowledge. We take a stand similar to Maweu (2011) who argues that despite modern western ecological knowledge and TEK being conceptually different, none should be regarded as superior to the other and instead they should be applied in a complementary manner since they are premised

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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on two different worldviews. Considering that there is a substantial amount of TEK embedded in folklore, educationists should endeavour to use different categories of folklore to transmit these ecological values to the younger generation through incorporating them into class texts and other learning and teaching materials. In this way, we can bring up a generation that has a high ecological awareness consequently playing a part in promoting sustainable environmental practices.

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Mitigating Climate Change Through Gikuyu Indigenous Knowledge: An Ecolinguistic Perspective

Jane Ngoiri Njuguna,[1*] Vicky Khasandi[1], Sinfree Makoni[2]
[1]Laikipia University, Kenya
[2]Pennsylvania State University, USA
*Corresponding Author

Abstract
Scientific approaches are necessary but inadequate in climate change mitigation. The paper sought an integrative approach to reverse the impact of climate change through Kikuyu indigenous knowledge as manifested in the stories the community lives by. The rich cultural knowledge which needs to be transmitted is declining due to the effects of socioeconomic modernity. Lack of transmission of this cultural heritage, part of which is language, might lead to deterioration of the environment thus disrupting ecosystems. Speakers use language to interact with their environment, thereby preserving it. Conversely, incompetence in language leads to a decline in biodiversity. The main objective of this paper was to analyse the stories the Kikuyu community lives by from an Eco linguistic perspective. The stories analysed are ideologies, metaphors, framing, narratives, evaluation, salience and erasure. The paper used a narrative literature review methodology and analysed peer-reviewed journal articles. Part of the data was obtained from the mass media and researcher's knowledge of community's cultural knowledge. Eco linguistic and Deconstruction theoretical frameworks were used to explain the impact of the stories the community lives by and discuss how eco-destructive narratives can be reconstructed or deconstructed. It was found out that the stories the community lives by were partly responsible for the climate change crisis and the need for integrating scientific and indigenous knowledge was advocated.

Keywords: Biodiversity diversity, climate change, eco linguistics, indigenous knowledge, language diversity

Introduction

Climate change mitigation has traditionally relied on scientific methodologies which are necessary but insufficient. Indigenous communities possess a deep understanding of local ecosystems, weather patterns, and resource management that are yet to be fully utilized in central Kenya which has rich agricultural potential but adversely affected by climate change. The main objective of this paper is to explore climate change mitigation through the stories the kikuyu community lives by. The stories are derived from everyday discourses. Sources of this discourses are community's indigenous knowledge and mass media and expressed in the community's language. This study examines the transformative role of language embedded in cultural knowledge of kikuyu community to navigating the climate crisis.

The paper has an eco-linguistic orientation and examines the intricate relationship between language and the environment. It also provides insights into how language shapes our attitudes,

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

behaviour, and policies towards the environment. It, therefore, fosters environmental awareness, promoting sustainable practices and addressing complex challenges climate change poses. The paper is organized into distinct sections, beginning with an introduction, followed by methodology, theoretical frameworks, literature review, discussion, and conclusion.

In terms of methodology, a narrative review method was used. The methodology holistically synthesize literature (Rother, 2007; Turnbull et al. 2021a) allowing for an exploration of the stories the community lives by. The approach also provides a contextualized understanding and aids in integrating diverse sources to uncover patterns, trends, and gaps in the Eco linguistic landscape. The methodology provides depth and insight into the current research (Snyder, 2019).

Relevant studies were identified to comprehend the stories of the community lives by particular literature on eco linguistics, indigenous knowledge, and deconstruction theories. Reputation of peer-reviewed journals was also assessed. Databases such as Tylor and Francis, de Gruyter, International Journal of Arts, Google Scholar, and Science Direct Social Science were sought. The purpose was to review peer-reviewed journals and articles. Inclusion and exclusion criteria were stipulated to avoid bias in selection. Recent journals spanning ten years were sought unless in cases where older literature was deemed necessary. The literature reviewed was limited to eco discourse from a narrative analysis framework. Indigenous literature was reviewed through primary sources. Additionally, mainstream media commercials were investigated, and Stibbes (2021) classified the community's narratives into a typology.

Data was systematically gathered, and critical information from the sources was summarized, analysed, and synthesized to obtain findings and critical themes in the stories. Each selected study was thoroughly read to gain a cohesive understanding of the subject.

Theoretical Framework: Theory of Ecolinguistics and Deconstruction Theory

Eco linguistics examines how language shapes and reflects our perception of the environment. It also promotes language that recognizes the intrinsic values of all living entities but challenges anthropocentric perspectives. Eco linguistics also explores how language constructs and reinforces societal attitudes towards nature and examines the role of language in biodiversity conservation by examining metaphors and frames and how they shape our understanding of ecological processes and sustainability. Most theories dealing with stories communities live by have a psychological orientation, and thus, there is a need for a linguistic theory that can explain climate change.

The language embedded in the community's discourse shapes their perception of the environment. For instance, Kikuyu narratives on consumerism, as expressed in proverbs such as *kinene kiuru no karonda* (large quantities are appreciated except for a wound), create a consumerism mentality that can lead to the destruction of natural resource in the pursuit of land acquisition. Some stories demean nonhuman entities in the ecosystem structure. Some animals are framed negatively in proverbs, for example, *wakahare akirumia ndarama waruhiti arumagia muka* (while the hyena was beating his wife, the hare was beating a drum). The nonhuman hyena is framed as foolish and can, therefore, be eliminated from the ecosystem.

In the Kikuyu oral tradition, even food is gendered. For example, while millet was a woman's crop, banana was a man's crop since the man was responsible for propping it. There were differential assignments to labour tasks (Musalia, 2010), which could lead to negligence of some crops, thus affecting ecosystemic balance; metaphors and frames can create attitudes on how we relate to nature. Critics of the theory argue that there is simplification and determination by attributing climate crises to linguistic construction, yet climate change challenges are multifaceted. In this study, we advocate for an integrated approach to climate change.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

The deconstruction theory is associated with Derrida (1967) and relies on textual instability, binary opposition difference, and logocentric critique. The theory seeks re-evaluation of established concepts and invites a more nuanced understanding of language and interpretation. It is vital to note that the stories, which in this case are the spoken texts, are not absolute truth due to the fluidity of truth in the text. For instance, an advertisement praising commercial feed over natural feed does not convey absolute truth.

Binary opposition implies that language privileges one term over another and creates hierarchies, leading to misconception and reinforcing power imbalances. For instance, there is a binary opposition between anthropocentrism and ecocentricism.in Kikuyu stories, and anthropocentrism has been praised over ecocentrism. For instance, in the famous Kikuyu proverb *igutunywo mwana niikigirio mungu* (when an animal is being snatched of its young) food is given to make it forget the pain of losing it.

The other tenet is difference. Difference, according to Derrida, refers to fluidity in meaning. Meaning is unstable as words will differ, and their meaning may be deferred. For example, the popular Kikuyu advertisement on *migunda maguta maguta* (land that is as good as oil) prospective buyers of the advertised plot may be disappointed after noting that the advertised land could be unproductive.

Finally, the concept of logo centrism implies that we cannot have speech or writing representing the truth. Derrida argues that no ultimate fixed point of reference or foundation for truth exists. In order to deconstruct the Eco destructive stories in the context of the theory, we are called upon to question assumptions, unveil hidden structures, and recognize the inherent instability of language and meaning. Logocentricism applies to eco discourse because the stories the community lives by are taken to be absolute truths; for instance, that progress is associated with flashy and posh living in the urban area neglecting rural area with calm natural surroundings.

Literature Review

Eco linguistics deals with the relationship between language and the environment. Language affects the way we think about our environment. According to Stibbe (2015), the greatest threat to humanity is not terrorism but the deterioration of the environment due to stories that focus on unlimited economic growth, consumerism, progress, individualism, success, and human domination of nature. Stibbe questions the validity and value of these stories that emanate from newspapers, magazines, advertisements, films, nonfiction, and visual images. He invites us to search for new stories and proposes that a discourse analysis approach is necessary to search for new stories that can change our environment since we think, talk, and act according to the stories we live by.

Recently conducted studies on the stories we live by use diverse approaches, themes, and theoretical frameworks within eco linguistics. Literary texts have been analysed to explore how characters relate to their environment**.** Nameen and Sarhan **(**2021) explore *Sunset Oasis* by Baha Taha. He uses the appraisal theory to show the stance of the characters. Das and Chanda (2023) explore the healing impact of nature in Toni Marissoni's novel *Home.* The novel presents nature as benefactor and healer. Quratul et al. (2023) focus on a Stibbe typology on erasure (Stibbe, 2015). The reviewed works examine how commercial advertisements for food products has been partially or entirely erased. The advertisements analysed underpin stories of conviction, metaphor, and erasure.

The current paper focuses on the stories we live by and derive data from indigenous knowledge and mass media. Local perception and knowledge are crucial for community-based

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

climate change adaptation measures and the conservation of natural resources as traditional knowledge is crucial regardless of global change, cultural erosion, and transformation challenges. Chanza and Masakwa (2022) also affirm that indigenous local observation can enrich our knowledge of climate change. Considerable research in Gikuyu has revealed the devastating consequences of climate change on the local community. According to Savenije (2021), Rockstrom (2003) and Ngetich et al. (2014), rain-fed agriculture dominates the central highlands of Kenya.

Indigenous people create regional, traditional, and distinctive indigenous knowledge. This knowledge is critical for catastrophe classification, preparedness, and mitigation (Greiner, 1998; Nakagawa & Zhang, 2018). This knowledge, may, at times exceed the capacities of modern science and technology in the context of disaster response (Nakashima, 2010; Hiwasaki et al., 2014b; Dewan, 2015). The preservation of ecological information, a component of indigenous knowledge communicated through cultural expressions and oral tradition, is both necessary and economically feasible for long-term progress, particularly in locations where environmental protection is critical.

The global shift towards socioeconomic modernity has led communities to forsake their native languages and abandon traditional environmental knowledge. As a result of delocalization, communities seek guidance and the will to sustain ecosystems in their new locations. These cultures have yet to accept alternative narratives as guiding principles for their survival. The move from indigenous knowledge that is distinct and culture-specific to a universal culture characterized by consumerism, capitalism, civilization, and anthropocentric economic tendencies is responsible for the current climate quagmire.

Language plays a vital role in shaping engaging narratives essential for maintaining the stability of our social structure. We must reassess our storytelling approaches to our planet to uphold this structure. Transformative narratives can change or help create new ones. Kingsnorth and Hine (2009) examine the Dark Mountain Project and argue that it challenges the concept of civilization and presents an alternative viewpoint by denouncing human-caused Anthropocene activities by searching for new stories. Analysis of the *stories we live by* was conducted using the typology by Stibbe (2015) though not in its entirety: ideologies, framing, metaphors, evaluations, identities, beliefs, erasure, and salience were evaluated.

Decoding Kikuyu Environmental Ideologies

Ideologies manifest as verbal expressions of shared beliefs within a social group. Everyday discourse among individuals reflects these beliefs, contributing to understanding the world. Language usage and ecological perspectives can illuminate individuals' ideologies regarding ecosophy; fostered through the incorporation of ecological knowledge. It impacts technical, environmental, moral, and ethical concerns and advocates for personal convictions and actions, arguing for an end to anthropocentric perspectives and promoting ecological harmony (Bernaerts et al., 2013; Naess & Devall, 2008).

Some Kikuyu proverbs reflect the community's ideologies; for example, *Kindu kiuru no kibungo* (every currency is acceptable , as long as the currency is not a button). This is an example of an unsustainable and consumerist ideology in Gikuyu culture. The preceding aphorism emphasizes the importance of each business aspect and the pursuit of profit maximization. Entrepreneurs are encouraged, aphoristically, to maximize profits to the detriment of the environment. This viewpoint is reflected in the eco-destruction story, which pits profit against nature.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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Greed and materialism are embedded in these two proverbs as the first has a connotation of grabbing, and the second implies amassing as much wealth as possible: *Kuria mbere ti gukorok*a (being the first to eat does not imply greed) and *Kinene kiuru no kironda* (the only thing that is truly terrifying is a wound). These proverbs demonstrate how modern civilization's consumerist discourse hurts the environment by encouraging greed, competition, and consumerism. The proverbs reflect capitalism's destructive and unfettered national ideology, threatening to deplete environmental resources. The proverb *cia thuguri itihuragia ikumbi* (purchased goods cannot fill a granary) emphasizes that acquiring material belongings does not ensure prosperity. It suggests that natural resource management is required to achieve goals. The preservation of the environment is critical to the survival of the human race. As a result, the saying encourages diligence and efficient use of natural resources. The proverbs emphasize the value of competition and enterprise in managing land and natural resources, alluding to the negative impacts of over-exploitation, mismanagement, and depletion. Such a proverb is eco-beneficial.

According to Stibbe (2015), investigating a group's ideas necessitates analysing social agents, actors, recipients, transitive verbs, and the product. In a Gikuyu television commercial (Inooro Television, 2023), a cow is fed on commercial feed and produces large amounts of milk. The primary agent is feed, and the recipient is a cow. The underlying narrative in this commercial advertisement is that commercial feeding is preferable to natural feeding. The spread of this mindset through the media may make farmers prioritize commercial commodities more than natural feeds, resulting in ecological disruption and environmental harm as natural fodder may be neglected. Greed, consumption, and anthropocentric beliefs are all promoted by an economy that prioritizes wealth through non-natural means. The story we create and perpetuate in advertisements of artificial products is that nature can be substituted, which is an ideology opposed to environmental conservation. For instance, commercial fertilizers' preference for manure conveys a similar ideology.

The Power of Framing: Analysing its Impact on Ecosystems

Framing is complex and context-dependent (Nijland et al., 2018), as language is tailored to align with diverse pre-existing beliefs of different audiences (Nisbet, 2009). We use cognitive frames to evaluate the world (Dewulf et al., 2009). The source frame is built on a plausible perceived reality separate from the target domain. Cognitive schemata, or frames, connect narratives, build cohesive accounts within temporal, historical, and geographical settings, and integrate thoughts and subjects. For instance, Hameed (2021) asserts that animals are accorded prominent or destructive roles in Quranic discourse as beings, benefactors, heavenly signs, food supply, cherished goods, battle instruments, and holy emblems. It is critical to understand how animal frameworks influence ecosystems. Animals framed negatively are less valued and can be killed, causing an ecosystem imbalance.

It is critical for frame selection to identify trigger phrases during the framing process. The framing analysis of Stibbe (2015) suggests that clusters of linguistic elements unique to a specific group be used, whereas trigger words elicit specific mental imagery. For example, according to a Kikuyu proverb, *njogu ndiremagwo ni muguongo wayo* (an elephant can carry its tusks, however heavy), trigger words are *heavy* and *power*ful. The main topics are *tusks* and *individualism*. Elephant power, not tusk weight, is the solution to this concept's quandary. The proverb is ecologically ambivalent because of its contradicting opinions, yet it emphasizes the importance of coordinated efforts to fight climate change. While promoting individualism, the proverb depicts the elephant as a docile beast with tusks but submissive to human beings. The audience is alarmed

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

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by the elephant's might. This phrase implies that artificial activities pose a threat to climate change mitigation. Climate change is an enormous phenomenon, but like the proverbial elephant, we should tackle it efficiently and with much ability.

Another Gikuyu proverb states that *Iganagwo yari iria yakua* (A good dairy cow is only praised posthumously). Critical phrases are *praised, milk cow,* and *posthumously. Consumption* is the domain frame, and *a milk cow* is the frame of reference. The topic *of milk production* is in the spotlight. The word *commendation* could be used to describe the solution framework. The story implies that lower-ranking species should never be acknowledged. This proverb highlights potential environmental concerns. The story aphorism encourages environmentally harmful consumption, such that human beings perceive other creatures as having a lower rank and are only valued for profit.

In the proverb, *Kanyoni kabariti keninagira njoya* (the little bird that spreads its wings perishes), the trigger *is little bird, feathers, wings, and 'ruin,*' with *motion* as the contextual framework. *The inconsistency or instability of a small bird species* is the problem, moderation is recommended. According to the argument, avian species are essential to the environment and should be safeguarded for intrinsic and utilitarian reasons. Avian species are not immune to having inherent worth in terms of climate change.

Cloudiness is commonly associated with those who have disagreeable personalities in narrative literature. A person with such a personality is said to be *athititite ta itu* (He/she is so upset that they resemble a cloudy sky). This image of a cloudy sky is an unfavourable portrayal of the weather. In Kikuyu's oral narrative, a story about the community's rainbow paints the phenomena negatively. The rainbow has been anthropomorphized and given a carnivorous vibe. Following the depletion of the famed animals and human beings by the rainbow, the central character of this Kikuyu story resolves to exterminate it. The connection between precipitation and rainbows may contribute to social antipathy to this natural event.

Another well-known Kikuyu proverb states, *mburi ya rwagatha ndikiraga* (a chattering goat is never quiet). Goats considered troublesome can be sold or slaughtered. Positive frames are attached to hares and rabbits, which may contribute to climate change as animals with a positive frame can be maintained and the ones with a negative frame can be gotten rid of.

Unveiling Metaphoric Language used in Kikuyu Discourse Relating to Natural Resources

By identifying shared characteristics, metaphors facilitate the comprehension, perception, and visualization of diverse entities or procedures (Thibodeau et al., 2019). Gikuyu radio stations and advertisements for *migunda maguta maguta* (plots that are as good as oil), land for sale is portrayed as valuable, replenishing and moisturizing providing a smooth and supple feeling. The choice of words increases exposure to land availability through the utilization of language. Potential buyers are persuaded to purchase land regardless of the environmental hazard that clearing bushes might cause. In media, strategic choice of words is critical (Rai, 2013; Semino 2013).

A Gikuyu cultural song called *Muthirin'gu: Gikuyu Muri Irimu* (Wakaba, 2013) (Muthirin'gu: Gikuyu people you are foolish) praises sorghum and finger millet crops that were grown by the community is metaphorically compared to wheat. *Mwere wi makumbi bururi wa Kirinyaga na mwere na Makumbi ni ngano ya agikuyu.* (sorghum and finger millet are the wheat of Kikuyu land.) Wheat was associated with the white man, and community members were dissuaded from abandoning indigenous food. *Muchugwa: Nyumba ya wambui wa maitu (Muchun'gwa:* Wambui, my sister's house), which is thatched with grass and cattle tails. (Wakaba, 2013) persuades community to embark on livestock farming so as to get grass and cattle tails.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

A Kikuyu program is labelled metaphorically as *Gucookia Ruui Mukaro* (Restoring the river to its origin). Kikuyu's traditional culture is likened to a river that has left its source and should now be restored. Restoration implies rehabilitating or rejuvenating cultural knowledge to rescue the environment.

Depiction of Nature in Kikuyu Narratives

*Ngai (*one who shares*)* bestowed the universe on Gikuyu, the progenitor of humanity. The region was distinguished by its rivers, valleys, verdant forests, and abundant fauna. Kikuyu was commanded to build his dwelling near a *Mugumo* (fig) tree, an emblematic figure representing the harmony between humanity and nature that holds significant cultural and spiritual importance to the Kikuyu community and symbolizes unity, strength, and spiritual connections. The embedded narrative is an eco-centric one indicating harmony with nature.

The harmony between Kikuyu parents was maintained until new stories of civilization, consumerism, economy, individualism, and greed invaded the existing tranquillity. Today, nature and human beings are adversaries. Eco-beneficial narratives such as the one above have been abandoned. The storytelling style influences ecological systems. Storytelling styles can resist eco-destructive discourse, and linguistically embedded indigenous knowledge can make information more memorable, enjoyable, and accessible. The art of storytelling enables us to react flexibly to the agency and dynamics of nature by establishing a connection between oneself and others (Nanson, 2021). During a storytelling session, we intertwine stories of both self and others, creating a narrative mosaic that keeps everyone hanging on to every word, thus genuinely being part of nature described in the oral narratives.

Numerous popular local radio and television programmes depict Kikuyu's rich and untainted culture, such as the *Gucokia Ruui Mukaro* (restoring the river to its origin) initiative, which advocates for ecological restoration and eco-friendly discourse. According to Kikuyu oral tradition, most ceremonial rites feature goats and sheep. The Kikuyu society is concerned with the welfare of sacred sacrificial animals.

A Critical Evaluation of Kikuyu Nature Discourse

By analysing appraisal patterns, one can discern the narrative being constructed; for example, posh living is deemed favourable as evidenced by the lexical attributes present in a Kikuyu commercial advert endorsing land sales, for example, *ii hihi niwiriragiria gwaka mucii mwega*? (Do you desire to build a good house?). *Hena maai maingi ma borehole ni micii miega?* (The land has borehole water and is for sale with several constructions). This advertisement portrays borehole water as satisfactory and supports felling trees to make way for aesthetically pleasing structures by using phrases like *good* and *very good*. Additionally, the ambiguous expression *Wira ni Wira* (Work is work) promotes the notion that work is valuable as long as it provides an adequate income.

Erasure of Kikuyu Environment in the Community's Lived Stories

While language can emphasize some aspects of an event, it can also diminish others (Stibbe, 2015). It is critical to scrutinize the explicit portrayal of information and that which has been concealed, omitted, or removed. The Gikuyu oral tradition, known as *Kirira* (Oral tradition), is rapidly fading. As the community's anchor, *Kirira* is an indispensable source of the stories by which the community lives.

The Gikuyu courtship and matrimonial rituals were ornate and followed the community's prescribed protocols. Upon arriving at the girl's homestead, the betrothed and accompanying

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

youths would solemnly consume yams and porridge. According to traditional agricultural practices, men grow yams and arrow roots. Kikuyu oral tradition vehemently opposes the substitution of money for animals in modern bride price. As a result of its monetary focus, modern bride price has resulted in the depletion of animal populations. As an additional component of bride price, a tree branch is planted to represent the bride's reservation. Neglecting local tree species establishes a link between the extinction of languages and the decline of biodiversity. In addition to plant and insect names, animal familial terms such as *ndurume* (male sheep), *mugoma* (female sheep), and goats, are being eradicated from the Kikuyu language.

The Role of Salience in The Kikuyu Environmental Protection

According to Dioum (quoted in Wilderness Workshop, 2016), our appreciation will be limited to what we know, so our conservation efforts will be focused on what we value. We must emphasize qualities through clear, prominent, and precise communication, especially regarding the environment.

A horizontal camera angle serves as an additional pragmatic method of communicating principles of equality and reverence for the environment. Smaller creatures should receive more attention in visual displays representing the Kikuyu language, as they contribute significantly to environmental sustainability. Nature is highlighted when linguistic characteristics are visualized. Due to their cognitive and physical experiences, animals should be portrayed as independent beings with psychological qualities. Alternatively, for example, one of the local television stations in Gikuyu gives salience to Mount Kenya in a segment that serves as a prelude to the news bulletin. Another station emphasizes modern cities replete with skyscrapers. We attribute ethics to what we perceive and experience. Dioum (in the Wilderness Workshop,2016) contends that our capacity to conserve is proportional to our love for it and that our understanding of love is limited to what we have been instructed. We should be instructed in environmental conservation by the media.

The Discussion

The ideologies, framing, narration, evaluation, salience, and erasure stories presented in this paper are some narratives the community lives by. These stories are derived from the community's discourses, cultural heritage, and the mass media. The content embedded in these stories about climate change conversation can be related to the environment and broadly classified as eco-beneficial, ambivalent, or eco-destructive. According to Stibbe (2021), the stories we live by can influence our thoughts and actions.

The stories created and perpetuated in the community are on consumerism, greed, entrepreneurship, and anthropocentric tendencies, as reviewed in the framing of the animal proverb, *kuria mbere ti gukoroka (Being the first one to finish does not imply greed).* A consumerism narrative can lead to amassing as much wealth as possible at the expense of natural resources, which contravenes the conservation of the environment.

An observation of the Kikuyu land indicates an area with climate devastation, yet scientific mitigation measures have been undertaken. The measure taken should be context-specific because different cultural groups are endowed with indigenous knowledge from which communities derive and create stories relating to their environment. The Kikuyu community needs to be sensitized on how the environment relates to their discourse, given the devastating effects of climate change in central Kenya, as evidenced by landslides and the decline of cultural knowledge. Scientific measures should go hand in hand with creating eco-friendly discourse to mitigate climate change

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

Indigenous knowledge connotes awareness of non-living entities some of which were awe-inspiring and therefore preserved because they connected the deity with human beings. Postmodernism has replaced these stories with the ones of consumerism, greed, and materialism perpetuated through media such as unwarranted sales of land and subsequent clearance of natural resources.

Eco linguistics discourse serves as a potent instrument in mitigating climate change by fostering empowerment, with the community playing a pivotal role in reversing environmental impacts. However, the practical application of this strategy is yet to take effect. Sensitization on the effects of climate change mitigation is yet to be carried out. This sensitization should be applied to all communities to reclaim the rich cultural heritage that once protected Mother Nature. For instance, stories classed as erasure in the Kikuyu categorization denote that much of Gikuyu kiriira (rich oral heritage on Kikuyu customs) has been erased. The erasure of cultural heritage is prevalent in other communities.

The study's findings can help stakeholders alleviate the frustration that comes with our incapacity to handle climate change as we cannot predict the weather patterns or mitigate climate change. The stories we live by can change how we perceive and act towards our environment, and censorship on the media so that whatever is being consumed by the public contributes to climate change mitigation. A collaboration between scientists and professional Eco linguists would help alleviate climate change without scientists demeaning and disregarding the vital role played by Eco linguists perceiving indigenous knowledge as superfluous (Lesperance, 2017; Whitefield, 2015). We advocate for a collaboration between Eco linguists and scientists to solve the climate change crisis.

Conclusion

The exploration of narratives woven into the fabric of the Kikuyu language has been discussed in this paper. It has been established that ideologies, framing, metaphorical language, evaluation of various commonplace objects, erasure of the ecosystem, and giving salience to the ecosystem are stories in which linguistic embedment and interpretation influence our perspective and utilization of the ecosystem. These stories can be eco-beneficial, ambivalent, or eco-destructive.

Although it has been asserted that narratives influence our thoughts and consequently, how we behave toward the ecosystem, the community needs to be cognizant of the benefits of these stories. Instead, a unilateral scientific approach has been advocated. This method is necessary but needs to be improved to alleviate the impact of climate change on the Kikuyu community.

An amalgamation of scientific and a re-valuation of the stories the community lives by is fundamental because one approach is inadequate to address the climate change crisis. There is a need to search for new stories from indigenous knowledge and the mass media. Climate change mitigation can only happen by having a multidimensional approach. Mass media is a powerful force for redirecting the trajectory of eco-destructive narratives.

The paper was anchored on a comprehensive narrative literature review. The methodology was used to map out the significance of the stories we live by from Stibbe's Eco linguistics perspective. Theoretical underpinnings of the study were Stibbe's Eco linguistics perspective and Derrida's deconstruction theories. The former perspective provided a framework and explained the stories in which we live by. In contrast, the former was used to demonstrate how the ingrained narratives can be deconstructed or reconstructed. We conclude by advocating for the inclusion of an Eco linguistic perspective in dealing with the climate change crisis.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LAIKIPIA UNIVERSITY JOURNAL OF SOCIAL SCIENCES, EDUCATION AND HUMANITIES

Use of Songs as An Effective Communication Tool for Climate Change and Transformative Action in Kenya

Grace Waithira Njenga
Department of Literary and Communication Studies, Laikipia University, Kenya

Abstract
Music is a powerful tool that can be used for transformative action. Music can be used to communicate information and emotions, and thus, it influences the way people think and how they view the world. A song is a musical piece involving lyrics that can be sung with or without accompaniment. Songs have always been a uniting cultural tool throughout human history. Songs serve not only a single purpose of entertainment but also educational purposes. The objective of this research is to analyse the climate change themes addressed in environmental songs by Kenyan artists and to examine how these songs can be used in climate change conversations. Songs about climate change can drive and encourage people and even countries to make positive changes. Even though songs play a crucial role in transforming people's minds, limited research on using songs in climate change action has been done in Kenya. Kenyan artists have composed songs on climate change. However, only some of these songs are popular, but we predict they can bring substantial transformative change if utilized. This research uses data from YouTube channels. The study adopts a descriptive design guided by the Ecocriticism Theory. The researchers relied on previous studies and critical analysis of scholarly texts on songs. We argue that songs by Kenyan artists have themes that express the scenario of environmental degradation due to climate change. These songs can be an effective communication tool about climate change in Kenya.

Keywords: Climate change, communication tool, environmental degradation, Kenyan songs, transformative action

Introduction

Climate change and environmental degradation affect all humanity regardless of social class, economic system, political orientation, or profession. Climate change refers to long-term shifts in temperatures and weather patterns in a region. Different countries adopt diverse ways of addressing climate change in their region. In 2010, the government of Kenya rolled out a strategic plan on how to deal with environmental degradation. The plan was part of attaining the Vision 2030 agenda on climate change (Government of Kenya, 2010). Favourable climatic condition is a major driving factor for most economic activities. In Kenya, the primary economic activity is agriculture, thus greatly affected by climate change.

Scholars have researched and written about the mitigation practices of climate change. The government has also involved other stakeholders in the fight against environmental degradation (Abbass et al., 2022). Government agencies, private sectors, youth groups, women's groups, faith-based organizations, and the media have participated in the climate change debate. Despite the efforts by the government, climate change awareness still needs to improve countrywide. Most community members need to recognise their role in the fight against climate change. Therefore,

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

there is a need to create awareness among community members. The government strategy plan highlights different tools that can be used to create awareness. Some of the tools proposed include print and electronic media, drama, community forums, and integrating climate change into the education system, among other ways (Government of Kenya, 2010). The role of creating awareness is to make citizens better informed on climate change issues and actively participate in programs to combat it.

There is a need to create appropriate models of communication that will be used to transmit and disseminate information on climate change. The community should own the communication model and devise appropriate tools for dissemination. These models and tools should have local content relevant to the target community. They should also have a language and cultural relevance for people to identify with. One such communication tool is the use of songs in climate change conversations.

Songs are emotive; hence, they can change the world by encouraging people and countries to make positive changes (Nabeta & Ongutte, 2014). Songs can be found in all spheres of life and serve diverse purposes. Songs make one creative, play with the emotions, make learning enjoyable, and develop listening skills. They can influence what people think and their view of the world. They also serve as a uniting cultural tool across the world.

In Kenya, artists have composed and sung songs about climate change. Even though most of the songs on climate change may be unpopular, they contain themes that express the scenario of environmental degradation due to climate change relevant to the Kenyan community. These songs touch on deforestation, environmental degradation, and other elements of climate change in Kenya.

Unlike the scientific jargon used in climate change workshops and forums, songs use simple language that people can flow with. Songs play a crucial role in transforming people's minds. Hence, more research on using songs on climate change action should be done in Kenya. This paper analyses the climate change themes addressed in environmental songs by Kenyan artists and examines how these songs can be used in climate change conversations. We argue that songs with themes on climate change can be an effective communication tool for transformative action. Such songs can be used as educational tools for climate change for the current and future generations.

Methodology and Theoretical Framework

The researcher deliberately selected three songs from the YouTube channel that have themes on climate change for analysis. These songs were selected from a pool of ten based on the thematic areas each song covered. The song's thematic areas were analysed, and a comparison between the songs was made. The research adopts a descriptive analysis where the themes of each of the songs selected were critically analysed.

This study is guided by the ecocriticism theory. Ecocriticism, also known as literary ecology or environmental literary studies, is the study of literature and its relationship to ecology (Barry, 2020). It adopts an interdisciplinary point of view where scholars analyse texts that illustrate concerns and examine how literature treats the subject of the environment. The following tenets of ecocriticism were used to guide this research:

- Ecocriticism theory studies the interconnection between nature and culture. This tenet was useful in investigating the cultural aspects of the songs.

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

- Ecocriticism, as a critical stance, has one foot in literature and the other on land. Through this, it was possible to discuss how man relates to the physical environment through the language used in the songs.
- Ecocriticism deals with the relationship between the physical environment and human beings. This tenet was useful in analysing how humans interpret land by reviewing the themes of the various songs.

The Role of Songs in Creating Environmental Awareness

Music remains one of the most universal ways human beings communicate and express their views in the present world. Music has been a characteristic of the human condition over the years. People of all ages and cultures worldwide use music as their language of communication. Although musical behaviour is universal, its achievement is shaped by the environment and experiences of people (Andang'o, 2020). There are different types of songs in every community. These songs are used for different purposes to cater for the diverse needs of society. The purposes of songs vary from entertainment, education, recreation, uniting the people, and cultural identity among others. Every community has its songs, which mostly harbour the culture that serves as an identity of a particular community.

In a study carried out on a song from the Central Pacific atoll nation of Kiribati, Hermann and Kempf (2021) argue that emotive songs are one of the artistic forms the community uses to articulate the vulnerability of the will to face the challenges brought by climate change. Further research shows how, in Kiribati, the Pacific Islanders used the reticulations of Noah Story with politics and songs to face the challenge posed by climate change (Kempf, 2017). Through songs, the Kiribati community reclaimed power, which brought meaning and shaped their future concerning land, culture, and nature. Mills (2016) claims that protest songs can be used to change how the community views the environment. The protest songs covered topics on the effects of climate change on global agriculture and environmental justice.

In Kenya, some communities perform rainmaking rituals to appease the gods. Rainmaking rituals are rites that accompany prayers for rain. Even if 'making rain' is entirely left to God, it is the responsibility of people to summon God's rain through prayers and singing (Ombati, 2017). The rainmakers sang songs touching on climate change issues such as drought and rainfall. The Akamba community also performed the *kilumi* dance to invoke blessings of water spirits. The dance involved singing about climate change. Researching oral poetry for environmental conservation, Monanti et al. (2014) concluded that several song texts from the Gusii community in Kenya are vibrantly addressing climate change.

Some songs can be relevant in one environment and lose meaning in another. It is important to note that the songs used in this survey are about environmental degradation and the conservation of water resources, which is significant in Kenya. Like most developing countries, the major environmental challenge is deforestation. Most Kenyan households in rural areas have limited alternative fuel sources and thus use charcoal or firewood as their primary energy source (Veldkamp et al., 2020). This results in the cutting down of trees, which leads to desertification. Nonetheless, natural water resources such as rivers, lakes, and oceans play an essential role in domestic and agricultural activities in Kenya.

The primary cause of climate change in Kenya is deforestation. Deforestation is cutting down trees indiscriminately. Deforestation is the second largest contributor to the climate crisis. The United Nations body warns that deforestation intensifies the effects of climate change, such as drought, water scarcity, and food shortages (Kumar et al., 2021). Deforestation mainly affects

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

rural parts of the world, who depend on farming for their livelihood. By nature, the backbone of Kenya's economy is agriculture. Most of the agricultural practices rely on rainfall to thrive. When the trees are cut down, there is a shortage of rainfall, which subsequently affects agriculture. Since most people in Kenya listen to, sing, play, or create music, singing about deforestation and its environmental effects will bring the message home. In this regard, the songs will be an effective tool for climate change and transformation action in Kenya.

Findings and Discussions

There are songs on climate change done by Kenyan artists. For this research, three songs were analysed. These songs are: *Together We Can'* by Dandora Music; *Pray for Nature by Mwakazi, Kaisa and Mwanjala; and Maji* by the indigenous music band Afro-Simba.

Dandora Music is a group of Hip Hop artists from Dandora, Nairobi-Kenya. The group was formed in year 2012 after members of this group graduated from Dandora Music School. Apart from the song *Together We Can*, the group partnered with Connect 4 Climate and produced a song, *One Planet.*

GREATSON's MUSIC released a music video, Pray for Nature, in 2021. The group comprises Kenya's rising rap artists whose song has a message about the climate crisis. The group leader, Mwakazi, comes from Kasigau Corridor, a severe drought region in South Eastern Kenya.

Afro Simba is a music band that explores the music of the Mijikenda community. Mijikenda comprises nine indigenous coastal communities of Kenya. The group sings songs that accentuate environmental stewardship and peace. In May 2017, Afro Simba released the song Maji. Maji is a Swahili word which means water. The song about water conservation is written in Swahili, which is predominant in the coastal region.

The three songs have diverse themes on climate change, such as the effects of deforestation, the role of the community in protecting the environment, and the benefits of environmental conservation. These are discussed in the next sections.

Effects of Deforestation

In the song *Together We Can*, by Dandora Music, the artist is lamenting the effects of cutting down trees without planting others.

1 TOGETHER WE CAN LYRICS- DANDORA MUSIC

I wish you could hear me and plant more trees to make the world green.
Green for trees, blue for the sky, yellow for the sun,
Together, we can make these mother's colours shine.
Together, we can make Mother Earth smile,
Our eyes are in tears as we watch trees being cut down
I am asking where is the shade.
It's climate change, it's global warming.
Our future is built on our past.
We are the new generations, the pollution increase, there is no food, dust all over. Diseases like Tuberculosis over.'

One of the effects of cutting down trees is sadness. *Our eyes are in tears as we watch trees being cut.* The artist laments that it pains when people cut down trees. The earth also becomes dull and

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

gloomy. *Together, we can make these mother's colours shine. Together, we can make Mother Earth smile.*

Nonetheless, deforestation leads to a lack of trees, hence no shade: *I am asking, where is the shade?* Cutting down trees increases the daytime temperatures and heat levels, hence the need for shade. In Kenya, high temperatures have been recorded, which results in prolonged drought. India has also experienced heat waves, which caused deaths (Im & Eltahir, 2017). Deforestation causes global warming; *It is climate change; it is global warming.* Global warming increases the earth's temperatures, which can be disastrous.

Other effects of deforestation are the increase in pollution, lack of food, and spread of dust, which leads to diseases like Tuberculosis: *We are the new generations; the pollution increased, no food, dust all over. Diseases like Tuberculosis over.* According to this song, the future generation is at risk of experiencing harsh climatic conditions. Therefore, there is a need to sensitize the young generation on the importance of protecting the trees: *I wish you could hear me and plant more trees to make the world green.*

Whereas deforestation is a complex phenomenon, the songs are used to express the outcomes. The audience can resonate well with the environment due to the choice of words and figures of speech used in the song. In addition, the song also has simple lyrics that an ordinary person can sing along and remember.

Our eyes are in tears as we watch trees being cut down
I am asking where is the shade.
It is climate change; it's global warming.
Our future is built on our past.

Such a song can be used in schools to teach children about the importance of planting trees and the effects of deforestation. The song can also be played on media platforms for a wider audience.

The artist of the song *Pray for Nature highlights deforestation as the significant cause of climate change.*

2 PRAY FOR NATURE LYRICS - GREATSONs MUSIC

I remember there was a big tree amid our village,
It was long ago, in the days of my young age,
We used to play around the tree when we were small
It was where grandparents told stories to us all,
On top of the tree, there were birds of all kinds,
Their melodious songs blessed the ears of the blind,
It was a landmark and the central meeting spot,
It was the holy spot that the ancestors brought,
One calm day, I heard a big boom,
I couldn't believe my eyes it was a sign of doom,
A big bulldozer fell the noble tree,
The locals who were watching were cheering with glee,
I was lost in the midst of the cheers and the dust,
Tears filled my eyes as I watched in disgust,
Oh! Baby chicks fell out of their nest,

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

They couldn't fly away, though they tried their best,
This mindless act affected the rain,
Bringing them drought with the hunger with the pain,
There were no more cures for the sick and the weak,
The future became quite sad and bleak,
Forests have vanished, fading away, like the evening sun,
From earth we'll be banished, sent away, life's gone and done.
Warning to everybody living in the generation,
Message to every state and every conscious nation,
Death of our trees has become a fixation,
We ain't moving forward with this null acceleration,
It spits in the face of the source of creation,
So mindlessly terminating our earth's duration,
Destroying the trees causing irreparable harm,
It is like slashing your throat and cutting off your arm,
So, before I proceed, let me ask it,
Why are you pushing us to this early casket?
Calling our leaders to stop deforestation,
Do what's right to end this abomination,
We must shout real loud, Stand strong and proud,
Our last opportunity, to achieve impunity,
In all corners of the world and every congregation,
We must put our efforts in one combination,
Listen up, have no doubt,
Hurricanes, fires, floods and drought,
We must act without hesitation,
There is no life on earth without conservation,
Forests have vanished, fading away, like the evening sun,
From earth we'll be banished, sent away, life's gone and done x2
no, no, no, no, no no,
We should never do it again,
So I say no, no, no, no, no, no,
Pray for nature and say amen,
Sote twasema pamoja tuzidi,
Kuitunza miti daima,
Kunena kutenda tutaiweka bidii,
Kuitunza miti daima,
So it's time to wake up and care for the tree,
It's time to make our world carbon-free,
Cause the trees are the reason we breathe clean air,
And we can only breathe if the trees are there,
To protect the trees and avoid the strife,
When you save the trees, you are saving your life.

The effects of cutting down trees include the destruction of wildlife habitat, reduced rainfall, and hunger: *Oh! Baby chicks fell out of their nest, they couldn't fly away; though they tried their*

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

best, this mindless act affected the rain, Deforestation also causes early deaths: Why are you pushing us to early casket?

Furthermore, deforestation makes the earth unproductive*: there is no life on earth without conservation.* This implies that the world has been left bare. Cutting down trees leads to a lack of rainfall, which is essential for agricultural activities.

Solution to Deforestation

Although trees have been cut down, these songs solve this problem. In the song *Together We Can,* there is hope that people can come together and plant trees. Planting trees will make the planet blossom: T*he only way to make Mother Earth smile is to plant trees.* The artist wishes people could plant more trees to make the world green.

The song *'Pray for Nature'* demands that leaders take immediate action to protect the environment. This is an urgent plea to the leaders to sensitize the community on the need to stop deforestation. The community is also urged to join hands and save Mother Nature.

Calling our leaders to stop deforestation,
Do what's right to end this abomination,
We must shout loud, Stand strong and proud,
Our last opportunity, to achieve impunity,
In all corners of the world and every congregation,
We must put our efforts in one combination…

Sadly, the local community seems unaware of the effects of cutting down trees. Instead of fighting for their trees, the locals watched and cheered with glee when the tree was felled down by the bulldozers. A question arises about who brought the bulldozer and why the tree was cut down.

A big bulldozer fell the noble tree,
The locals who were watching were cheering with glee,
I was lost in the midst of the cheers and the dust,

This is an awakening message that even though forests, in this case, trees, are essential, most locals do not try to protect them. It could be because of ignorance or being helpless. If no action is taken, the future generation will suffer from harsh, severe climatic conditions: *The future became quite sad and bleak, from earth we will be banished, sent away, life's gone and done.* He cries for Mother Africa and urges people to pray for nature, whose future is at stake: *Pray for nature and say amen. D*eforestation is not only a local problem but a global problem because of the shared atmosphere.

The writer also emphasizes the importance of a tree in society: *Destroying the trees is equated to self-destruction. Destroying the trees, causing irreparable harm, is like slashing your throat and cutting off your arm.* The big tree has been there for a long and has a cultural attachment: *The ancestors brought it to be used by the community.* This sentiment shows that there is interconnection between nature and culture.

It is the responsibility of the local community to protect the surrounding physical environment. If the community does not protect the forests, eventually, *the earth will be banished and doomed*. Deforestation starts by just cutting down a single tree. The use of a big tree in the village is relevant because anyone can identify a giant tree that used to exist in their village or homestead which is no longer there. The listener can comprehend the experience, and the message

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

is sensible. Society has no option but to fix the challenges facing the environment. Deforestation does not only happen in large forest tracks but cutting down a single tree leads to environmental degradation.

Benefits of Environmental Conservation

Apart from songs about environmental degradation, some songs show the benefits of preserving the environment. One such song is 'Maji' by the indigenous music band Afro Simba. *Maji* is a Swahili word that means water.

3 MAJI LYRICS- AFRO SIMBA

CHORUS
Mimi maji, Mwanijua
Wengi waniita bahari, mvua, mto ama ziwa
Mwanijua
Wengi waniita bahari, mvua, mto ama ziwa
VERSE 1
Wengi waniita maji, Maji ni uhai
Mwatatizika nami
Mwasema maji meupe, Baharini samawati
Mtoni maji ya vumbi
PRECHORUS:
Kuishi kwaraha (mwahitaji maji)
Mili yenu isafi (mimi maji)
Bustani zenu zanawiri (mimi maji)
Kiu na maliza (mimi maji)
VERSE 2
Je mashambani, Mazao kwa wingi
Vicheko na wapa, Mwaishi karibu nami
Asiye penda aseme
Nawachukua mbalimbali, Ulimwenguni mwote
Baharini na mitoni, Nahifadhi nakuwapa
Milki wanyama samaki binadamu

English Translation

CHORUS:
I am water, and you know me
You call me ocean, rain, river, lake
You know me
You call me ocean, rain, river & lake
VERSE: 1
You all call me water. And you say water is life.
Yet, you are confused about me.
You say water is clear, Oceans are blue
and the rivers are brown
PRE-CHORUS:
To live happily , (you need water)

Received: 20-06-2023 Accepted: 20-09-2023 Published: 27-12-2023

Volume 1, Number 1, 2023 ISSN N0 2791-190X

You are all clean, (it's me water)
Your gardens are flourishing, (it's me water)
I quench your thirst, (it's me water
VERSE 2:
Look at your farms. There's much to harvest
, and it gives you joy. You live by my side.
Whoever is not satisfied, may speak.
I take you to far places, around the world
through oceans and lakes. I help preserve surroundings
and all living things.

This song is a celebration of water conservation. The persona, water, talks about the positive things it brings to the society that conserves it well. Water is life as it is used for cleaning and also to quench thirst: *I quench your thirst (it's me water*). Clean water brings happiness to people: *To live happily (you need water).*

Another benefit of water conservation is a bountiful harvest, which brings joy to society and satisfaction to the people living near the water bodies. Water conservation also preserves the surroundings and living things: *Your gardens are flourishing, (it's me water)*: *Look at your farms, there's much to harvest, and it gives you joy. You live by my side.*

This song gives hope that all is not lost if the community preserves the environment. Preserving the environment is a collective responsibility because it affects the whole world. Just as the water that goes to all corners of the earth, the effects, both positive and negative, will be felt the world over: *I take you to far places worldwide through oceans and lakes. I help preserve surroundings and all living things.* There is a mutual relationship between the physical environment, the water bodies, and the people that live near them.

Conclusion and Recommendation

Deforestation is the second largest contributor to the climate crisis in Kenya. United Nations body warns that deforestation is a catalyst of climate change. The effects of deforestation include water scarcity, drought, and food shortages. If the issue of deforestation is not addressed, millions of people, especially those in rural areas who depend on agriculture for their livelihood, will be adversely affected. There is need also to involve the young generation in the fight against environmental degradation. One way of reaching most people is through songs. The mainstream media should play environmental songs to reach a wider audience. Although the musicians do not tackle the climate change issue like climate scientists, policymakers in government, and other agencies, they use songs that reflect the accurate picture of environmental degradation (Hermann & Kempf, 2021). Literary language is a powerful tool that can awaken the audience into environmental action. Songs speak to the heart and soul; hence, they can be used for transformation action. It is time for the society to embrace green talent.

From our findings, we advocate for creating songs and music that address environmental degradation. These songs should be sung at public gatherings, played in media houses, and taught in schools for them to be effective. The Kenyan artists should take the challenge and sing about climate change. Songs have the power to bring out emotions and thus can give positive energy to people to change their situation. From this study, the role of the media cannot be underrated. It is through the media that the climate songs will reach a wider audience. We recommend further research on the role of the media in making popular climate change songs.

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

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Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

LIST OF CONTRIBUTORS

1 **Dr. Charity Chemnjor** is a Senior Lecturer in the Department of Curriculum and Education Management at Laikipia University, Kenya
cchemnjor@laikipia.ac.ke

2 **Dr. Peter Githae** is a Senior Lecturer in the Department of Curriculum and Education Management at Laikipia University.
pgithae@laikipia.ac.ke

3 **Dr. Florence Wamahiga Githuthu** is a Lecturer at Tangaza University College of the Catholic University of Eastern Africa.
fwamahiga@gmail.com

4 **Dr. Gertrude Musuruve Inimah** is a Lecturer at Jomo Kenyatta University of Agriculture and Technology, Kenya.
gminimah@jkuat.ac.ke /ginimah2010@gmail.com

5 **Vincent Indasi Inimah** is a Master's student at Jomo Kenyatta University of Agriculture and Technology, Kenya.
vincentinimah2010@gmail.com

6 **Dr. Josephat Kigo** is a Lecturer in the Department of Physical Sciences at the Kenya Methodist University, Kenya.

7 **Dr. Isaac Kingori** is a Senior Lecturer in the Department of Psychology, Counselling and Educational Foundations at Laikipia University, Kenya.
ikingori@laikipia.ac.ke

8 **Nancy C. Langat** is a PhD Student of Applied Linguistics in the Department of Literary and Communication Studies at Laikipia University, Kenya.
nancykorir15@gmail.com

9 **Prof. Sinfree Makoni** is a Professor at Pennsylvania State University, USA.
sbm12@psu.edu

10 **Dr. Janerose Mayabi** is a Lecturer in the Department of Psychology, Counselling and Educational Foundations at Laikipia University, Kenya Laikipia University, Kenya.
jmayabi@laikipia.ac.ke

11 **Dr. Stella Isendi Muhanji** is a Senior Lecturer of Economics at Laikipia University.
smuhanji@laikipia.ac.ke

12 **Dr. Fredrick Ephraim Khaunya Mukabi** is a Deputy Director at the Kenya School of Government, Embu Campus.
fredrick.mukabi@ksg.ac.ke / khaunyamukabi@gmail.com

Journal of Social Sciences, Education and Humanities (JSSEH, 2023) Vol. 1, No. 1: ISSN 2791-190Xv

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**

Volume 1, Number 1, 2023 ISSN N0 2791-190X

13 **Dr. Daniel Thuo Ndung'u** is a Lecturer in the Department of Business and Entrepreneurship at the South Eastern Kenya University, Kenya.
thuondungu.dt@gmail.com

14 **Grace Waithira Njenga** is a PhD Student of Kiswahili and Communication Studies in the Department of Literary and Communication Studies at Laikipia University, Kenya.
gracenjenga76@gmail.com

15 **Jane Ngoiri Njuguna** is PhD Student of Applied Linguistics at Laikipia University, Kenya.
janengoiri2016@gmail.com

17 **Dr. BenJack Otieno Ochieng** is a Lecturer in the Department of Economics, School of Business and Economics, Laikipia University, Kenya.
bochieng@laikipia.ac.ke

18 **Patrick Michael Ogeto** is a Doctoral Researcher in History at Laikipia University, Kenya.
patrickogeto@gmail.com

19 **Monica Okubo** a PhD Student in the Department of Psychology, Counselling and Educational Foundations at Laikipia University, Kenya
okubomonique@gmail.com

20 **Jacquiline Ondimu** is a PhD student of Applied Linguistics at Laikipia University and also works at Moi University in the Department of Literature, Linguistics, Foreign Languages & Film Studies, Moi University, Kenya
jacqueondimu@gmail.com

21 **Dr. Samuel O. Onyuma** is a Senior Lecturer of Business Administration in the Department of Commerce, School of Business and Economics, Laikipia University, Kenya.
sonyuma@laikipia.ac.ke

22 **Dr. Florence Opondo** is a Lecturer in the Department of Commerce, Laikipia University, Kenya.
fopondo@laikipia.ac.ke

23 **Dr. Prisca Simotwo** is a Lecturer in the Department of Literature, Linguistics, Foreign Languages & Film Studies, Moi University, Kenya

24 **Prof. Vicky Khasandi Telewa** is an Associate Professor of Applied Linguistics and English Language in the Department of Literary and Communication Studies at Laikipia University, Kenya.
vkhasandi@laikipia.ac.ke

25 **Rev. Fr. Dr. Peterson Kabugi Thumi** is a Lecturer of Religious Studies, Department of Social Studies at Laikipia University.
rkabugi09@gmail.com

Received: 20-06-2023 **Accepted: 20-09-2023** **Published: 27-12-2023**