



Effects of Climate Change on Women's Health in Mahama Sector, Rwanda

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Received September 11, 2020; Revised September 29, 2020; Accepted September 30, 2020

Abstract: Climate change effects resulting from extreme weather events are diverse and do tremendously affect the physical environment and human health across the globe. Vulnerable rural livelihoods are the most affected. These vulnerable livelihoods are both the gender-men and women. However, the extent to which gender are affected is not well documented in the literature of developing countries. In this study, we investigated the effects of climate change on women's health in Mahama Sector, Kirehe District, Rwanda. Three research questions guided the study: (1) What type of climate changes are in mahama sector? (2)What are their effects on women's health compared to men? (3) What can be done to alleviate their effects? The study employed phenomenological and case study designs to collect and analyse data from 3 FDGs and 5 individual cases. 35 respondents participated in the study. Qualitative methods of coding, and categorizing data, was used in the development of themes. Findings indicated that the climate changes that prevailed in mahama sector were- prolonged droughts, destructive rains, destructive winds, and irregular rains. Their effects on women's health included hunger, poor health, lack of sex appetite, men's migration, children's school dropout, psychological harm, destruction of houses and crops, teenage pregnancies; family conflict-free living and house privacy exposure. They affected women's health than men. It was concluded that climate changes have drastic effects on women health. These findings led to the design of a climate change intervention conceptual model.

Keywords: Gender issues, Climate change, Women health, Mahama, Rwanda

How to reference this article (APA):

Gatsinzi, P. & Byandaga, L. (2020). Effects of climate changes on women health in Mahama sector, Rwanda. *Journal of Research Innovation and Implications in Education* 4(3), 249 – 257.

1. Introduction

Climate change is a world issue and a hot topic for discussion (Knee, Ogawa, & Matsumura, 2008). It is defined as referring to any change in climate over time, whether due to natural variability or as a result of human activity. It is caused by increase in greenhouse emissions that raise earth's temperature, hence global warming thereby leading to the melting of snow/glaciers, increased precipitation, increased extreme weather events, and shifting seasons (IPCC, 2007). Its victims are- livelihoods, food and water security, ecosystems, infrastructure etc (government of the Netherlands, 2019).With such effects, agriculture becomes vulnerable, especially in developing countries where the application of scientific methods of growing crops is limited. The impact is that high temperatures affect crop

yields and cause human health exposure to heat, while alterations in precipitation patterns causes short-run crop failures and long-run production failures (IFPRI, 2009).

According to the World Health Organisation (WHO), the increasing temperatures, precipitation pattern changes, droughts, floods, extreme weather events that result from rapidly changing earth climate due to human activities tremendously affect the human health, especially in regard to shelter and food (WHO, 2014). Rwanda is very vulnerable to climate change like other world countries as it is ranked 116 out of 181 countries in the ND-gain index⁵ report of 2016 for climate vulnerability. It is ranked 185 out of 188 countries in per capita GHG emissions³ and its contribution is only 0.01% to global emissions⁴. It is the 29th most vulnerable and 94th least country and this signifies that

it is highly vulnerable to climate change effects and its readiness to alleviate these effects is moderate (government of the Netherlands, 2019).

Since the current and expected effects of climate change differ locally, nationally and regionally, as well as at the community and individual level, gender, particularly women are most vulnerable (government of the Netherlands, 2019). Gender norms, roles and relations are highlighted by the WHO (2014) as key factors in climate change vulnerability. The UNO 2030 global agenda and the SDG agenda 2 aims at attaining zero-hunger while SDG 3 calls for attaining good health and wellbeing. Climate change effects are the ones causing these hunger and health issues especially in developing countries which lack sufficient climate change mitigation measures. In Rwanda, for example, 90% of the inhabitants obtain their living from agriculture. Their agricultural activities are thus susceptible to climate change effects of prolonged droughts, intense rainfalls that cause destruction and erosion of crops and houses, and dry spells during rain seasons.

Subsequently, famine, conflicts, population displacement, and environmental degradation occur (Ministry of the foreign affairs of the Netherlands, 2018). When famine ensues, women and children are the most affected. Women die more than men, women, girls and children suffer consequences of nutritional deficiencies, walking long distances in search of food and water collection. Because of social and family roles, women suffer a lot as they are mandated for providing food, water, and energy compared to their male counterparts. Men are also revealed to migrate while women resort to wage labour to support the children (WHO, 2014; Alam, Bhatia & Mauby, 2015; UN Women Watch, 2009). These women's health experiences with climate change effects is however not comprehensively highlighted in the literature, especially in varying localities of least developed countries like Rwanda. This qualitative study thus aimed at investigating how the climate changes affects women's health in Rwanda's remote region of Mahama Sector, Kirehe district, Eastern province. The findings inform policy in regard to climate change health effects mitigation measures in Rwanda. The study was guided by the following research questions: - 1) what are the types of climate changes that occur in mahama sector? 2) How do they affect women's health? 3) Do they affect women more than men? 4) What can be done to alleviate their effects?

2. Literature Review

. According to REMA (2011), Rwanda's climate temperatures are projected to increase at 1⁰c-2⁰c in the next 100 years. The UNDESA (2008) stipulates that climate change is a vital threat for sustainable development achievement. Climate change events like increased duration of dry spells, variable rainfall, prolonged droughts, and heavy rains do affect agricultural activities in most developing countries. In Rwanda for example agricultural activities employ 70 percent of the population and contributes to 30 percent

of the Gross National Product (USAID, 2019). Rwanda's eastern Province where Mahama Sector is located has been described as a low lying region with un predictable rains, intense rains that erode top soil and cause valley flooding which again affect the highly dependent rain fed crop production (Green Fund, 2019; USAID, 2019). These climate change events affect humanity in a disproportionate manner as the most affected are the poor women livelihoods (Alam, Bhatia, & Mauby, 2015; Mupenzi, Bao, & Li, et al., 2011).

The women who are the main producers of agriculture (food), water and energy in most rural developing countries are thus at the spearhead of the climate change effects since it causes food insecurity and migration. It affects the little natural resources women depend on (IFAD, 2010; UN Women Watch, 2009). In this case, women will not have what to cook for the family (children and the husband), husbands (men) will thus resort to migrate leaving behind women to deal with children with nothing to eat. In Rwanda for example, climate change effects of prolonged droughts, intense rainfalls and dry spells during rain seasons were found to cause famine, conflicts, population displacement, migration and environmental degradation (Ministry of the foreign affairs of the Netherlands, 2018). Dry spells during rainy season means that during the rainy season, there are at times/shot periods of 3-4 weeks where rain stops and it shines thereby affecting the growth of the crops which affects the yields.

Other climate change health effects especially on women include poverty, poor air quality, heat exposure, vector-borne diseases, and poor water quality (Sorensen, Saurik, & Sehgal et al., 2018; WHO, 2014). According to UNICEF, children's health is also affected by a myriad of climate change impacts (UNICEF Research Office, 2014). A study by the Ministry of Environment (2019) indicated that the metrological information in Rwanda was not used by majority sectors to take mitigation measures because of lack of its awareness, it is provided in a general manner without area specificity, and its inaccuracy. Mupenzi, Bao, & Li, et al. (2011) in their study of the effects of climate change on the Rwandan smallholder agriculture established that because of climate change effects, farmers needed external support to adopt effectively to current and future climate change effects. This help can come from the government and other development partner agencies.

Sorensen, Saurik, & Sehgal et al. (2018) in their study of climate change and women's health in India found that women were the most vulnerable to climate change effects due to geo-political social and environmental factors. These authors proposed that proactive gender based alternatives aimed at protecting women's health need to be mobilized by policy makers so as to help women mitigate, respond and cope with climate change effects. Studies further reveal that prolonged droughts, caused men to migrate while women resorted to doing wage labour to sustain children. This had impact to their health due to nutritional deficiencies, hard work and

travelling long distances for food and water collection (WHO, 2014).

USAID (2019) established that in 2016, droughts in the Rwanda's Eastern Province affected agriculturalists mainly in the districts of Kirehe, Kayonza and Nyagatare where 44,000 households were left without food. Huggins (2017) analysed climate change adaptation in Rwanda's agriculture sector in Kirehe district and found that the agricultural policies were shortsighted of the effects of the climate change. He also found that in a planting season where 50,000 tonnes were estimated to be harvested in Mahama Sector, rains delayed and only a quarter of the estimated harvest were harvested, implying changes in the climate as the cause and this in turn, affected the livelihoods' food security whose impact is most felt by women.

3. Methodology

The study purposed to investigate the effects of climate change on women's health. Both phenomenological and case study designs were used to collect and analyse data. These designs were chosen as they help the researcher to collect data of deeper lived life experience of the subjects under investigation. 35 participants participated in the study. The participants were located in Kigufi Village, Kamombo Cell, Mahama Sector, Kirehe District (Local administrative entities in ascending order from the grassroot level-Umudugudu or Village is the lowest local government administrative level, followed by the, Cell, then the Sector, District, and lastly at the Province) Rwanda. Kirehe District is found in the Eastern province of Rwanda where extreme weather events (prolonged droughts, intensive rains, hailstorms, winds) caused by the climate changes severely affect the small holder farmers.

Simple random sampling was used to select Mahama Sector from the four most affected Sectors (Mahama, Nasho, Nyamugari, and Nyarubuye) with extreme weather events in Kirehe district. Mahama Sector is made up of 4 cells and 37 villages. Simple random sampling was also used to select Kamombo Cell from all the Cells constituting Mahama Sector. Purposive sampling was used to select Kigufi village in Kamombo Cell because it was among the most affected villages. Convenience sampling was used to reach to respondents because during the time of study, majority residents couldn't be traced as they were busy searching for food by doing manual work since they were still suffering from the consequences of the climate changes.

Data collection was done in two days in April, 2019. Before data collection, we sought authorization permits from the Kirehe district authorities and Mahama Sector authorities. The sector authorities introduced us to the Kigufi village authorities, who also helped us to reach to respondents who were available and most affected by the climate changes. We also sought consent from participants who agreed to voluntarily participate. They signed consent forms which we kept confidential. The 35 participants were organized into 3 Focus Group Discussions (FDGs), each containing 10 participants and 5 cases. 2 FDGs constituted women participants

while the third one constituted men participants. Five (5) women were studied individually (cases study) so as to elicit their deeper lived experience of the effect of climate change on their health. The men's FDG was purposively selected for inclusion in the study so as to counter check the validity of data/ women's views. In-depth interviews were used to collect data. We collected data by asking the guiding questions in reference to the research questions, asking probing questions, and manually recording/taking notes of what is being said by the participant(s). Where we could miss the point said, we paused and asked the participant(s) to repeat what they had said so that it is properly recorded and no single point is missed.

After collecting data, we analysed it using thematic analysis and constant comparative analysis. This was done manually by editing raw data, coding it and categorizing it, and then developing themes out of it. Constant comparative analysis was done by familiarizing with data, comparing the codes and code categories so that no point was not categorized and then comparing the coded data and categorized data to establish data relationship and discrepancies. Finally the emerged themes were highlighted according to each research question.

4. Results and Discussion

This section presents the study results from the case studies and the FDGs. They are presented basing on the themes developed according to each study question. They are also discussed in relation to the secondary data.

4.1 Respondents views on the type of climate changes in Mahama sector

The first research question investigated the types of climate change in the mahama sector. Responses from the two focal group discussions and the individual cases indicated that the most types of climate changes were prolonged severe droughts, destructive winds, destructive rains, and irregular rains during planting season. They indicated recent climate changes as the normal drought that started June to September and December 2018, thereby affecting the September planting season. They also highlighted destructive rains and winds that occurred in March, 2019 as destroying crops and houses.

4.2 Respondents views on the effects of climate change on women's health

The second research question investigated the effects of the climate changes on the women' health. The themes that emerged from the two FGDs and individual cases were grouped together in the following ways:

Hunger

Prolonged droughts that affected the planting season of September- December 2018. Planting was not carried out due to lack of rain caused by prolonged drought yet in the other parts of the district and the country, they

received rain fall, planted and harvested food. There was no planting due to drought in some parts, while others planted after receiving rainfall in their side of the same district ; *“because of lack of food, in my family we could at least manage to eat either once a day or once in two days,”* said one female respondent from the women’s FGD and her response was supported by other FGD members . Furthermore, during the planting season of Feb-May 2019, destructive rains and wind storms of March destroyed their crops by washing them away to downstream as well as floods, since most of the farmers grow crops in the valleys. *“as we were recovering from the effects of 2018 droughts, the march destructive rains and winds further escalated our hunger.”* said one woman whose statement was supported by all focal groups) all women and men in the combined focus group. This signifies that the climate changes of prolonged droughts and destructive rains and windstorms had a severe hunger impact on the women in Mahama sector.

Lack of sex appetite

Climate changes affected the couples’ sex interaction relationship. Responses from both focal group discussions and individual cases pointed out lack of sex appetite as resulting from hunger. For example, women indicated that because of hunger, they had no moment of desire to have intimacy with their husbands. One woman stressed that *“during hunger periods, I sleep with my husband on the same bed but facing in the opposing direction until morning”*. When men were asked to justify the women’s assertion in the combined focus group, they all responded in agreement with women. One man hinted that *“we as men also become weak because of hunger and this causes me to lose lust for sex. Besides, I cannot entice my wife for sex since I know that I have not provided food to the family.”* A probing question was asked to men if they didn’t resort to having sex with other wives outside their marriage secretly. They responded that they couldn’t do it because they had nothing (money) to entice other women but focused on where they could get work and get food for the family. Women also justified this men’s statement. This implies that climate changes had a remarkable effect on couples’ sex relationships.

Weak body/physical weakness

The climate changes affected the women’s health in that they lived a hungry life and their bodies became weak, liable to sickness, lack of energy to do and finish manual work on time, lack of medical access due to lack of money to pay the local medical insurance (Mutuelle de Santé), lack of breasts (milk in breasts) for those breastfeeding babies, malnutrition of children causing their stunted growth, as well as loss of weight due to unstable mind of how to survive. This illustrates that poor women’s health is linked to climate changes in Mahama sector.

School dropout

Responses further indicated that climate changes caused hunger and families would not get food as they could eat

once a day or once in two days. Mothers could tell their children to go to school but couldn’t due to hunger. In justification to this answer, a question was posed to men. Men who also agreed with the women’s statement that children refuse to go to school hungry, even if force is applied. Furthermore, some school girls dropped school because they had become pregnant through looking for jobs and some necessities because of hunger at home. This means that climate changes affected even the children’s school attendance thereby affecting their education, health and future.

Men’s migration

Climate changes on women’s health was also realized in the migrations of husbands, children and women themselves for work/jobs. Because of hunger, husbands could not sit comfortably when they knew no food was available for the family. Thus, men resorted to migrating to distant places/ districts for temporarily work where they could spend one to two months and they return back. One man stressed that *“when I migrated temporarily for job, I was paid and sent money back to my wife to buy food for children.”* Wives also migrated to search for temporary jobs in the surrounding areas so that they get food for children since husbands had migrated. Also, the school dropouts could wander around in the neighborhoods or in distant places begging for food or looking for jobs. This made women to stay as caretakers of the family, doing manual work while hungry, thereby affecting their health.

Psychological harm

The effects of climate changes on women’s health indicated psychological harm that caused their husbands to migrate for jobs and were left responsible to care for the children yet had nothing to feed them. Children asking for food and they could provide with water, lack of breasts for sucking babies which would make them cry yet no alternative. Lack of sleep as they were thinking what to feed children, pregnant mothers being sucked by the fetus/ baby in the womb yet nothing to eat the whole day as well as doing heavy manual work. Lack of husband’s whereabouts and living status, their children refusing to go to school hungry, some men knocking their doors to open for unwanted sex during night since they knew their husbands had migrated and this instilled in women fear and instability due to lack of husband’s protection. Begging for food from the well-off families in the neighborhoods for the children which was a hard task as some could sympathize and provide while others could just listen and mock them. Men were asked whether there were some who went in the midnight to homes where husbands had left the wives and migrated. They responded that not all of them but a few who had the vice of practicing sex outside their marriage. This reveals that the climate changes had severe psychological harm on women’s health.

Minimized family conflicts

Another finding that resulted from the effects of climate changes on women’s health was rare conflicts in the family. Women expressed that during hunger times,

men become calm and peaceful in the family thereby minimizing family conflicts. This was contrary to the period after harvest due to stable climate where they have abundance of food. Some men become drunk or sell some of the harvest for drinking or business purposes, buy land without the women's consent thereby leading to conflicts like fighting, divorce, sex outside marriage, etc. When a probing question was asked to men about the women's assertion, they agreed that the village is most peaceful during hunger times. When the local leader who was contacted to justify these assertions of no conflicts; He pointed out that *"during the hunger times, the whole village rarely receives violent/conflict cases from the couples/families compared to harvest times."* This indicates that although climate change causes severe negative effects on women's health, its positive effect is conflict-free living families as most men do sympathize with their wives for the survival and benefits of the family.

Destruction of houses and privacy exposure

A combination of destructive winds and rains that blow off the roofs/sheets and leave the house structure and its interior exposed to the public view. Families could be exposed to being rained on, since they don't have money to immediately repair or buy new sheets. They resort to seeking accommodation from friends in the neighborhoods. Since women by nature love privacy of the way they live, their privacy is exposed hence making them uncomfortable with the new life experience as well as fear to be mocked by their counterparts in the neighborhoods. The sympathizing neighbors give them shared accommodation in one room. This affects the privacy of women's families thereby causing psychological trauma as well as incurring expenses to rehabilitate houses.

4.2 Climate change effects on women than men

After women's health, the next research question probed responses about who between men and women are mostly affected by climate changes than the others. All respondents (men and women in the two focal groups and individual cases) strongly remarked that women were the most affected. This illustrates that the climate changes affected women's health more than men in Mahama sector.

Measures to alleviate the effects of climate changes on women's health

On the question about what can be done to alleviate climate change effects on women's health, respondents indicated that the government should establish rapid intervention measures to aid specifically pregnant women and widows since they are the very most affected amongst all the people. Furthermore, income-generating projects should be established in the area so that people in mahama can have off-farm jobs on those projects and they get income that will sustain them in case prolonged droughts or destructive rains and winds

strike. This would prevent men, women, and children from migrating for work in distant places.

In addition to that, respondents highlighted that agriculture planning should be done in a manner that crop growing is done up land/ upland hills and valleys be kept for bio conservation only. This is because most of the farmlands are in the valleys and when floods strike, they are washed away, leading to poor harvest, hence hunger. Irrigation systems should also be extended to this place as well as people be taught how to irrigate crops up land especially during the prolonged droughts. Children's rights should be promoted in this area so that they are fed and don't abandon school in search of food and jobs. This would enhance their education thereby leading to the achievement of education for all as well as quality education. Lastly, they suggested that the national metrological agency should tell exactly when the rains would end and when droughts will start so that they don't plant and their crops don't do well. Furthermore, it should tell the intensity of rains and droughts through localized meteorological information centers so that they are prepared for it.

Findings from individual cases

The study collected data from 5 women (individual cases). This was done to find out their real experience with the effects of climate change on their health. Purposive sampling was used to select only 5 women, while convenience sampling was used to reach to those who were available during the time of the data collection exercise. The guiding research questions were: What are the types of climate change that occur in Mahama sector? What are the effects of climate change on (women) health, and what can be done to combat climate changes? The following were the findings from individual cases.

Hunger (case 1) For climate changes of the prolonged droughts and destructive rains, one widow revealed that hunger affected her severely in that *"occasionally, together with children, we spent a day and a night without food. I gave children water to drink as food and they went to sleep. The children accepted, hoping that they shall get food the next day. Next morning I went to search for manual work to pay me for food. I totally failed and came empty at midday. While walking back home, I had no strength of where to start telling children that I have no food to cook. Reaching at home, they came running to welcome me. When they saw that the bag for raw food was empty, they realized that they are going to have the same experience again!! They then got used and just drank water. The oldest had refused to go to school hungry. I went into neighborhood to beg for the children's food and fortunately got it."* She felt very sad to see her children asking for food and are given water! It is a hunger experience she shall never forget in her life as it affected her emotional state. Thus climate changes in Mahama had a drastic effect on women's psychological state.

Unwanted sex (case2): In a related experience, hunger caused one widow to resort to engaging men to earn a

living by sleeping with them. She highlighted that *“as I had nothing to eat with children, I called one man in the neighborhoods to lend me little money to buy food for children. Then he told me to come. On arrival, he started enticing me for sex before getting the money. I hesitated but had no alternative other than having protected sex. I went with money and bought food. Another occasion, a man called me to meet him, hoping he was going to get me money to buy food for supper. Surprisingly, he bought me a bottle of beer. I took it while he was also taking his. Fortunately we parted without enticing me for sex. I went back home praising that the beer I took was the food for my night since children had got from the neighborhood.”* She remarked that she did those things because of the hunger that had been caused by the prolonged droughts that didn't allow them plant in September 2018 rain season.

Destroyed house (case3): Relatedly, another widow and her children were affected by the destructive winds and rains that destroyed the roof of their house. Since she had no capacity, she sought accommodation from the neighborhood. At the neighborhood, she recounts, *“I was told to work for them without pay, while catering for my children's food. They could even eat alone without considering us. This was a sad experience seeing others eating while my children just watching! When I fell sick, they dismissed us away. We went to another family in the neighborhood that sympathized and cared for us. Finally the Sector/local authorities had mobilized resources and our house was constructed and we returned home, thanks to the local authorities.*

Migration (case 4): Because of hunger resulting from the prolonged droughts, a widow and her children had to sleep without food for some days. She narrated that *“I decided to leave my children with the neighbor and went to distant place for job search. I went with other ladies. We finally got manual work at a construction house and were paid a daily wage. Since the wage was small, we decided to rent and share a house of one room, and eat once so that we could save. My children had dropped school due to hunger. As I had departed from them, I had unstable state of mind as I thought how they were living and being treated in the neighborhood. I could send some money to the family accommodating them so that they can get food. When the construction manual work ended, we returned back home with some savings to buy food and clothes, as well as pay the local medical insurance fee and school fees.”* It is a terrible experience to sleep with children without eating, as well as migrating and leaving them behind.

Water as a solution for hunger (case 5): Also, men go for jobs for food at home. A woman was in her last phase of pregnancy. She recounted that *“Someday, I went to neighborhoods leaving children without food. I was also very hungry, I finally got where to do cultivation and had to be paid after finishing the work. The work was to be completed in two days. As I was cultivating, the foetus started sucking me until I felt the sucking in my brain!!! I drank water to calm the pain of sucking. Each time I was sucked, water was the solution.”* After finishing the work for the first day, I was paid half of the total pay and bought food without energy.” This was the life style

of the neighborhoods. Those who had food, however, sympathized with her and provided. In the due process, the husband sent money and they rejoiced. The experience with hunger while pregnant devastated health, an experience she shall never forget.

After analyzing and presenting findings from the focus group discussions and from individual cases, the next step was to triangulate those findings with the existing literature as emphasized by the grounded theory (Charmaz, 2014; Grazer and Straus, 1967; Creswell, 2013). Emphasis was on qualitative research, you begin with primary data collection so that it is not limited to theoretical concepts established in literature. The available literature indicates that globally, droughts, floods and storms kill more women than men, and tend to kill women at a younger age. These effects also interact with the nature of the event and social status. In Bangladesh, for example, the 1991 cyclone disasters killed 140 000 people, of whom 90% of victims were women (Aguilar, 2004, cited in WHO, 2011). Relatedly, severe weather conditions highlighted in studies as destroying shelter, contaminating water supplies, crippling crop and livestock production, tearing apart existing health and other service infrastructures. The magnitude of their effects on human health vary by region, by relative vulnerability of population groups (in this case women), by the extent and duration of their exposure, and by society's ability to adapt to it (IPCC, 2007, Mboera, et al. 2011).

Other impacts were floods, frequent and prolonged droughts, crop failure, loss of livestock, which results into internal displacement and significantly contribute to malnutrition due to lack of adequate food (Githeko et al., 2000; Patz et al., 2005; Kandji & Verchot, 2005, cited Mboera, et al. 2011). Such impacts are reported in Tanzania, where heavy rains accompanied with strong winds causing floods are noted to have left thousands of people displaced and without food in Muleba, Kilosa, and Dares Salaam between 2009-2011 (Fahey et al., 2011, cited Mboera, et al. 2011). These impacts relate to those affecting the Mahama residents.

According to the Government of the Netherlands (2019) report, climate changes in Rwanda is anticipated to result in increased temperatures, intensified rainfall, and prolonged dry seasons where the east and southeast regions are expected suffer from droughts and food insecurity that will result in hunger for the communities living there.

The USAID (2019) highlights that rising temperatures and variable rainfall are likely to impact rain fed agriculture in the drier eastern region/ province of Rwanda which is considered the most vulnerable to climate impacts because dry spells are increasing in length, leading to food shortages. In 2016 for example, prolonged droughts affected the regions/ districts of Kayonza, Kirehe, and Nyagatare, leaving 44,000 poor households that sustain 225,000 people) food insecure.

The findings on girls' pregnancies are complimented by CLADHO's (2016) study report that indicates the main

contributing factors that pushed school adolescent girls to early pregnancy included the poverty of parents, sexual violence and subsequently, resulting to school dropout, poverty, and HIV/AIDS and other sexually transmitted infections. Such findings have led us to design a climate change effects mitigation model explained below.

4.3 Climate change effects intervention model

The model below is derived from the findings gathered from the field study at Mahama Sector that are unique to particular locations and people. The model that we have developed for the women in Mahama sector could be replicated for women with similar social economic and

climatic conditions across the globe. As seen from the figure below, women, children, adolescent girls in regard to school dropouts, girl’s pregnancies and men’s migration are all affected. In order to build resilience to these climate shocks and stresses, different interventions can be adopted to reduce effects of climate change on the vulnerable women. The model, therefore, recommends the measures that can be implemented by Government, development partners and residents of Mahama sector. The model is unique as it provides conceptual understanding of how the climate change types (illustrated in blue sky color for nature illustration) cause effects (illustrated in red color to highlight adversity) on humanity especially women. The intervention measures are depicted in green color to illustrate hope for living among the vulnerable affected people.

Climate change intervention conceptual model

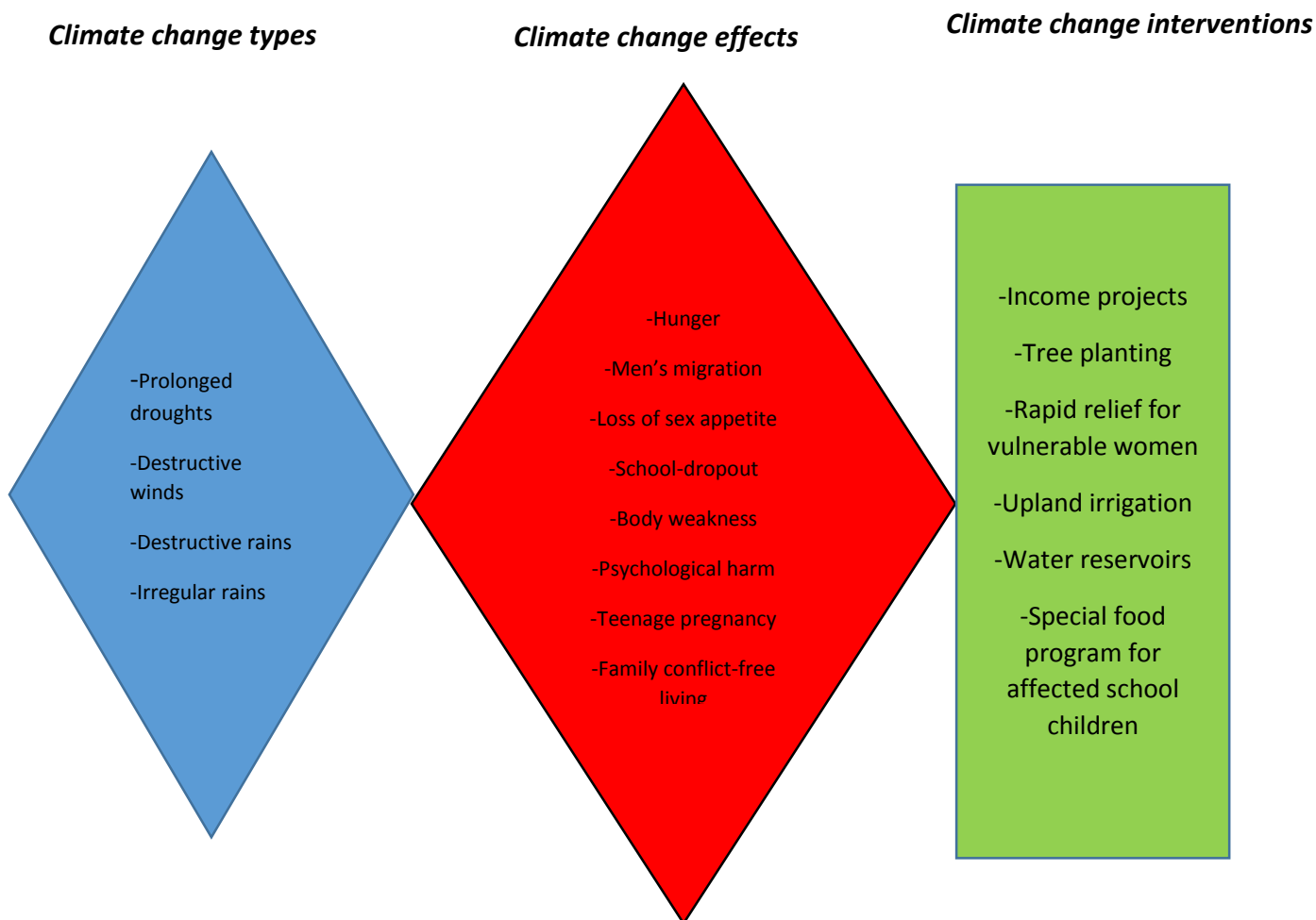


Figure 1. Climate change effects interventional conceptual model

5. Conclusion and Recommendations

5.1 Conclusion

This study investigated the effects of the climate change on women's health in Mahama Sector, Kirehe district, Rwanda. We conclude that the climate changes that prevailed in Mahama sector were the prolonged droughts, destructive rains, destructive winds, and irregular rains. The effects of climate change on women's health in Mahama Sector included hunger, poor health, lack of sex appetite, migration for food and jobs, children's school dropout, psychological harm, destruction of houses, school girls' pregnancies, privacy exposure, women did hard manual labour for survival, and were the more affected than men. Climate change and its impact on women's health do not occur in isolation. An individual or community could face multiple threats at the same time. Some of these health impacts resulting from climate changes types are compounded by secondary or tertiary factors such as access to men's employment leading to men's migration; food insecurity, damages to houses, and these consequently affects the economy and peoples' health. Governments need to keep track of the climate change whose effects can either be amplified or reduced by socioeconomic interventions. Governments need to build resilience to climate change through individual and community capacity building to acclimatize to different meteorological conditions and build the level of preparedness for and recover from damage, injuries, and lives lost due to extreme weather events.

5.2 Recommendations

1. We do recommend that the Government of Rwanda, Development Partners and residents of Mahama sector, implement intervention measures for the women's life improvement. For instance, the aid intervention measures specifically be given to vulnerable women (pregnant women and widows) since they are the very most affected amongst all the people.
2. Trees should be planted around the gardens and homes to act as windbreakers.
3. Income-generating projects should be established in the area so that people in mahama can have off-farm jobs on those projects and they get income that will sustain them in case prolonged droughts or destructive rains and winds strike. This would prevent men, women, and children from migrating for work in distant places.
4. Crop growing can be done upland while valleys be kept for bio conservation only. This is because most of the farmlands are in the valleys and when floods strike, they are washed away, leading to lack or poor harvest, hence hunger.
5. Integration of and training on irrigation systems should be extended to this place to

enable the community to irrigate crops up land especially during the prolonged droughts.

6. Children's rights should be promoted in this area so that they are fed and don't abandon school in search of food and jobs. This would enhance their education thereby leading to the achievement of quality education and completion for all.
7. The Rwanda Meteorology Agency should communicate appropriately the onset and cessation of rains and warn the farmers on the probability and severity of possible climate hazards.
8. Future studies should cover the effects of the climate changes on women's health in the other Sectors of the District and the country.
9. Comparative study should be done to compare the effects of climate changes on girls' education with boys' education in Kirehe District.
10. Future studies should be extended to other Sectors to establish how hunger periods lead to family conflict-free living and how sex appetite is lost.

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