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Assessment of Gender Roles in Climate Change Adaptation in Kisarawe, Tanzania

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Abstract

Climate change has received global attention as it poses challenges to climate-sensitive sectors; and affects natural, social, and economic systems, resulting in changing gender roles. This paper assesses the relationship between climate change adaptation and gender roles to understand the effects of climatic stresses on a wide range of gender roles in Kisarawe district, Tanzania. The study investigated the effect of climate change on rainfall and temperature patterns. It further looked at sex-based division of work at the home level. The study employed a mixed research design. Data collection involved gender-disaggregated survey data, focus group discussions (FGDs), and key informant interviews (KIIs). The latter two were employed in collecting qualitative data, whereas quantitative data were collected using a household survey that involved a total of 120 heads of households, who were selected using simple random sampling techniques. Participants for FGDs and KIIs were obtained through purposive sampling. People's perceptions were validated using temperature and rainfall data. The results suggest that from 1987 to 2018, there were climate changes in both minimum and maximum annual rainfalls and temperatures, which led to a change in traditional gender roles, and a switch to shared roles. The differences in perceived changes in gender roles were statistically insignificant ($p > 0.05$). The study results recommend that gender-responsive and bottom-up-oriented policies, together with locally-led adaptation plans are fundamental in resolving climate change impacts in Kisarawe district.

Keywords: *climate change, climate variability, gender, gender roles, adaptation.*

1. Introduction

Climate change (CC) and variability have received considerable attention throughout the world as they pose many challenges to climate-sensitive sectors (UN, 2018). According to the Intergovernmental Panel on Climate Change (IPCC) (2014), each of the three decades since 1850 has successively been warmer than the preceding decade. Globally, the average ocean and land surface temperature from the 1880 to 2012 has shown a linear rise of 0.85℃ (ibid.). Anthropogenic factors (human activities) have exacerbated global warming by approximately 1.0^{0}C above pre-industrial levels. If the current rate

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continues to occur, the IPCC estimate a global warming of 1.5℃ between 2030 and 2052 (Hoegh-Guldberg et al., 2018; Leung et al., 2019; Rogelj et al., 2018).

Since the industrial revolution, temperature rise has been related to greenhouse gas emissions and their concentration, causing warming (IPCC, 2012). Also, since 1950 Africa has undergone a temperature and rainfall shift (IPCC, 2013; Pauline & Grab, 2018). Vulnerabilities and responses to climate change and variability vary from one community to another depending on time, social status, economic condition, atmosphere, and the location of a region (Niang et al., 2014). Furthermore, the impacts felt differ from one region to another; and while the resulting effects may have been beneficial to some, to others they have been catastrophic (Rowhani et al., 2011). Because of low adaptive ability, Africa is affected mostly by the disastrous impacts (IPCC, 2014; Niang et al., 2014).

Overall, multiple impact studies reveal changes in rainfall and temperature, sea-level rise, and increases in extreme events, including droughts and floods (Goh, 2012; IPCC, 2012, 2013). The impacts are felt and predicted to increase in sectors essential for human and economic development (Magesa & Pauline, 2018). For example, sectors such as food security, employment, health, incomes, social groups, livelihoods, and gender have been affected directly or indirectly at national and international levels (McKune et al., 2015; Vasseur et al., 2018). The adverse effects have been a threat to sustainable development, exacerbating other environmental and social problems (IPCC, 2007; Pauline et al., 2017).

The adverse effects of CC and variability have also led to changes in coping and adaptation strategies that have had a significant impact on traditional gender roles (IPCC, 2014; Arntzen, 2015; Mtupile & Liwenga, 2017; Magesa & Pauline, 2019). In this respect, gender vulnerability has been one of the most unnoticed areas, in which feminists have now begun to examine (Pearse, 2017). For instance, GTZ and AusAID (2010) found that exposure to the effects of CC in Vietnam differs from men to women due to differentiated roles. Due to such circumstances, a change of traditional roles has begun to be experienced worldwide as coping and adaptive mechanism, whereby men have started to participate in women's activities (Swai et al., 2012). For example, men have begun doing domestic activities like fetching water and collecting firewood to lessen the burden of women's triple roles under CC (Arntzen, 2015; Mollel, 2015; Sellers , Leydon & Uribe, 2016).

A study by Glazebrook (2011, as cited by McKune et al., 2015), argued that traditional gender roles are vital in assessing vulnerability trends and responses to CC and variability. Furthermore, Terry (2009) argued that greater attention is needed to gender dimension policies in responding to CC and

variability to avoid hardships to more vulnerable groups. A study by Sellers et al. (2016) noted that women are the most at risk as they have many household activities, and hence are more susceptible to CC and variability impacts. Also, about 80% of smallholder farmers in the least developed countries are women who depend heavily on climate-sensitive activities like agriculture, making them more vulnerable to CC impacts than men (Mtupile & Liwenga, 2017). Therefore, incorporating gender issues in addressing CC and variability is crucial for proper formulation and design of policies and programs related to coping and adaptive strategies (Alston, 2013).

Various negotiations and conferences have been undertaken, including the Conference of Parties (COP 21), to address CC impacts and variability. Globally, the 1994 UNFCCC made efforts to address CC and variability, with about 197 countries ratifying the convention. The 1997 Kyoto Protocol was also an effort to limit greenhouse gas emissions. Correspondingly, mitigation and adaptation options have been undertaken worldwide. Planting varieties of crops to adapt to CC and variability has been practiced in rural areas (Arora-jonsson, 2011). As mentioned earlier, CC and variability affect cultural and socially constructed roles for men and women differently, and so do adaptation strategies as regards traditional gender roles (USAID, 2010). For example, in this respect, men in Mozambique have started to assume roles previously perceived to be women's (Babugura, 2010; FAO, 2012). This, notwithstanding however, focus should be put on gender relations in view of coming up with a finding about who is the most affected between women and men, and therefore be able to come up with the best adaptation measures (Skinner, 2011).

Like the rest of the world, Tanzania is also experiencing the impacts of CC and variability. Notable changes are variations in temperature and erratic rainfall patterns that have resulted into extreme events like floods, droughts, and sea-level rises, which usually threaten sensitive sectors like agriculture, water resources, energy, human health, ecosystems, and infrastructure (USAID, 2018). The effects have also resulted in significant impacts on gender roles, as indicated earlier (Arntzen, 2015; Mollel, 2015).

The Coastal region of Tanzania, including Kisarawe district, has experienced CC and variability as evidenced by the decrease in annual maximum and minimum temperatures that are associated with changes in rainfall patterns (Kashaigili et al., 2014). Previous studies (Lyimo et al., 2013; Kashaigili et al., 2014) have focused on how coastal communities have responded to the effects of CC and variability as regards the impacts on tourism, agriculture and industries, with little attention on gender. Therefore, there is a paucity of information on the impacts of CC and variability on gender—and specifically on women's and men's traditional gender roles, particularly in rural areas—and its effects in coping and adaptation strategies.

This study fills in the knowledge gap of understanding climate change and variability, and its effects on gender roles in Kisarawe district. In doing so, first, we establish the historical rainfall and temperature trends of the District. Second, we examine the division of labour based on sex at the household level, and finally analyse adaptation strategies undertaken by men and women to address the impacts of CC and variability. We hope that the findings of this study will assist various stakeholders—like policymakers and decision-makers—better understand the impacts of CC and variability on gender roles, and thus help in developing requisite gender-responsive adaptation strategies.

2. Context and Methods

2.1 Study Area

This study was conducted in two selected villages, Chole and Kwala, in the Kisarawe district of the Coastal region, Tanzania. The district is located at a latitude of 7°10′0″S and longitude 38°50′0″E (Figure 1). It is bordered by Mkuranga district to the east, Morogoro region to the west, Rufiji district to the south, and Kibaha district to the north. The district has two main rain seasons: *vuli* (short rain season) from October to December, and *masika* (long rains) from March to June. The mean/average annual rainfall differs in the area. The eastern part receives an annual average rainfall of 1400mm to 1600mm, while the western part covering the Chole division receives an average annual rainfall of 1000mm. Also, the temperatures of the area ranges from 28^{0}C to 33^{0}C, with an annual average of 30.5^{0}C.

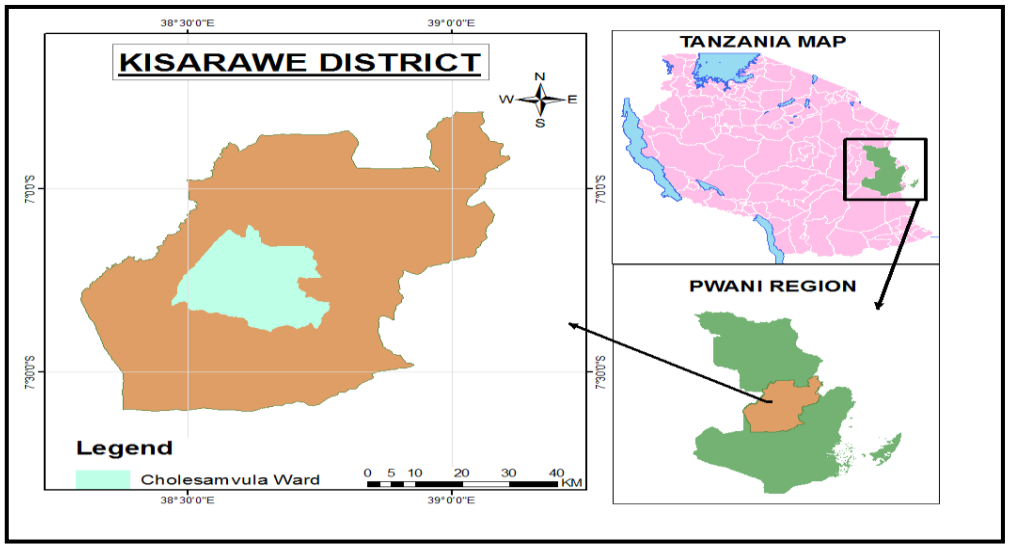

Figure 1: Map of Kisarawe District showing Cholesamvula Ward Dar es Salaam, (2019)

Source: GIS La-UDSM, 2019

According to the 2012 national census report, the Kisarawe district had 101,598 people: 50,631 were male, and 50,967 were female (NBS, 2013). About 84,174 (82.9%) lived in rural areas, while 17,424 (17.1%) lived in urban areas. Many people were aged between 15–64 years, while the youngest ranged from 0–14 years. Kisarawe district covers a total area of 5028km^2.

2.2 Methods

A mixed approach was used to collect quantitative and qualitative data (Kothari, 2004). Within the mixed design, a descriptive research design was used to get the existing situation of gender roles in climate change and variability. The design answers questions on how, what, when, and where. The use of the method helps to get a more understanding of a research problem.

2.2.1 Sampling Procedures

During the preparation phase, a reconnaissance survey was done before the actual fieldwork. A preliminary survey helped to familiarize with the study area and get more information in selecting the area, FGDs participants, and key informants. Also, during the preliminary survey, interview guides for FGDs, key informant interviews (KIIs), and structured household questionnaires were tested before the actual collection of field data, and errors found were minimized. Both participatory methods and structured questionnaires were used in data collection. A purposive sampling technique was used to select the study area, participants for the FGDs, and KIIs. People with long experience and history of the villages (at least 40 years) were selected for in-depth interviews and group discussions. For the FGDs, 8 members—comprising 4 men and 4 women—were chosen to participate in the discussions.

A simple random sampling procedure was used to obtain household respondents for the questionnaire from the village households register list with the help of village leaders. Also, village leaders helped to identify people who had lived long, and had the village's history, for at least 40 years and above to participate in the household survey interviews.

2.2.2 Sample Size

Establishing the sample size continued until the size of 10–12.5% was achieved as recommended by social scientist researchers. The study sample comprised 120 households out of 1000, whereby households from both Chole and Kwala villages of the Cholesamvula ward contributed 60 from each. The combination of the sample size from the selected villages adheres to be a reasonable size as per the recommendation by Kothari (2004). In Chole village, out of 600 households, 60 heads of households (10%) were selected from the study population; while in Kwala village a total of 60 households' heads, (15%) out of 400 households, were selected from the study population.

2.2.3 Data Collection

The study involved the collection of primary and secondary data. Three phases were involved in collecting the primary data. In the first phase, a household survey through questionnaire interviews gathered information about demographic characteristics, climate change, variability, and adaptation strategies of the impacts of CC and variability with regard to gender roles.

The second phase of data collection was on FGDs, which broadened the understanding of issues, and added further information on the data collected through the household interview. A total of 8 discussants—with an equal number of men and women—participated in the discussion through an open-ended checklist to avoid biases. The selection of FGD discussants was based on factors like: aged people with a long experience of the history of the village (45 years and above); living in the village for at least 40 years; and a knowledge about climate change and gender roles. This was done with the assistance of the respective village leaders. The discussion included matters on the impacts of CC and variability, and adaptation strategies to address the impacts of climate change vis-a-vis gender roles. Furthermore, 4 key informants were also interviewed on the following sub-topics: climate change and variability impacts; traditional gender roles practiced in the village at the household-level; the influence of climate change and variability in altering gender roles; and the responses of men and women in addressing the impacts of CC and variability at the household level.

The third phase involved collecting the average annual rainfall and temperature data from the Tanzania Meteorological Association (TMAs) for 30 years. The data covering the period were obtained from the Kibaha TMA station. The use of data for the Kibaha station was due to the lack of data for Kisarawe district: Kibaha was the nearest station-just 95km away.

2.2.4 Data Analysis

The analysis of qualitative data e.g., on the causes of climate change, and the general perception about CC and variability as regards gender roles—involved theme-content analysis techniques and descriptive analyses. Data related to demography and the social-economic characteristics of the respondents were subjected to descriptive analyses only. Furthermore, another statistical test—inferential analysis through Pearson Chi-square was computed to establish the relationship and association between the key variables, e.g., gender roles, and perceptions of CC and variability. The quantitative data related to people's perception about the impacts of climate change and variability on gender roles were analysed using the IBM Statistical Package for Social Sciences (SPSS), version 20. The analysis of temperature and rainfall data was done using the Microsoft Excel program and linear trend lines to indicate the rates for both rainfall and temperature. Data were analysed in three decades, namely; 1987–1997, 1998–2008, and 2009–2018.

3. Results and Discussions

3.1 Rainfall Trends

Results from the household survey, KIIs, and FGDs were validated using 30-years rainfall and temperature data from 1987 to 2018. The average annual rainfall in the study area is 1000mm (Kisarawe District Profile, 2010). The analysis rainfall data showed an increasing trend ($y = 0.0766x + 919.65$), with higher inter-annual variability over the past three decades. The analysis of the annual rainfall showed that there were six years between 1987 and 1997 (1987, 1988, 1990, 1991,1992,1993) in which the total annual rainfall was below normal (i.e., below 1000mm); and five years (1989, 1994, 1995, 1996, and 1997) in which it had above-normal total annual rainfall. Three years (2002, 2006, 2008) had recorded total annual rainfall above normal; and eight years (1998, 1999, 2000, 2001, 2003, 2004, 2005, and 2007) had below-normal annual total rain between 1998 and 2008. Moreover, four years between 2009 and 2018 (2011, 2014, 2017 and 2018) had above-normal total rainfall, and six years (2009, 2010, 2012, 2013, 2015, and 2016) had below-normal rains (Figure 2).

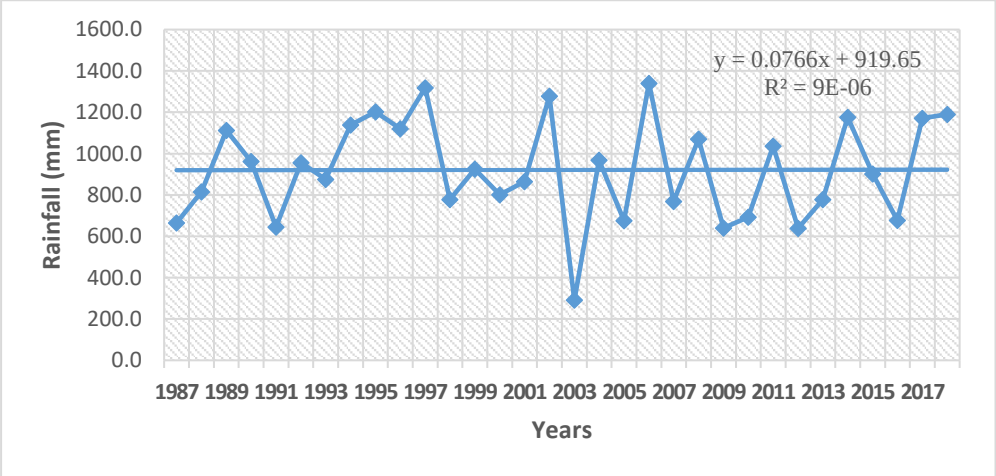

Figure 2: **Annual Rainfall Trend (1987–2017)**
Source: Tanzania Meteorological Agency, 2019

Moreover, the mean monthly rainfall analysis indicated shifts in monthly rainfall peaks between 1987–2002 and 2003–2017 (Figure 3). The finding coincides with the perceptions of household respondents and key informants, which showed a decrease in rainfall amount and failure to predict rainfall. Analysis of the rainfall data for the years 1987–1997 period indicated an increasing rate of 48.571 rainfall ($y = 48.571x + 691.25$) (Figure 4). The analysis of the years 1998–2008 showed a rising rate of 16.039 ($y = 16.039x + 791.21$) (Figure 5); while that of the years 2009–2018 indicated an increasing rainfall rate by 46.566 ($y = 46.566x + 633.69$) (Figure 6). Generally, the rainfall patterns for the three decades show an increasing rate.

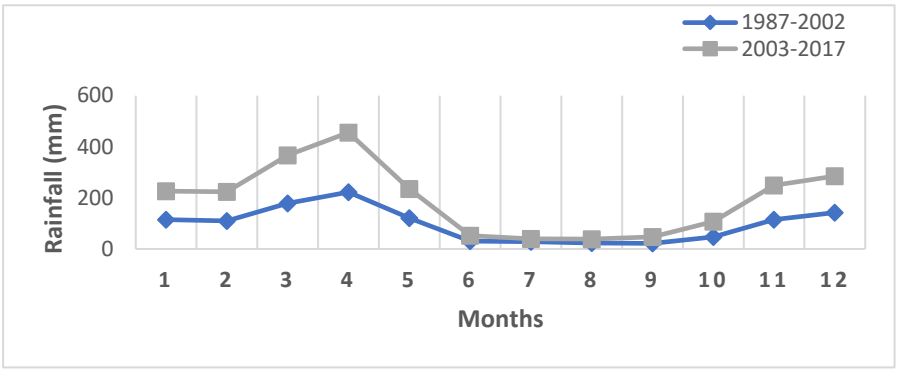

Figure 3: Mean Monthly Rainfall (1987–2017)
Source: Tanzania Meteorological Agency, 2019

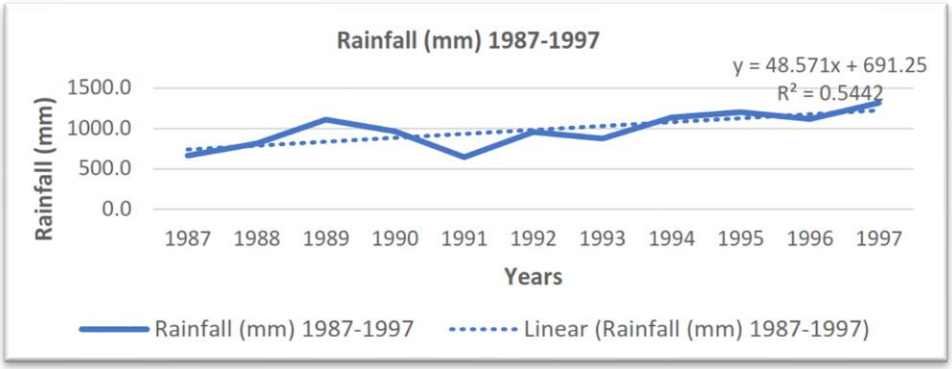

Figure 4: Annual Rainfall Trend (1987–1997)
Source: Tanzania Meteorological Agency, 2019

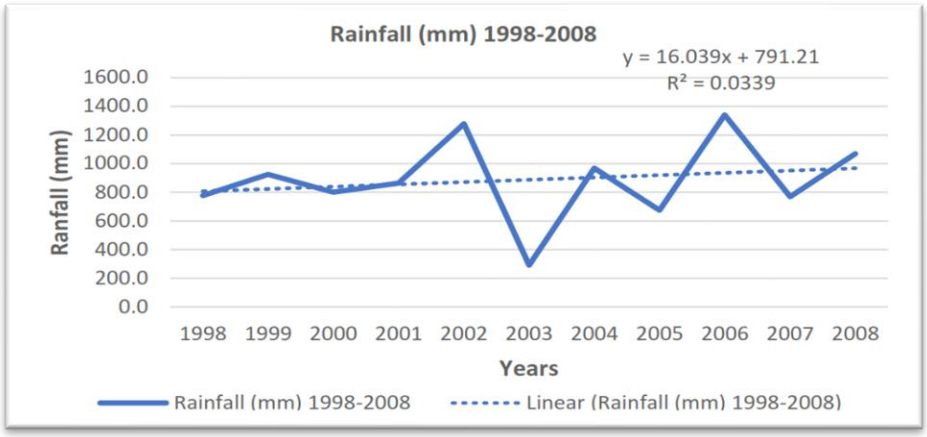

Figure 5: Annual Rainfall Trend (1998–2008)
Source: Tanzania Meteorological Agency, 2019

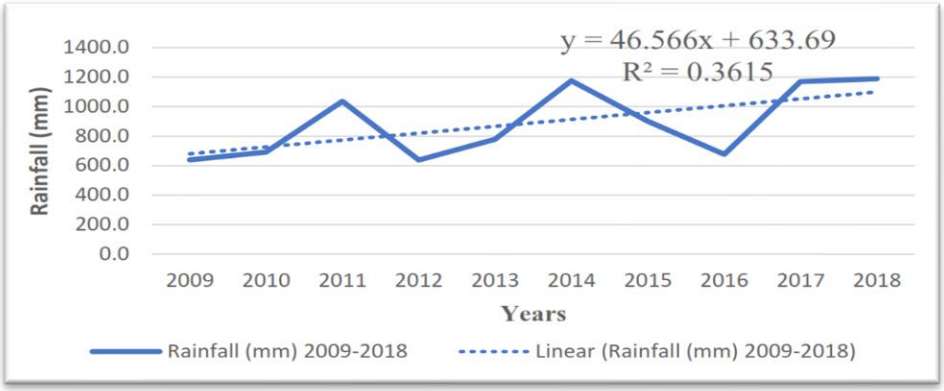

Figure 6: Annual Rainfall Trends (2009–2018)
Source: Tanzania Meteorological Agency, 2019

3.2 Temperature Trends

Temperature rise causes global warming, affecting ecosystems and human social and economic livelihoods (Rogelj et al., 2018). Specifically, the change of temperature affects water (groundwater recharge due to increased evapotranspiration rate) and food security, which in turn affects men and women's roles in society. This could affect some societies' traditional gender roles when trying to cope and adapt to CC and variability impacts. Thus, temperature data were collected and analysed. Both minimum and maximum temperature data (Figures 7 & 8) indicated an increasing trend. A trend line indicated that the annual minimum temperature rose at the rate of 0.0333 (y = 0.0334x + 20.936) per decade, and the maximum average temperature increased at the rate of 0.0429 per decade (y = 0.0429x + 30.279).

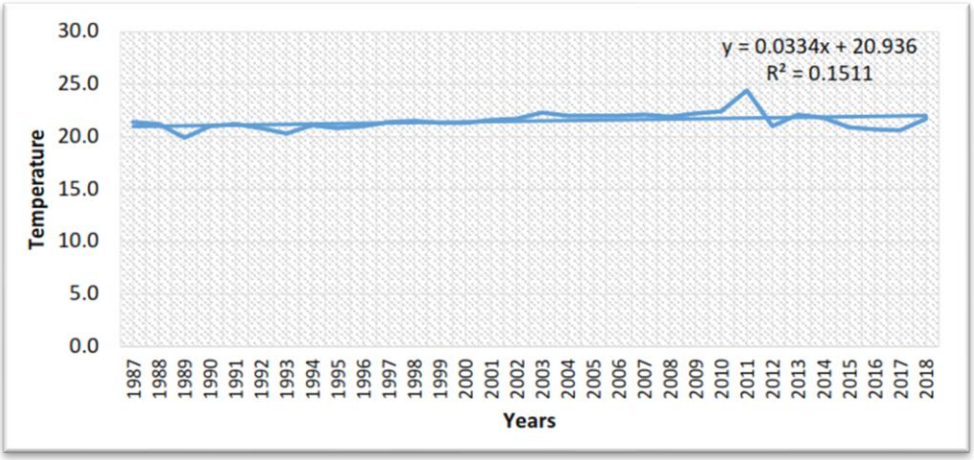

Figure 7: **Minimum Annual Average Temperature (1987–2018)**
Source: Tanzania Meteorological Agency, 2019

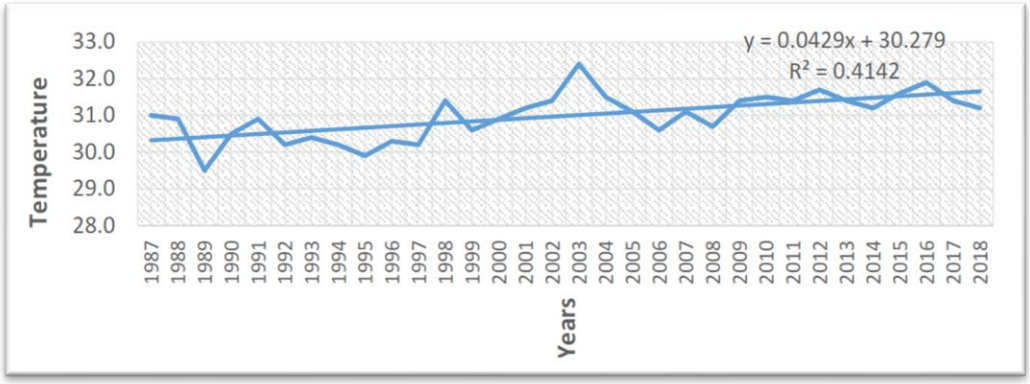

Figure 8: **Annual Maximum Temperature (1987–2017)**
Source: Tanzania Meteorological Agency, 2019

The minimum temperature shifted from the lowest temperature of 19.9 ℃ recorded in 1989, to 21.7°C in 2018. The highest recorded minimum temperature was 24.4˚C in 2011. After 2011, the temperature trend shifted from 21℃ recorded in 2012 to 21.7℃ recorded in 2018, an increase of 0.7℃ (Figure 7). The study area's average maximum temperature was 30.5°C. An analysis of the maximum temperature indicated that, except for the years 1989 and 1995, temperatures were above average. Therefore, the temperature and rainfall records indicated an increase in precipitation and temperature. Other studies in the same region reported similar temperature and rainfall trends (Kashaigili et al., 2014).

3.3 Gender Roles, Climate Change and Climate Variability

The study results indicate that 74.8% of the male and 20.8% of female respondents from Chole village, and 72.0% of male and 51.4% of female respondents from Kwala village, agreed that there is a change of traditional gender roles; implying that climate change and variability contribute to changing gender roles.

The stated traditional gender roles for men were farming, charcoal-making, and building; while some of the traditional women's roles were fetching water, collecting firewood, and doing other domestic activities. The results showed that the majority (96.8% and 96.0%) of male respondents and (86.2% and 82.9%) of female from Chole and Kwala respondents, respectively, agreed that CC and variability had forced men to perform domestic activities, such as helping their wives to collect firewood, fetch water, and in the search for animal feeds. However, the reported shift in gender roles was statistically insignificant ($p > 0.05$). Similar studies (Arntzen, 2015; Mollel, 2015) have also reported changes in gender roles in the face of CC and variability. Some of the gender

role changes include men fetching water and helping women with domestic chores. From the FGDs and key informant interviews, women were found engaging in activities of making charcoal. There were gender differences in the responses related to women doing men's activities. Results indicate that 87.1% of males and 86.2% of females from Chole, and 92% of males and 91.4% of females from Kwala, agreed that women were undertaking traditional men's tasks, but this result was not statistically significant ($p > 0.05$). Similar issues have been experienced in South Africa (Babugura, 2010).

Besides, the majority (74.2% and 64.0%) of male respondents and (58.6% and 45.7%) of females from Chole and Kwala villages, respectively, agreed that CC and variability had led to the sharing of activities that were traditionally only in the sphere of women or men. The gender differences and perceptions reported on shared gender roles were statistically insignificant ($p > 0.05$). A study by FAO (2012) in Mozambique found a similar situation: men working with women in the weeding, harvesting, and processing of agricultural products; activities that were previously a preserve for women.

Table 1: Respondents' Perceptions about Climate Change and Variability and Gender-related Roles (Computed Pearson's Chi-square (X^2))

	Village	Variable	Categories	Yes	No	X^2	P- value
Climate Change leads to shared activities	Chole	Sex	Male	74.2	25.8	1.635	0.201
			Female	58.6	41.4		
	Kwala	Sex	Male	64.0	36.0	1.959	0.162
			Female	45.7	54.3		
Climate change influence women to do other activities	Chole	Sex	Male	87.1	12.9	0.010	0.919
			Female	86.2	13.8		
	Kwala	Sex	Male	92.0	8.0	0.006	0.937
			Female	91.4	8.6		
Climate Change influence men to perform domestic activities	Chole	Sex	Male	96.8	3.2	2.190	0.139
			Female	86.2	13.8		
	Kwala	Sex	Male	96.0	4.0	2.444	0.118
			Female	82.9	17.1		
Climate Change leads to change of traditional gender roles	Chole	Sex	Male	77.4	22.6	1.045	0.307
			Female	20.8	8.2		
	Kwala	Sex	Male	72.0	28.0	2.571	0.109
			Female	51.4	48.6		

Source: Field Survey, 2019

Most of male (87.1% and 92.0%) and female respondents (86.2% and 91.4%) from Chole and Kwala villages, respectively, agreed that CC and variability had made women to participate in petty business because they had to ensure that food is available at home. Also, Babugura (2010) claimed that women have started to engage in earning activities, which has also been observed in the study areas.

Significant important issues also indicate that CC variabilities do not come with negative impacts only, but also with some positive impacts in societies; with an unequal distribution of the traditional gender roles. The household survey results show that 67.7% and 32.0% of the male respondents and 37.9% and 34.3% of the female respondents from both Chole and Kwala villages, respectively, state that CC and variability have stabilized gender roles, resulting into gender equality (Table 2).

Table 2: **Respondents' Perceptions about Climate Change and Variability and Gender-related Roles**

Respondents' Perceptions	Chole Village (N=60)						Kwala Village (N=60)					
	Male			Female			Male			Female		
	Yes	*No*	*Total*	*Yes*	*No*	*Total*	*Yes*	*No*	*Total*	*Yes*	*No*	*Total*
CC leads to shared activities	74.2	25.8	100.0	58.6	41.4	100.0	64.0	36.0	100.0	45.7	54.3	100.0
CC influence women to do other activities	87.1	12.9	100.0	86.2	13.8	100.0	92.0	8.0	100.0	91.4	8.6	100.0
CC influence men to perform domestic activities	96.8	3.2	100.0	86.2	13.8	100.0	96.0	4.0	100.0	82.9	17.1	100.0
CC leads to the stabilization of gender roles	67.7	32.3	100.0	37.9	62.1	100.0	32.0	68.0	100.0	34.3	65.7	100.0
CC leads to change of Traditional gender roles	77.4	22.6	100.0	20.8	78.2	100.0	72.0	28.0	100.0	51.4	48.6	100.0
CC leads to unequal Distribution of roles	25.8	74.2	100.0	44.8	55.2	100.0	28.0	72.0	100.0	26.8	71.4	100.0

Source: Field Survey, 2019

In addition, it was found through FGDs that most people—be it men or women—have started to adapt by performing activities that were formally done by the opposite gender; for example, men had started to carry out some of women's roles, and vice versa. This implies that men and women had been forced to change their traditional roles in response to changing situations. This was corroborated by two respondents who stated:

> *When food is not available, the burden is for both men and women, but men respond to this by traveling to the nearest villages in search of food* (Male respondent, Chole village).
>
> .....
>
> *When food is scarce, we just wait for the government to bring us the food because it is its responsibility to ensure that people do not die because of hunger* (Female respondent, Kwala village).

3.4 Impact of Climate Change on Men and Women's Roles

The results showed that a minority (29.6% and 37.5%) of the male respondents, and a majority (70.4% and 62.5%) of the female respondents from both Chole and Kwala villages, respectively, consider women to be the most affected by CC and variability than men (Figure 9). Furthermore, it is evident from the results that both men and women have been affected because of the dependence on climate-sensitive economic activities practiced by the majority, especially agriculture. For instance, due to differences in gendered social roles at the household level, food scarcity during drought affects women more because they are the ones who are supposed to ensure that food is available in their homes.

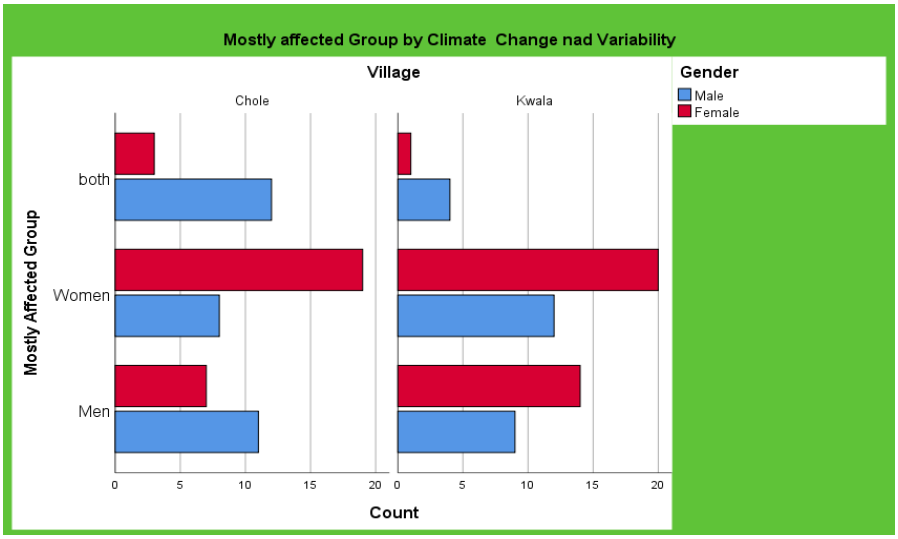

Figure 9: Groups Mostly Affected by Climate Change and Variability

Source: Field Survey, 2019

One of the discussants from Chole village was heard saying:

> *Both men and women are affected by climate change. But women are mostly affected because, for men, when there are climate changes and variability, it is easy to migrate from one place to another—far away from home—in searching for life; but it is difficult for women because they are supposed to stay at home with children* (Discussant from Chole village).

Another of the discussants from Kwala village had this to say:

> *In the past, we collected firewood near our homes, but due to climate change and variability, agricultural crop production is not sufficient. Many people, therefore, have decided to cut down trees to sell charcoal. This causes women to suffer more because they have to travel long distances to collect firewood. … some men have recently begun to help in collecting firewood* (Female respondent from Kwala village).

Despite the sharing of activities, women are still the most affected by the negative impacts of climate change and variability as they have to play many roles, including reproductive and productive roles. Similar results have been documented by Lyimo et al. (2013), Arntzen (2015), Mollel (2015), and Magesa and Pauline (2018).

3.5 Adaptation Options and Practices

Responses to climate change and variability differ from one place to another, and depend on contextual variables. The study results show that 87.1% and 76.0% of the male, and 86.2% and 62.9% of the female respondents from Chole and Kwala villages, respectively, agreed that they apply different ways of adapting to the impacts of climate change and variability. About 38.7% and 32% of the males, and 37.9% and 28.6% of the females from Chole and Kwala villages, respectively, agreed that they change their economic activities to adapt to the impacts of CC and variability. Furthermore, 96.8% and 80.0% of the male respondents; and 89.7% and 62.7% of the female respondents, from both Chole and Kwala villages, respectively, reported practicing planting varieties of crops—and especially drought-resilient crops—as a way of responding to negative CC and variability impacts (Table 3).

Table 3: Percentage Gender Concerning Response to Climate Change and Variability

	Chole (N=60)						Kwala (N=60)					
	Male			Female			Male			Female		
Adaptation options	***Yes***	***No.***	***Total***	***Yes***	***No.***	***Total***	***Yes***	***No.***	***Total***	***Yes***	***No.***	***Total***
Change of economic activities	38.7	61.3	100.0	37.9	62.1	100.0	32.0	68.0	100.0	28.6	71.4	100.0
Planting varieties of crops	96.8	3.2	100.0	89.7	10.3	100.0	80.0	20.0	100.0	62.9	37.1	100.0
Conducting irrigation activities	0.0	100	100.0	0.0	100	100.0	4.0	96.0	100.0	2.9	97.1	100.0
Switching from farming to non-farming activities	51.6	48.4	100.0	55.2	44.8	100.0	48.0	52.0	100.0	34.3	65.7	100.0

Source: Field Survey, 2019

However, some of the practiced adaptation strategies in the area are destructive in moderating CC and variability. For instance, the felling of trees and burning of charcoal affects carbon sequestration, which results into global warming. This harmful adaptation practice has also been observed by other studies, e.g., that of the University of Oslo (2013), which reported that the economic conditions of most developing countries are not supportive of robust adaptation to CC and variability.

Therefore, these results imply that more capacity building on gender-differentiated strategies for responses is required due to differences in gender-specific responsibilities and roles created by a particular society. A similar issue concerning building capacity on gender and CC and variability has been documented by other scholars (Alston, 2013; IPCC, 2014). A focus is needed on gender relations with issues of power -- especially on how different social positions make women underprivileged -- and create new equitable power relations (Skinner, 2011). While recognizing power relations, it is also important to remember that female and male roles do not fall under the same category, and therefore climate change interventions are needed to meet a diverse range of situations and needs like those of female-headed households (ibid.). Therefore, people need support from the government as endorsed by other studies raised in the COP 21 (Conference of Parties) (Alston, 2013; Sellers, Leydon and Uribe, 2016).

4. Conclusion

This study has provided an empirical case study of the impacts of CC and variability on gender roles in Kisarawe district, in Tanzania. Using annual rainfall data for 30 years, the results indicate an increase in the annual rainfall trend. Also, the annual minimum and maximum temperature data indicate an increasing trend. All these indicate an ongoing CC and variability. In turn, gender roles in the study area are also changing to adapt to this. For example, women have switched to activities traditionally carried out by men (e.g., charcoal-making and engaging in petty trade); while men have also done the same by undertaking some former women-only roles (such as cooking food, fetching water, and collecting firewood). Thus, the change of traditional gender roles could also be associated with the impacts of CC and variability in the study area, which have forced the communities to respond with measures that involve crossing traditional gender lines.

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