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### The Liability of Climate Change on Constraining Women's Rights in the Southern Highlands, Tanzania: A Case of Kilolo District.

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*Liability,  
Climate change,  
Constraining,  
Climate change impacts,  
Women rights.*

The study investigated the liability of climate change on constraining women rights in Kilolo District. Systematic random sampling was used to obtain a sample of 240 respondents. Data were collected using Focus Group Discussions (FGDs) and Questionnaires for the complementation. Data analysis was done using thematic data analysis for survey data for rainfall trends, Statistical Package for Social Sciences (SPSS) and content analysis for data from the FGDs and documents. The study revealed that climate change was liable for constraining women rights in the district. The main constrained women rights were the right to food adequacy, right to water, right to health and well-being, right to decision making and gender-based violence. The study concludes that climate change has diverse impacts on vulnerable groups such as women and children. This study recommends communities that to adapt to and mitigate climate change impacts, there should be an inclusive approach to all gender on a local and global scale. The central governments should find the appropriate strategies to rescue women who are severely tormented and disrupted by climate change.

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## INTRODUCTION

The term climate' is defined as the average meteorological conditions over a specified period of time, usually at least a month, resulting from interactions among the atmosphere, oceans, and land surface (Glantz, 2003; Bellard et al., 2012; Bushesha, 2014). In the other hand, climate change can be viewed as any change in the state of climate which persists for extended periods, usually for decades or longer (IPCC, 2014). In this study, climate change is referred to as any change in climate's attributes such as precipitation, temperature over time, either due to natural variability or as a result of human activity or both Lambin & Meyfroidt 2011). Climate change as a global environmental challenge has caused impacts on natural and human systems across the world (IPCC, 2014; Bushesha, 2014; Joseph & Kaswamila, 2017b; Sintayehu, 2018). In this regard, climatic change has continued to negatively impact agricultural activities, human health, and other livelihood sources (IPCC, 2014).

In Africa like other continents in the world, biodiversity, ecologies, and humans have been experiencing greater changes in climate. Overall, the continent has warmed 0.7°C over the twentieth century and warming across Africa is expected to continue with an increase ranging from 0.2°C per decade (low scenario) to more than 0.5°C per decade (high scenario) (Hulme et al. 2001; IPCC 2001; Parmesan 2006; IPCC 2013; Sintayehu, 2018). In this scenario, there is a loss of biodiversity due to climate change that have directly or indirectly changed the pattern and dynamics of energy flow and material circulation (Zhong & Wang, 2017; Sintayehu, 2018). It greatly impacts the African ecosystem and ecosystem service.

Climate change in Tanzania is affecting the natural environment and residents (Joseph & Kaswamila, 2017b). Temperatures in Tanzania are rising with a higher likelihood of intense rainfall events (resulting in flooding) and dry spell (resulting in droughts). In the country, different regions and sectors suffer severely due to the persistent variability in rainfall and temperature (URT, 2006; URT, 2008). Among the consequences associated with climate change in Tanzania include melting of glaciers, the rise of sea level, food insecurity, water shortage, loss of biodiversity, loss of pasture and drop of water levels in major rivers, lakes, and reservoirs (NIDOS, 2009).

Both women and men working in natural resource sectors, such as agriculture, are likely to be affected. However, the impact of climate change on gender is not the same. Women are increasingly being seen as more vulnerable than men to the impacts of climate change (Joseph 2011; Gamble et al., 2016). The difference between men and women can also be seen in their differential roles, responsibilities, decision making, access to land and natural resources, opportunities and needs which are held by both sexes (Gamble et al., 2016).

In the southern highlands of Tanzania, women's vulnerability to climate change stems from a number of social, economic, and cultural factors. They are mainly responsible for the more time-consuming and labour-intensive tasks that are carried out manually or with the use of simple tools (Joseph & Kaswamila, 2017b). Those who are at greatest risk to the effects of climate change are those who are most marginalized based on socially and environmentally mediated factors such as socioeconomic status, culture, gender, race, employment, and education (Gamble et al., 2016; McMichael, 2017).

In Kilolo District, climate change continues to exacerbate social, economic, and demographic inequalities with the impacts eventually felt by all populations (Pima et al., 2021). In many of these contexts, women are more vulnerable as they are primarily dependent for their livelihood on natural resources that are threatened by climate change. Furthermore, they face social, economic, and political barriers that limit their coping capacity as a result of gender inequality is experienced in every angle of their lives (Joseph & Kaswamila, 2017b). Many studies have been conducted to investigate the impacts of climate change but as best of the author's knowledge fewer studies focused on women's vulnerability to climate change. For instance, to what extent and how climate change is putting pressure on women is unknown facts that need a scientific investigation. To what extent climate change constrains women's rights in the local communities brings another task to researchers. It is from this perspective the study was conducted to investigate how climate change is liable for constraining women rights in Kilolo District in southern highlands of Tanzania. The understanding of how climate change constrains women rights will pave the way toward finding sustainable strategies to involve women in all processes of adapting and mitigating climate change impacts.

## METHODOLOGY

### Study Area

The study was carried out in four wards which were Bomayang'ombe, Ibumu, Mulafu and RuahaMbuyuni in Kilolo District (See *Figure 1*). The district is one of the four Local Authorities forming Iringa Region-Tanzania. The district extends between Latitude 7.0° and 8.3° South of the Equator and between Longitude 34° and 37° East of the Greenwich. The district borders Mpwapwa and Kilosa districts to the north, Kilombero District to the east, Iringa District Council to the west and Mufindi District to the south. The district is divided into 3 divisions, 24 wards, 106 villages and 555 hamlets with 46,002 households, with a population of 218,130 people (URT, 2012). The district experiences mean annual rainfall ranging from 500 to 1600 mm and temperatures from 15 to 27°C. It already hosts a

number of small and large-scale agriculture and forest plantations (PFP, 2017). Major crops that have been grown include maize, legumes, fruits, and vegetables. The region is among the big four regions described as the breadbasket of the country (URT, 2012).

### Data Collection Methods

Focus group discussion and household questionnaires were used as data collection methods in Bomayang'ombe, Ibumu, Mulafu and RuahaMbuyuni wards in Kilolo District. The combination of these methods and techniques was employed to assess data from different angles and to increase data reliability and validity. Before administering household questionnaires, there are several major steps followed: selection of sample frame and pre-testing and training of research assistants as in each study ward, 60 households were sampled from the wards register using simple random sampling. One respondent (20 years of age and above) from each household was picked using a table of random numbers following the procedure described by Bouma (2000). The set of respondents included women, village leaders and environmental officers. The respondents who answered questions ranging from household socio-economic characteristics, the role of climate change on constraining women rights, strategies to mitigate climate change impacts were asked for suggestions to make the plans to deal with impacts of climate change more effective in the future.

Focus group discussions were conducted mainly involving women in Bomayang'ombe, Ibumu, Mulafu, and RuahaMbuyuni wards, which were facilitated by their traditional leaders whereby a total of fifteen people for each ward attended. This method was applied to the fact that discussions have an advantage over interviews in that people are able to talk in detail about their beliefs and feelings (Creswell, 2012). Also in this study, temporal, and spatial analysis of data for detection of trends in rainfall from three stations with rainfall data which are Mtera, Msembe, and Iringa Maji stations situated adjacent to and in Kilolo District. The collected data were checked for consistency and accuracy.

Then data were analysed using a combination of techniques to examine variability and trends in the

time series. The study employed several approaches for the analysis of data including thematic data analysis for survey data and content analysis for data from the documents. Both qualitative and quantitative information were analysed separately to complement and supplement each other. Subsequently, quantitative data were collected through questionnaires and were analysed through a statistical analysis where data were edited, coded, summarized, and analysed using the Statistical Package for Social Sciences (SPSS) version 16. Simple mathematics was applied to analyse rainfall records - done with the help of excel computer software. In order to understand rainfall fluctuations and variability for the period between 1973 and 2020 in the study area, different rainfall regime components were considered. They include annual rainfall, annual

average rainfall, monthly rainfall, monthly average rainfall as well as long-term averages and moving averages.

## RESULTS AND DISCUSSION

Climatic change-related impacts in Kilolo District aforementioned to perceive of climate change materialization on the livelihoods of the communities in Iringa region, respondents persuaded to mention the indicators of climate change. The main climatic change attributes identified in the area include droughts, decrease in rainfall, unpredictable rainfall, strong winds, and increase in temperature (see *Table 1*). The results of the study obtained through multi-response indicate drought and decrease in rainfall as major attributes that made the respondents perceive the change in climate in Kilolo District.

**Table 1: Perceived Indicators of climate change in Kilolo District**

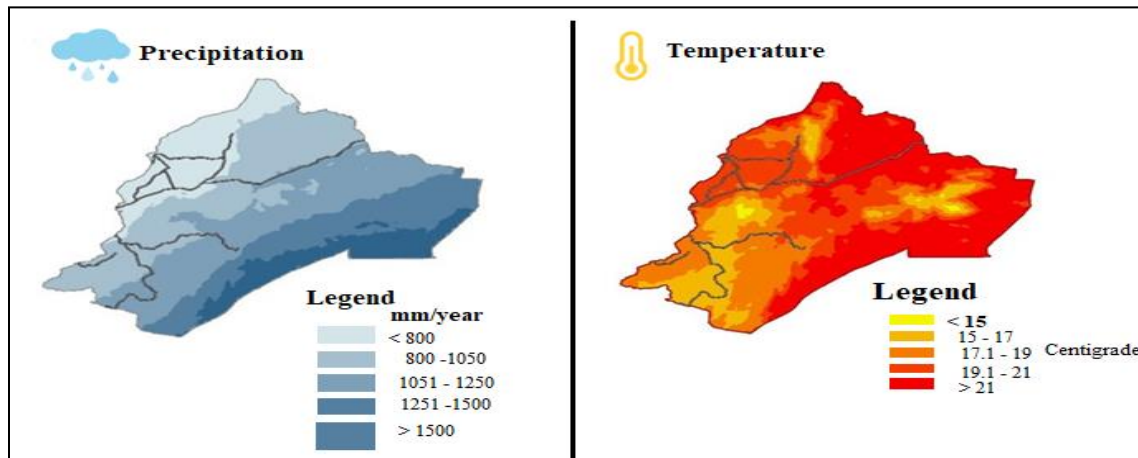
Indicators for climate change in the area *	Percentages (%)	Frequencies(N=180)
Drought	70	126
Decrease of Rainfall	66.66	120
Unpredictable rainfall	50	90
Strong winds	20	36
Increase of temperature	53.88	97

\*Dataset based on multiple responses

Temperature, wind, and precipitation are the main climate attributes that seemed to change in Kilolo District hence causing peoples' livelihoods devastated because of unpredictable situations for growing food crops. Kilolo District profile indicates that data trends from 1980–2015 (Figure 1) show increasing frequent and intense precipitation and rising temperatures across time. The average temperatures were lower in the first

season compared to the second. The average temperatures increased by about 0.5°C across the data period and periods of heat stress concomitantly increased. The lowest mean temperatures of slightly higher than 20.5°C were observed in 1993 and 1989 in the second and first seasons respectively. There was a mild increase in mean temperature of about 0.6°C and 0.4°C in the first and second season respectively increasing exposure to heat stress, drought risks and reduced crop cycle (Dhaen, & Nielsen, 2017).

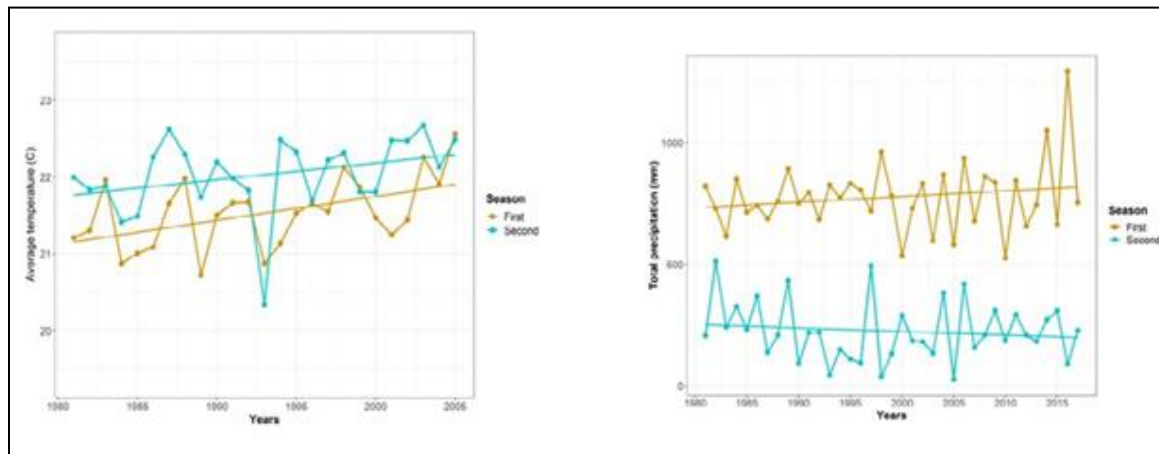
**Figure 1: Average rainfall and temperature in Kilolo District, 1970-2010**



SSource: Adopted from District profile and adjusted to complement the study, 2021

The climate change-related tragedies experienced in the district vary substantially across the Iringa region. Figure 2 indicates that temperature and rainfall received in the district vary throughout the year hence justifying the occurrence of unpredictable environmental circumstances.

**Figure 2: Indicating the total variations of precipitations and average temperature in a year (first and second season)**



Adopted from District profile and adjusted to sugary the study, 2021.

The study ought to understand if women rights in the district have been violated by the impacts of climate change or not. Overall results on average indicate that 95.6% (N=172) agreed, 3.9% (N=7) were neutral and 6% did not agree (See Table 2).

**Table 2: Liability of climate change in the violation of women’s rights**

Responses	Frequency	Percent	Cumulative Percent
Agree	172	95.6	95.6
Neutral	7	3.9	99.4
Disagree	1	.6	100.0
Total	180	100.0	



They further prompted and pointed to women rights violated by climate change impacts in the district such as the right to food adequacy, right to water, right to health and well-being, right to decision making and gender-based violence as they are stipulated below one after the other.

**Violation of Women Right to Food Adequacy**

In overall four wards combined, 67.78 % (N=180) of the respondents agreed that climate change has constrained the adequacy of food for women (See table 1). In ward specific level, results indicate that in RuahaMbuyuni, Ibumu, Bomayang’ombe, and Mulafu, 80%, 71.11%, 66.67% and 53.33% of respondents respectively agreed. On the other hand, cross-tabulation (at 95% level of significance) was performed to explore the association between two variables; that is, violation of women right to food adequacy and climate change impacts using Chi-square tests. The use of Chi-square tests allows ascertainment of the probability that the observed relationship between

variables may have arisen by chance while the use of cross-tabulation is meant to demonstrate the presence or absence of a relationship and/or association between independent and dependent variables (Bryman & Cramer, 1999).

A chi-square test results of independence showed that there was a significant association between climate change impacts and violation of women right to food adequacy ( $\chi^2$  (4, N = 180) = 54.419,  $p < .001$ ) (See Table 3). In this perspective, the study noted that climate variability in Kilolo District has negatively affected the production of food as a result violates women rights to varieties of food for consumption. Prolonged drought in the study area is the cause for the drying of crops such as beans, onion, tomatoes and creates unfavourable conditions for the growth of other crops. The findings of the study revealed that some women in the district miss options to the kind of food to eat/consume in a day as only sorghum and maize products are obtained hence take only one meal per day and sometimes, they eat after a day.

**Table 3: Response on how climate changes affect women rights to food adequacy**

Responses	Bomayang’ombe% (f)	Ibumu	Mulafu	RuahaMbuyuni	Mean	X <sup>2</sup> Value	df	P Value
Agree	66.67(30)	71.11(32)	53.33(24)	80(36)	67.78	54.419	4	.001
Neutral	22.22(10)	6.67(3)	33.33(15)	13.33(6)	18.89			
Disagree	11.11(5)	22.22(10)	13.33(6)	6.67(3)	13.33			

The study revealed that women are more exposed to food insecurity than men and climate change impacts affect them differently because of their nutritional needs during pregnancy and lactation. Joseph & Kaswamila, 2017a; Merabtene *et al.*, 2016) assert that the core content of the right to adequate food implies two elements. The first is ‘the availability of food in a quantity and quality sufficient to satisfy the dietary needs of individuals. In this context, the climate change in Kilolo District constrains women right to food and well-being by producing attributes that do not support the growth of crops and vegetables during drought season. It influences the drying of already planted crops, promoting erosion of soil nutrients during floods leaving the land bare. As a result, famine was caused. Famine influences malnutrition and the death of women in the district.

FAO (2010) asserts that although many people might imagine that deaths from hunger generally occur in times of famine and conflict, the fact is that only about 10 per cent of these deaths are the result of armed conflicts, natural catastrophes, or exceptional climatic conditions. The other 90 per cent are victims of long-term, chronic lack of access to adequate food. Combating hunger and malnutrition is more than a moral duty or a policy choice; in many countries, it is a legally binding human rights obligation (FAO, 2009).

Explaining how climate change is a threat to food security across women rights and livelihoods to all four researched wards, Focus Group Discussants had a lot to speak. For instance, in Bomayang’ombe ward, one of the discussants stated:

*...the problem here is the failure and decrease of rainfall which has led to shifting seasons, drought and rainy seasons. The rain season which allows us to plant crops is unpredictable; nobody knows when it starts raining and when it ends. Sometimes, we plant crops but before we harvest, drought comes and dries the crops. We, women, are devastated and our right to food adequacy is not met. We cry to the government to help us with food and water (Anonymously, July 2021).*

In Mulafu ward, one of the discussants had this to say:

*In the past years' precipitation trends was clearly identified to women and farmers; today, 2021 rainfall is not well conventional as almost in fifteen years now, rainfall and drought seasons have not been predictable. Hence, this leads to less crop production which cannot sustain our families. I remember since 1995, we are not getting enough rainfall as we used to. Yes, there are some years like 2000, 2004, 2008, 2012, 2016, 2020 that can be remembered for a good harvest for food crops but cannot be compared with the production were obtained in 1980 and below (Anonymously, August 2021).*

The results are in line with World Bank Group (2018), women are inherently sensitive to the effects of food insecurity and resulting nutritional deficiencies due to increased needs during menstruation, pregnancy, and nursing. Micronutrient deficiencies are associated with cognitive impairments including poor attention span, diminished working memory, emotional and behavioural issues, and impaired sensory perception, which leads to poor educational outcomes (Jáuregui-Lobera, 2014). This act of climate change imposing famine is contrary to what is stated in the Universal Declaration of Human Rights of 1948, Article 25 (I) asserts that *"Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family including food..."*

The Committee on Economic, Social and Cultural Rights, May 1996, No. 16 (Rev.1) (Art. 11) assert that:

*"The right to have regular, permanent and free access, either directly or by means of financial purchases, to quantitatively and qualitatively adequate and sufficient food corresponding to the cultural traditions of the people to which the consumer belongs and which ensures a physical and mental, individual and collective, fulfilling and dignified life free of fear".*

The right to adequate food as a basic human right became legally binding when the International Covenant on Economic, Social and Cultural Rights (ICESCR) entered the force in 1976. Since then, many international agreements have affirmed the right to food, among them being the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), 1979 and the Convention on the Rights of the Child (CRC), 1989; The International Covenant on Economic, Social and Cultural Rights in 1967: Article 11 (2a). The right is also reflected in other legal instruments and policy documents such as the Charter of the United Nations in 2018 (Arts. 1 (3), 55 and 56), the Universal Declaration of Human Rights 1948 (arts. 22 and 28), the Convention on the Rights of the Child 2 September 1990 (arts. 4, 24 and 27), the Convention on the Rights of Persons with Disabilities (A/RES/61/106) of 13 December 2006 (art. 32) and the Rome Declaration of the World Food Summit Human Rights Council resolution 7/14, para. 4. 27<sup>th</sup> March 2008; (FAO, 2005; CESCR, 1999)

Furthermore, the right to food of specific groups has been recognized in several international conventions. "All human beings, regardless of their race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status have the right to adequate food and the right to be free from hunger". At the World Food Summit organized by FAO in 1996, States agreed to halve the number of undernourished people by 2015. They also called for the obligations arising from the right to food as provided for under international human rights law to be clarified. In response, the Committee on Economic, Social and Social Rights issued its general comment No. 12 (1999) which defines the right to food. In the United Nations Millennium Declaration, adopted by the General Assembly in 2000, States committed themselves to halving the

proportion of people suffering from hunger by 2015. In 2004, FAO adopted the Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security, providing practical guidance to States in their implementation of the right to adequate food (FAO, 2010). However, all programs to end famine will not be successful if the climate change and its parameters does not support growth of crops. To release women with all burdens, appropriate strategies for mitigating climate change impacts are inevitable.

### Violation of Women Right to Good Health and Well-Being

Overall, in the four wards collectively, 82.22% (N=180) agreed that rights to health and well-being for women has been violated due to imposed impact of climate change in the district. The

violation of the said right in each ward varied in percentage but in all wards, it was highly perceived with RuahaMbuyuni, Mulafu, Bomayang’ombe, and Ibumu being seriously perceived by 95.56%, 84.44%, 80%, and 68.89% respectively (See Table 4). On the other hand, a Chi-square test of associations was performed to examine the relationship between climate change and the violation of women right to good health. A Chi-square test result of association indicates that there was a significant association between climate change and violation of women right to food adequacy. The relation between these variables was significant,  $\chi^2(4, N = 180) = 76.403, p < .001$ . In this case whereby the results of P-value which have a value of .000 (reported as  $p < .001$ ) is less than the designated alpha level .05. It signifies that there is statistical significance between the two variables (climate change and violation of women right to food adequacy).

**Table 4: Response on the violation of health and well-being of women**

Responses	Bomayang’ombe% (f)	Ibumu	Mulafu	RuahaMbuyuni	Mean	X <sup>2</sup> Value	df	P value
Agree	80(36)	68.89(31)	84.44(38)	95.56(43)	82.22	76.403		
Neutral	13.33(6)	28.89(13)	15.56(7)	2.22(1)	15		4	.000
Disagree	6.67(f)	2.22(1)	0(0)	2.22(1)	2.78			

It was noted that during heavy rainfall season, there is an increased incidence of vector-borne diseases such as malaria combined with unequal care burdens which influence a disproportionate pressure on women to support their families. Women in the district are affected by heat stress which is directly caused by heat waves that have led to mood disorders, anxiety, and related consequences. Padhy et al. (2015) assert that people with mental illness were three times more likely to run the risk of death from a heat wave than those without mental illness.

Mazza et al. (2012) assert that living organisms may be biologically more prone to suffer the effect of atmospheric events on the mind and body. On the other hand, enteropathy subjects are those individuals who develop a specific illness or the worsening of an existing disease because of climatic changes. Psycho-physical symptoms include mood disturbances, irritability, anxiety, mental and physical weakness, hypertension, headache, hyperalgesia and pains and autonomic

symptoms. Moreover, air pollution can induce neural instability (Janiri et al., 2009).

During focus group discussion, it was revealed that women at Kilolo District are at high risk of contracting serious illnesses as aggravated by environmental hazards caused by climate change. For example, one of the discussants in the Ibumu ward stated:

*...in addition to the reference provided by my fellow discussants, I can state that climate change is impacting women’s health through water scarcity and water contamination; an abundance of evidence links the evolution and distribution of infectious diseases to climate and weather. This influences a greater incidence of infectious diseases such as cholera, malaria, and other diseases as even water fetched from our rivers are not treated (Anonymously, May 2021).*

Rahman (2013) asserts that physically, women of all ages are more calorie deficient than men



leading to poor physical health and vulnerability to resource shortages ensuing from catastrophes. Additionally, poor baseline nutritional status and physical health may prevent escape and survival in the acute phase of a disaster (Cannonet al., 2003; Dankelman, 2008). Pregnant women are a particularly vulnerable population and those giving birth in the time period following disasters have been found to have an increased risk of complications including preeclampsia, uterine bleeding, and low birth weight infants (Tong et al., 2011).

In Ruaha Mbuyuni ward, discussants stated that during drought season, speed blowing winds contaminate the air and cause the air to be full of dust. The dusted air changes air quality which, in turn, negatively impacts human cardiopulmonary health. In this context, women are at higher risk of cardiovascular complications. Furthermore, women may be more haematologically sensitive to toxicologic influences of airborne pollution than males because they have higher rates of anaemia.

Pointing to the impacts of climate change on human health, Willox et al. (2013) asserts that long-term droughts and erratic rainfall have been associated with deterioration of economic conditions, reduced social functioning and psychological distance to a perception of negative climatic conditions. The regulation and adjustment of emotion are disrupted by depression, demoralization, fatalism, passively resigning to fate, especially in women and adolescents or people with lower socioeconomic status, showing feelings of distress and helplessness (Padhy et al., 2015; Gronlund et al., 2019).

The climatic change health-related problems to women in Kilolo District is contrary to the women right to good health and well-being as stated in the Universal Declaration of Human Rights of 1948, Article 25 (I) which asserts that:

*“Everyone has the right to a standard of living adequacy for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services and the right to security...”*

The same right (right to health) is spelt in other legal documents including the American Declaration on the Rights and Duties of Man of November 1969 (art. 33), European Social Charter (Revised), 03.V.1996 (art. 11), International Covenant on Economic, Social and Cultural Rights of 16 December 1966 (art. 12), African Charter on Human and People’s Rights of 7 June 1981 (art. 16).

### **Violation of Women Right to Decision-Making**

Overall, an average of 75% (N=180) (see Table 5) agreed that climate change has violated and constrained women right to decision making due to time spent to fetch water from distant sources. The results from ward specific level vary in Ibumu 88.89% (n=45), Bomayang’ombe 75.6% (n=45), Mulafu 68.89 % (n=45), and RuahaMbuyuni, 66.67% (n=45) respectively (See Table, 3) agreed that climate change violates women rights decision. The probable reason for the respondents to agree is due to the fact that women have limited access to and control of environmental goods and services.

Cross-tabulation (at 95% level of significance) was performed to explore the association between climate change and the violation of women rights to decision-making using Chi-square tests. The relation between these variables was significant ( $\chi^2(4, N = 180) = 63.389, p < .001$ ). A Chi-squared test with 4 degrees of freedom was performed resulting in a test statistic of 63.389. The result is an asymptotic p-value that is less than 0.001; also, it is less than the designated alpha level 0.05. Therefore, the study has strong evidence to reject the null hypothesis that climate change and violence of women rights to decision making are independent and there is, therefore, significant association between the two variables. It was exposed that during extreme weather such as droughts, women tend to work more to secure household livelihoods. This leaves less time for women to attend village meetings, access training and education, develop skills or earn income and participate in family decision making as well as to those of village and ward levels.

**Table 5: Climate change on violation of women rights to decision making**

Responses	Bomayang'ombe	Ibumu	Mulafu	RuahaMbuyuni	Mean	X <sup>2</sup> value	Df	P Value
Agree	75.6(34)	88.89(40)	68.89(31)	66.67(30)	75	45.010	4	0.001
Neutral	22.2(10)	11.11(5)	11.11(5)	8.89(4)	13.33			
Disagree	2.2(1)	0(0)	20(9)	24.44(11)	11.67			

The climate change in Kilolo District is an added stressor that aggravates women's vulnerability and denies their right (women) to decision making which is contrary to human rights declared in the Universal Declaration of Human Rights (UDHR) in 1948 Articles (3, 13, 19, 20 and 21). Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers. This right has been pinpointed in other legal documents such as, The Convention on the Political Rights of Women (CPRW) of 31 March 1953, building on the UDHR in 2016, specifically protects the right of women to participate in the government of their country and to access public services.

*The International Covenant on Civil and Political Rights (ICCPR) of 1966 (Article, 25) asserts that every citizen has the equal right to participate in public affairs, vote and be elected through universal and equal suffrage and to have equal access to public services. The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) of 18<sup>th</sup> December 1979 (Article 7, 8, 10, 11, 13 and 15 ) articulates women's equal right to participation in political and public life including the right to vote in all elections and public referenda, eligibility for election to all publicly elected bodies, and participation in the formulation and implementation of government policy and commits States Parties to take appropriate measures to ensure women have equal opportunity to participate without discrimination.*

In this perspective, climate change causing water scarcity increases the burden on women who often

have primary responsibility for its collection. Exclusion from decision-making can further exacerbate the stress of dealing with climate change. The destruction of essential infrastructure can decrease the quality, availability and accessibility of sexual and reproductive health services which can lead to unplanned pregnancies and maternal mortality. High temperatures and salinization of drinking water can impact maternal and child health.

### Violation of Women Rights to Water

Overall, 77.2% (N=180) agreed that climate change influenced the violation of women rights to safe water and sanitation. At ward specific level, the violation of water and sanitation was felt to be more serious in RuahaMbuyuni (see Plate 1) 88.89%, Ibumu 80%, Malafu 75.56%, and Bomayang'ombe 64.4% (see Table 4). The probable reason for water shortage in the study area is attributed to prolonged drought, erratic rainfall and high temperatures as evidenced by climatic variation in the district. On the other hand, a Chi-square test of associations was performed to examine the relationship between climate change and the violation of women right to water. A Chi-square test result of association indicates that there was a significant association between climate change and violation of women right to water. The relation between these variables was significant,  $\chi^2(4, N = 180) = 45.010, p < .001$ . In this case whereby the results of P-value which have the value of .000 (reported as  $p < .001$ ) is less than the designated alpha level .05. It signifies that there is statistical significance between the two variables (climate change and violation of women right to water).

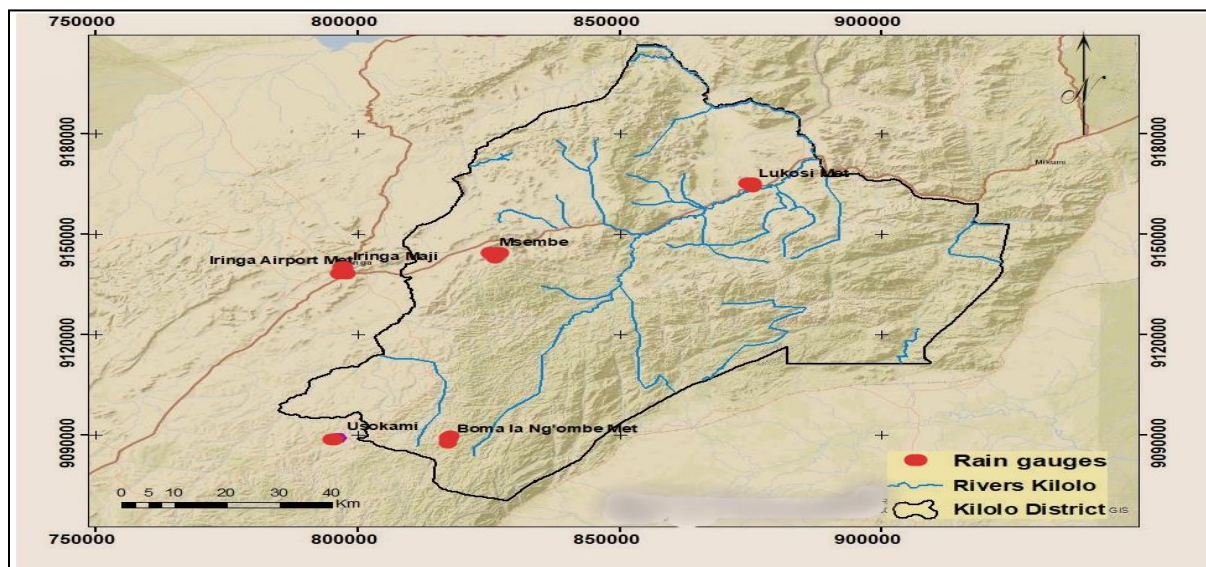
**Table 6: Climate change on the violation of women rights to water and sanitation**

Responses	Bomayang’ombe	Ibumu	Mulafu	RuahaMbuyuni	Mean	X <sup>2</sup> value	df	P Value
Agree	64.4(29)	8036)	75.56(34)	88.89(40)	77.25	45.010	4	.001
Neutral	26.7(12)	20(9)	15.56 (7)	8.89(4)	17.78			
Disagree	8.9(4)	0(0)	8.89(4)	2.22(f1)	5			

To verify if there was rainfall variability, a critical collection of rainfall data from several rain gauge stations located within Kilolo District such as Mtera, Msembe and Iringa Maji (See Figure 3) was

done. The stations marked with red colour are the stations where rain gauges are found and rainfall data were collected.

**Figure 3: Meteorological stations from which rainfall data were collected in Kilolo District**



The observations indicate that stations lack consistency in rainfall data as they vary in location and amount of rainfall in a station. On average, December, January, and March are months which receive the highest amount of rainfall by 139mm, 160 mm, and March by 144 mm respectively. June, July, August, September, and October are the driest months (See Fig. 2). Domino effect of the findings further prove that years of high precipitation were 1974 (847 mm), 1978(994.7 mm), 1981(822 mm), 1989 (921 mm), 1992 (915 mm), 1997(1010 mm), 2014 (830 mm) and 2017 (865 mm) and 2020 (870 mm). Years of low rainfall include 1976, 1980, 1983,1986,1990,1993,1995,2000,2003, 2005, 2007, 2010, 2012, 2015 and 2018. The results lined with that of (Pima et al., 2021) asserts that annual rainfall in the Kilolo District displays both spatial

and temporal variations. During the period analysed (1961–2019), a general decreasing pattern of annual rainfall was observed. These findings are in line with Merabtene *et al.* (2016) who reported annual rainfalls exhibit high deviations from the annual mean and that rainfall variability is visibly marked by periodic intermittence between successive wet years and successive dry years.

The declining trend is observed from 1998 and this could be a result of the decline of natural forest, bushland, open-land and wetland attributed by the increase of cropland, settlement and forest plantation. The finding justifies that there is water shortage in the area; hence, people depend on water from nearby rivers identified as the Little Ruaha River, Lukosi and Mtitu rivers. Similarly, Dhaen and Nielsen (2017) observed that the livelihoods along the great Ruaha river catchment

area are at risks, the rivers and streams are at the verge of drying up.

**Figure 4: Monthly rainfall variation at Mtera, Msembe and Iringa Maji stations in Kilolo District (1973 -2020)**

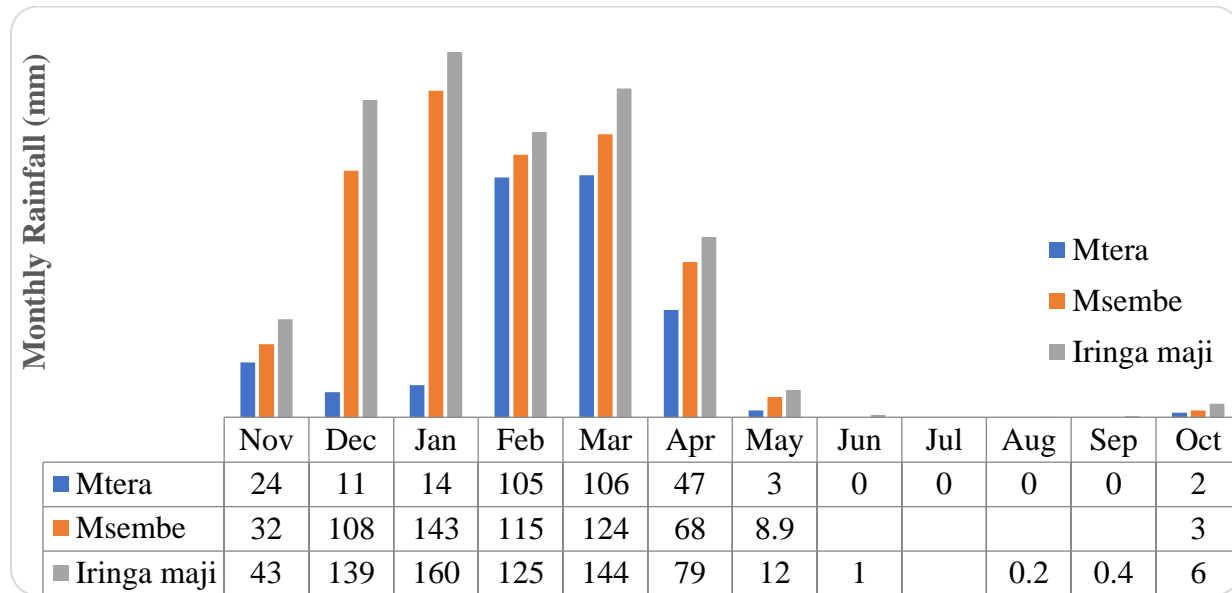
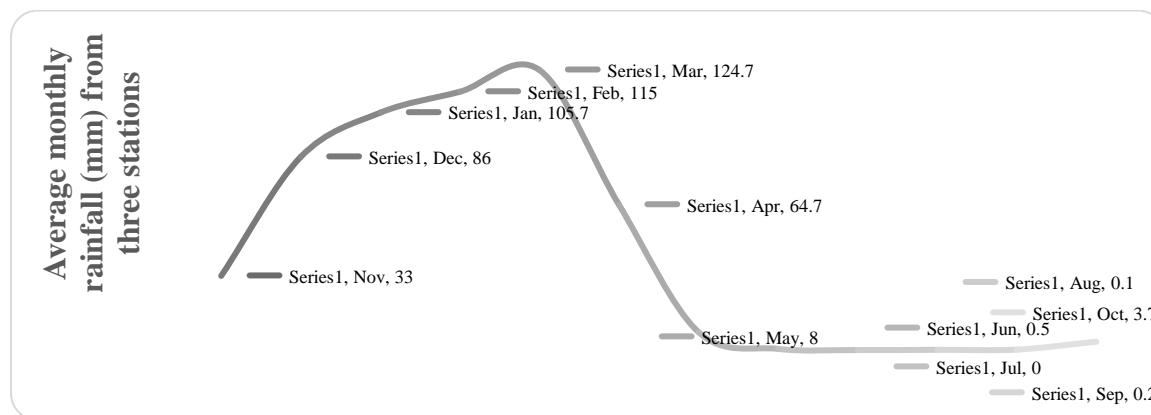


Figure 5 indicates that there are decreasing trends of rainfall in some months of the year in both three sported rainfall stations (Mtera, Msembe, and Iringa Maji). The fall in precipitation was mainly determined by the unimodal distribution of rainfall scenario experienced to incessantly happen above the consecutive periods. Merabtene et al. (2016) reported negative trends in rainfall in some months of the year. Hamisi (2013) and Mwinuka et al.

(2021) displayed the existence of decreasing trends in seasonal rainfall in most parts of Tanzania. Precipitation in Kilolo District starts in November and peaks in January and cessation is experienced in May. This result is in line with Mwinuka et al. (2021) who reported the same trend in the southern highlands of Tanzania. The dry period receives almost no rain for the entire period indicating that the area remains completely dry.

**Figure 5: The average rainfall from three rainfall stations (Mtera, Msembe and Iringa Maji) 1973-2020**



Pima et al. (2021) made annual trends analysis of precipitation in the same district by using Mann–

Kendall test, the Sen’s slope estimator and the linear regression as shown in Table 6. The study



discovered that the annual precipitation trends obtained by a linear regression were similar to the rainfall trends obtained by the Mann–Kendall test and the Sen’s slope estimator. Both indicate negative and positive trends and were attained by the statistical tests in annual rainfall data. However, although a declining trend was observed in the line are regression in the Iringa Maji and Mtera stations’ records, Mann- Kendall test show

that the trends were not significant at the 95% and 99% levels of significance. On the contrary, results for the Msembe station showed an increasing trend that was significant at the 95% level of significance. Results further show that the Sen’s slope for the Mtera station is negative and is about -0.903 as for Iringa Maji is positive and is about 0.750 and for Msembe station is positive and is about 5.894.

**Table 7: Annual rainfall trends in Kilolo District**

Rainfall Station	Test Statistic	Significance	Sen’s Slope
Mtera	-0.49	ns	-0.903
Iringa Maji	0.10	ns	0.750
Msembe	2.04	*	5.894

From this perspective, it can clearly be interpreted that the district faced drought for more than six months a year hence causing water shortage for domestic and productive tasks. It was noted that collecting water is the role of women in the context of African societies. Women and girls bear the burden of fetching water for their families and spend significant amounts of time daily hauling

water from distant sources to 6km -10km > (See plate 1). The water from distant sources (rivers) is rarely enough to meet the needs of the household and is often contaminated such that women and girls also pay the heaviest price for poor sanitation, as a result, cause fatigue, psychological torture to women in the district.

**Plate 1: Women with bicycle walking distance of 10 km to fetch water for domestic use**



Given the changing climate, inadequate access to water and poor water quality does not only affect women, their responsibilities as primary givers and the health of their families, but also it impacts agricultural production and the care of livestock; also, it increases the overall amount of labour that is expended to collect, store, protect and distribute water which constraints women rights to safe water

and sanitation. This is due to the fact that the human right to water entitles *everyone, without discrimination, to sufficient, safe, acceptable, physically accessible, and affordable water for personal and domestic use* Universal Declaration of Human Rights of 1948 (art.25(1).

Legal basis for the human rights to water and sanitation include the Universal Declaration of Human Rights of 1948 (art.25(1)), International Covenant on Economic, Social and Cultural Rights (art. 11), 1966/76; Convention on the Rights of the Child, 1989 (art.24(2)(h)); Convention on the Elimination of All Forms of Discrimination against Women of 1979 (art. 14(2)(h)); Convention on the Rights of Persons with Disabilities of 2006 (art. 18 (2)(a)); General Comment 15, 2002; UN General Assembly and Human Rights Council resolutions of 2006, (292/64 and 15/9) respectively; Human Rights Council resolution 2013 (24/41) affirmed the normative content of the HR to water and sanitation.

### Gender-based Violence

The discussants during the discussion revealed that climate change impact constrains gender rights, especially for women. It was pointed out that there are clear links between the violation of women rights and climate change. In the study area, climate change deepens sexual and gender-based violence by forcing women to fetch water in distances and obtain natural resources through difficult situations. Child labour and forced marriages can occur as a harmful coping strategy among those who suffer from climate change-related economic stress. Climate change impacts (floods and drought) can push women, survivors, into evacuation centres where they may be subjected to violence. Gender-based violence can include sexual, physical, mental, and economic harm inflicted in public or in private. It also includes threats of violence, coercion, and manipulation. This can take many forms such as intimate partner violence, sexual violence, child marriage, female genital mutilation and so-called 'honour crimes.

The right to life, gender equality, prohibition of discrimination on the grounds of sex, protection of physical integrity, the right to health - to mention a few of the human rights impacted by gender-based violence as it is spelt in the varieties of legal documents has been denied by impact of climate change. The stated right was declared in Declaration on the Elimination of Violence against Women; Proclaimed by General Assembly resolution 48/104 of 20 December 1993 (Art.1, 2,

3, 4, 5 & 6); The Universal Declaration of Human Rights of 1948 (Art.1, 3, 5, 7 & 8); the International Covenant on Civil and Political Rights of 16 December 1966 (Art. 1-53); the International Covenant on Economic, Social and Cultural Rights of 3<sup>rd</sup> January 1967 (Art. 1, 3 &4); Economic and Social Council resolution 1990/15 of 24 May 1990 and Economic and Social Council resolution 1991/18 of 30 May 1991.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

This study aimed at investigating the liability of climate change impacts on constraining women's rights in Kilolo District found in the southern highlands of Tanzania. In this line, women rights violated by climate change include right to good health and well-being, right to decision making, right to water and sanitation, and right to gender based violence.

### Recommendation

To reduce the vulnerability of women and increase the capacity of society as a whole to adapt to a changing climate, the study has the following recommendations:

- The central government should drill wells in every ward to make water available and reduce walking distance for women fetching water.
- The local communities should design adaptation programs focusing on women and gender equity in food security, agriculture, rangelands and managing natural resources in ways that are sensitive and responsive to the different and multiple roles.

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