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Climate Change-Induced Migration: Pre-Conditions Determining Out-Migration in Semi-Arid Areas of Shinyanga, Tanzania

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Abstract. This paper examines processes that make migration possible among climate change affected communities in Shinyanga Rural District of Shinyanga region, Tanzania. Questionnaires and in-depth interviews were used to gather data. Whereas qualitative data was analyzed thematically, numerical data was analyzed descriptively. Findings show that short term migration, plays an important role in soliciting resources necessary for permanent migration. Further, climate change-induced migration in the study area involves the realization that the eco-system is no longer livelihood supportive. The migration process also involves identification of opportunities in destination prior to moving out from the original home. Finally, migrants need to solicit resources to cater for en route costs and for investing in destination. The study concludes that climate change impacts ignite the desire to migrate. However, for migration to happen there are multiple facets that need to be addressed. The study recommends improved access to information about opportunities available elsewhere for people in climate change affected areas.

Key words Climate change; migration; resources; human capital; land and agriculture

Migration induite par le changement climatique : Conditions préalables déterminant l'émigration dans les zones semi-arides de Shinyanga, Tanzanie

Résumé

Ce papier de recherche examine les processus qui rendent la migration possible parmi les communautés affectées par le changement climatique dans le district rural de Shinyanga de la région de Shinyanga en Tanzanie. Des questionnaires et des entretiens approfondis ont été utilisés pour recueillir des données. Alors que les données qualitatives ont été analysées de manière thématique, les données numériques ont été analysées de manière descriptive. Les résultats montrent que la migration à court terme joue un rôle important dans la sollicitation des ressources nécessaires à la migration permanente. En outre, la

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migration induite par le changement climatique dans la zone étudiée implique la prise de conscience que l'écosystème ne permet plus de gagner sa vie. Le processus de migration implique également l'identification des opportunités dans la destination avant de quitter le pays d'origine. Enfin, les migrants doivent solliciter des ressources pour couvrir les frais de voyage et investir dans la destination. L'étude conclut que les effets du changement climatique déclenchent le désir de migrer. Toutefois, pour que la migration puisse avoir lieu, il faut en aborder de multiples facettes. L'étude recommande d'améliorer l'accès aux informations sur les possibilités offertes ailleurs aux personnes vivant dans les zones touchées par le changement climatique.

Mots-clés Changement climatique, migration, ressources, capital humain, terres et agriculture

Introduction

Literature on climate change indicates that over the past four years (2014-2018), Planet Earth has experienced the highest temperatures ever in the recorded human history (UNDP 2018; IPPC 2007). Records show that during this period, there has been an increase in temperature, which is 1.1°C higher than at the beginning of the industrial revolution. This explains why members of the 24th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) declared climate change as a "matter of life and death" (UN Climate Change 2019) acknowledging the alarming speed at which climate change is disastrously advancing. With such temperature rise, planet earth is exposed to polar caps melting, coral reefs bleach and deaths; and ocean level rises as reported by Kebede et al. (2010). Water scarcity, crop failure and increasing disaster frequency and intensity have become common characteristics in many areas around the world (Matata et al. 2019). The situation is especially worse in arid and semi-arid areas as well as those that are flood-prone (Kebede et al. 2010). As a result, the human race is not at rest. Indeed, people in climate change affected areas are on the run, seeking refuge in less affected areas (Wineman & Jayne 2016).

UNDP (2018) projects that by 2050, about 3% of the population in Sub-Saharan Africa, Latin America and South Asia could be forced to move within their own countries to escape the slow-onset impacts of climate change if no serious actions are taken to curb climate change. For Sub-Saharan Africa, up to 4% of the population is projected to become "internal climate migrants" by 2050. This "internal climate migrants" is likely to occur primarily because, to a large extent, the economies in Sub-Saharan Africa depends largely on rain-fed agriculture (Codjoe & Sward 2013). With increasing temperatures and reduced water resources, crop failure will become rampant, especially in arid and semi-arid areas. Under such conditions, out-migration will become one of the important adaptation options. Wilkinson et al. define climate-induced migration as the "movement of people driven by sudden or progressive changes in the weather or climate. This can include temporary and permanent, seasonal and singular, as well as voluntary and forced movement" (2016, p. 2).

In East Africa, the situation is not different from the rest of the Sub Sahara African region where dependency on rain-fed agriculture for livelihoods is higher; a situation that suggests higher vulnerability to climate change in the sub-region. Although farmers are doing their best to adapt to climate variability and change, the pace at which temperatures are rising is outsmarting even their adaptation efforts due to the exertion of too much pressure on water resources. As a result, adaptation options become less effective (Government of Kenya 2012).

Farmers in Kishapu, Tanzania, for example, reportedly apply drip irrigation to woodlots. However, the farmers spend longer hours to fetch water for irrigation, hence consuming much of their time for other activities relevant for their livelihoods (Bushesha & Katunzi 2017). Implicitly, this measure may not be sustainable in the long run. Given the projected increases in temperatures in East Africa, modest increases

in rainfall are likely to be offset by increases in evapotranspiration. As such, much of the region will likely be hotter and drier in future (UNDP 2017). In fact, climate variability and change has been reported as one of the migration drivers in the sub-region (see, for example, Liwenga et al. 2012). Climate out-migration hotspots in East Africa occur in areas with deteriorating water availability and crop productivity. Under the prevailing climate change records, by 2050, East Africa is likely to witness an average of 10.1 million climate migrants with numbers steadily increasing from 2.6 million in 2020 (UNDP 2017).

In Tanzania, climate change, which manifests through erratic rains, prolonged droughts and extreme weather events; constitutes one of the factors behind internal migration (Liwenga et al. 2012). A study by Liwenga et al. (2012) indicated that farmers in northern Tanzania opt to move to new areas in search of water and land for cultivation due to climate change effects. Likewise, Bushesha (2018) reported that in semi-arid areas of Shinyanga, out-migration is a common adaptation option to climate change whereby frequent and prolonged drought; variability of seasons and higher temperatures; lead to frequent crop failure, and have been major reasons for such out-migration.

Thus, the ongoing global climate change has a hand in human migration. Climate change influences migration drivers i.e. the environmental, social, political, demographic, and economic factors; which in turn influence migration decisions (Foresight 2011). In some areas, climate change negatively affects key livelihood options in the agricultural sector, which is important for most people in the developing world. Where climate change leads to excessive rainfall, people suffer just as the case is in areas where climate change causes a decrease in rainfall. With increased rainfall, people suffer from the impacts of severe floods, including destruction of resources and loss of life. As a result, in less developed economies, people tend to out-migrate to less affected areas (Wilkinson & Peters 2015).

However, migration due to environmental degradation is not a straightforward phenomenon. Extant literature indicates that, climate change decreases resources which could otherwise be used to buffer people from the impact of climate change (Foresight 2011; Wilkinson & Peters 2015). Such resources could, among other things, cater for costs of migration including transport fare and other en route expenses. By eroding resources, climate change may constrain migration. Much as people could wish to shift to better places, they may find migration non-feasible due to lack of resources to cover migration costs (Gray & Mueller 2012). Nevertheless, climate change induced migration still occurs among and within different countries in the world, including Tanzania. A recent study by Bushesha (2018) indicated that in semi-arid areas of Tanzania, many people out-migrate to other parts of the country, partly due to the impact of climate change. Extant literature on climate migration is, however, silent on processes that make out-migration possible under the assertion that climate change reduces resources in climate change-affected areas. The unanswered question which emerges here is: If climate change depletes resources which could otherwise make migration possible, how do people afford migration in climate change-affected areas?

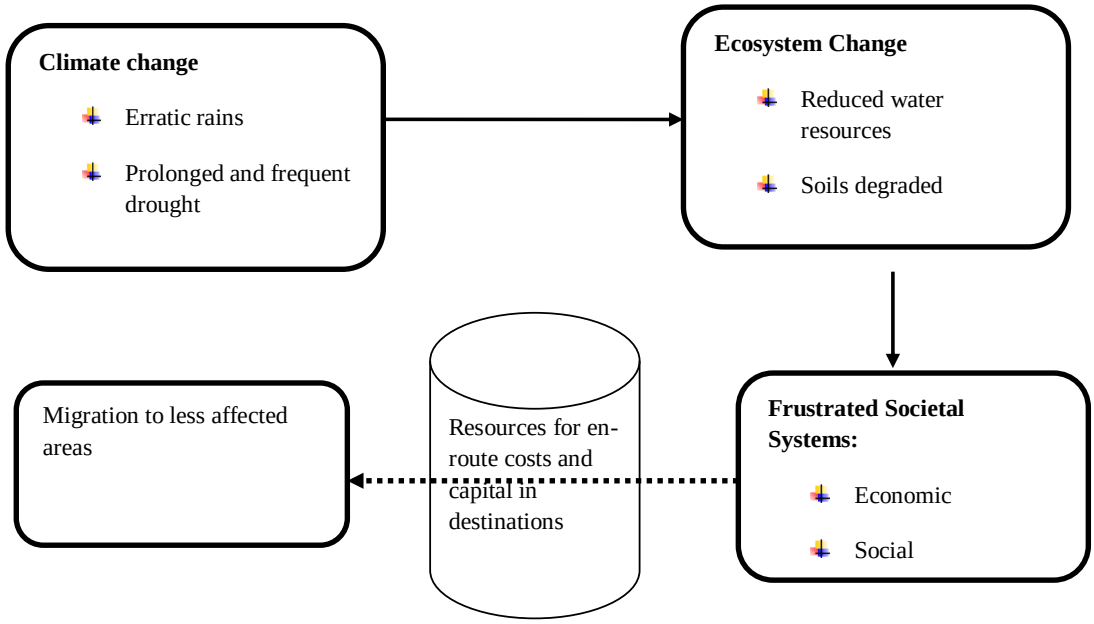
This paper sheds light on the processes and mechanisms that make migration possible among climate change-affected communities with reference to Shinyanga rural district of Shinyanga region, one of the semi-arid areas of Tanzania. Specifically, the paper describes outmigration in Isela and Mwalukwa villages. Secondly, it identifies the pre-conditions for such outmigration. The next section presents a conceptual framework that explains the process through which climate change frustrates socio-economic systems, forcing people to out-migrate from climate change affected areas. The framework also shows that migration may only be possible where there are resources to meet en route needs and cover investment in their host destinations. As already mentioned, the study set out to answer the question; how people afford migration in climate change-affected areas if climate change depletes resources which could otherwise make migration possible because the process that lead to accruing such resources (e.g. money

to cater for en-route expenses as well as capital for investing in destination) in a degraded environment is not clearly known thus far. After the conceptual framework, the paper presents the research methodology which was adopted for the study. The study findings are presented and discussed starting with out-migration (overview) in the study area followed by identification of the pre-conditions for outmigration. Finally, the study presents its conclusions, articulating that; while prior to this study it was not clearly known how people in climate change affected areas afford migration, this study has identified some of the factors that facilitated migration in climate change affected areas.

Conceptual Framework for Climate Change Induced Migration

Literature shows that climate change is manifested in erratic rains, frequent prolonged drought and floods. Extreme weather and temperature rise lead to eco-system changes (Foresight 2011; Gray & Mueller 2012; Liwenga et al. 2012; Wilkinson & Peters 2015). Changes in eco-systems include alteration in water resources mostly in terms of reduction of water resources due to increased frequency and length of dry weather. Such reduced water resources also result in soil degradation, which subsequently lead to degraded vegetation cover. Outbreak of pests and diseases due to climate change is also commonly reported in the existing literature (see, for example, Maegga & Malley 2005; Lema & Majule 2009; Kangarawe & Lyimo 2013). The changes in the eco-system translate into frustrations of different human systems in communities in question including economic, social, cultural and even political systems. The frustrations in the economic system may mean failure of income generating activities (livelihood options failure). And for rural communities in Tanzania, as is the case for most parts of Africa, this may mean failure in the agricultural system. Frequent crop failure and livestock deaths tend to be major agricultural characteristics in climate change-affected areas. Figure 1 presents a conceptual framework for the study.

Figure 1: Conceptual Framework for Climate Change-Induced Migration



Source: After literature review (Foresight 2011; Gray & Mueller 2012; Liwenga et al. 2012; Wilkinson & Peters 2015)

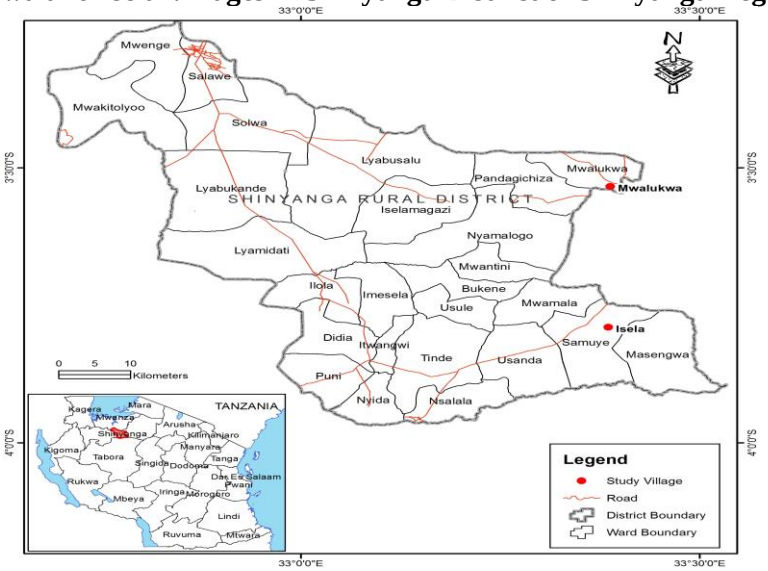
Where the economic system fails, the social system also usually suffers as there would not be enough supplies for things like food, clothing, and communication. Culture is also likely to be affected when the two economic and social systems have been shaken. Likewise, when resources for livelihoods are

inadequate, political stability also tend to be at stake, especially where conflict over resources arise. This study, however, focuses more on the economic system. Central to this study is the idea that when economic systems fail to support livelihoods due to climate change, people tend to migrate to other areas for better opportunities. Bushesha (2018) show that in Shinyanga rural district, people tend to out-migrate due to frustrations in the economic system. Such frustrations are partly caused by the impact of climate change. From the literature reviewed, it is evident that climate change depletes resources in migrants' areas of origin when they require resources for their upkeep en route for settling in their final destinations (Foresight 2011; Gray & Mueller 2012; Liwenga et al. 2012; Wilkinson & Peters 2015). The study, therefore, explored the means through which communities in the study area afford migration under situations where resources necessary for survival are depleted due to climate change effects.

Methodology

The study was conducted in Shinyanga rural district of Shinyanga region (Map 1). The district is located in the North Western part of Tanzania. The district lies between latitude 30°0'0" and 4°0'0¨" South of the Equator and between longitudes 33°0'0" " and 33°30'0" East of the Greenwich Meridian (Map 1). The long-term mean annual rainfall received from mid-October to December and then February to mid-May is between 750 and 900 mm (Matata et al. 2019). The dry season occurs between mid-May and mid-October. During the dry period, the soils are hard to cultivate, pasture becomes very poor in quality; and quantity and the availability of water for domestic use and livestock become an acute problem. The temperature ranges from 12.9℃ between June and October; and 34.7℃ between January and mid-March (ibid). The 2002 population and housing census indicates that Shinyanga rural district had a population of 276,393 people. The economy of Shinyanga rural district is predominantly based on subsistence agriculture and livestock rearing. Farming is predominantly subsistence whereby the use of hand tools and reliance on traditional rain-fed cropping methods and animal husbandry characterize the sector. The main cash crops are cotton and tobacco, whereas the main food crops include maize, sorghum, paddy, sweet potatoes, millet and cassava (URT 2013). Keeping cattle, goats and sheep are other major activities in Shinyanga rural district. The sector employs about 80 percent of the labor force in the district (URT 2013). The other sources of the economy in the region include trade and industry; forestry and fishing (Matata et al. 2019).

Map 1: Mwalukwa and Isela Villages in Shinyanga District of Shinyanga Region in Tanzania



Source: Town Planning, Shinyanga Municipal Council (2017)

The study employed a descriptive research design. Two villages from Shinyanga rural district were selected for the study using simple random sampling. Since the whole district falls under semi-arid ecological zone, all the villages would qualify to be selected for the study. However, due to limited resources only two had to be selected. These are Isela and Mwalukwa (Map 1). A sample population accounting for 5% of the households in each of the study villages was to take part in responding to the household questionnaire. At Isela village, 22 households were selected for the study out of 440 through simple random sampling. On the other hand, at Mwalukwa village, 25 out of 491 households were selected for the study through simple random sampling. Six key informants were purposively selected from each village. These included professionals in agriculture and elderly persons who stayed longer in the village (over 40 years). The assumption was that these could provide the best insight into climate change and migration based on their long-life experiences. Only those who had stayed in the study villages for more than 40 years were considered for inclusion. Data collection included in-depth interviews with key informants, questionnaire administration, and documentary review. An open-ended questionnaire was administered with the prior selected heads of household. The other data collection tool was an interview guide for in-depth interviews. Through documentary review approach, data on outmigration in the study villages was collected and analyzed descriptively using excel computer program. Qualitative data was analyzed thematically. The technique was used to identify themes and subthemes from transcribed qualitative data which was gathered through in-depth interviews to determine interviewees' perceptions on the pre-conditions for migration in the study area. Thematic data analysis was deductive, guided by the specific research objectives. The analysis involved familiarization with the data which started by data transcription followed by reading and re-reading the data until the researcher clearly understood the data content. Next was developing a thematic framework for initial coding. This was developed from both a-priori issues (including themes that emerged from the main research question as well as from specific objectives of the study) and from emergent issues. After that numerical and textual coding was done to identify specific piece of data which corresponded to different themes. Finally mapping and interpretation of the data was done. This involved searching for patterns, associations, concepts and explanations in the data. Excel computer software was used to analyze numerical data. The analysis was mainly descriptive. This approach was used to present quantitative descriptions in a manageable form. The approach made it easy to tell what was in the data. Totals, frequencies and percentages informed the discussion of the findings.

Findings and Discussion

Outmigration in the Study Villages

A number of people out migrated from Issela and Mwalukwa villages between year 2013 and 2018. Table 1 presents opinions of people in origins on forms of migration which take place in the study villages. The table shows that many people move out of the study area permanently. However, there are also some who migrate seasonally. The village data at Isela village indicated that about 50 households (making a total of about 300 people) moved out of the village entirely between 2013 and 2018. Bushesha (2018) indicated that part of the reasons why migrations happened in the study villages was climate change. From the village data presented here, calculations show that whereas the average annual out-migration for the village would be 8.3 (16.6%), 18 (36%) households moved out in 2018 - recording the highest number of out-migration in the village's migration recorded history. Likewise, village data at Mwalukwa indicated that, within the same period, about 200 households moved out of the village which is equal to 40.7% of the total number of households (i.e. 491 households). Among these, 54 (27% of the 200) households moved out in 2018 alone. This also was the highest number of out-migration in the recorded history of Mwalukwa village against the annual migration average of 33.3 (16.6%) as per the village office data. Figures on out-migration presented here show a notable rate of people who out migrate to other areas. As

pointed out earlier, previous studies including Liwenga et al. (2012) and Kangalawe and Lyimo (2013) indicates that migration in semi-arid areas in Tanzania are partly induced by climate change. Bushesha (2018) reports that migration is one of the common adaptation option to climate change in Mwalukwa and Isela villages. However, it is important to conduct a follow up study to establish outmigration trend in future.

Table 1: Opinions from Heads of Households in Communities where Migrations Happens on Forms of Migration

Migration form	No. of respondents	%
Permanent	27	57.4
Seasonal	7	14.9
Both	11	23.4
Not sure	2	4.3
Total	47	100

Source: Field Data (2018)

Respondents were asked to indicate whether or not climate change contributed to out-migration in the study villages. Table 2 indicates that 94% of all the respondents indicated that most people out-migrate due to climate change. These findings confirm findings from prior studies, which indicated that climate change is one of the factors for out-migration around the world and in Tanzania in particular (see, for example, World Bank 2018; Lucas 2015; Msigwa & Mbongo 2013). For instance, Kangalawe & Lyimo (2013) indicated that, in climate change affected areas, erratic rains lead to food shortage, lack of pastures, frequent crop failure, and outbreak of diseases all of which in turn stimulate outmigration in search for better opportunities elsewhere. Likewise, Lucas (2015) noted that shorter-term weather anomalies and hydro-meteorological related natural disasters (i.e. droughts, floods and windstorms) play a significant role in migration among the growing economies around the world. World Bank (2018) noted that climate variability, and particularly drought in dry land areas of East Africa, has been a common driver of migration in the region. In principal, climate change leads to the disruption of the economic characteristics of the affected area. According to Msigwa & Mbongo (2013), the disruption of economic characteristics has a tendency to influence the residents to migrate from origins moving to destinations seeking for better opportunities.

Table 2: Whether People Out-Migrate Due to Poor Climate in the Study Area

Responses	No. of Respondents	%
Yes	44	94
No	3	6
Total	47	100

Source: Field Data (2018)

Respondents reported that both genders out migrate from the study area (47%). Those who indicated that males out migrate the most accounted for 45% of all the respondents whereas only 6% indicated that females out migrate the most. The close to tie results between those who indicated that males out migrate the most (than females) and those who indicated that both genders out migrate can be rooted in the observation that where people out migrate permanently the whole family out migrates. However, seasonal migration shows that males tend to out migrate most. The findings here are in line with findings by Msigwa & Mbongo (2013) who indicated that for climate forced migration, both genders tend to out migrate. Overall, males tend to out migrate than females. This is likely attributable to males being involved in both seasonal and permanent migration while females are involved mostly in permanent out-

migration than in seasonal migration. This paper also notes that male members of households (mostly heads of household) are usually involved in seasonal migration in search of income in preparations for permanent outmigration. Social studies indicate that in many societies the female gender is usually responsible for domestic chores whereas males are responsible for searching for daily bread (Dankelman 2012; Arndt 2002). This creates more opportunities for males to out migrate seasonally in search for daily bread for their respective families.

People aged between 35 and 45 years out migrate more (32%) than the rest of the age groups. These are followed by those aged 25-35 (24%), 45-55 (19%), 15-24 (14%), 55 and above (13%); in descending order. Generally, the findings suggest that the young working age (25-45) is the most featured in out-migration in Isela and Mwalukwa villages; whereas the oldest age (55+) is the least category in out-migrating. This implies that elderly people are more vulnerable to the impacts of climate change since they lack the capacity to move to better areas. Their vulnerability may even be worse when the younger people who could otherwise give them support move out in search of better opportunities. Policies are required to address the challenges elderly people countenance with in the climate change induced migration arena. Thus, it is important to conduct detailed studies that will identify challenges that old people face when they attempt to move out from climate change affected areas. Findings from such studies will likely assist policy makers to improve policy and planning.

For permanent migration, many people out migrate to other regions within the country (Table 3). During interviews with key informants, it emerged that in most cases people migrate in regions such as Kigoma, Katavi, Mbeya, Morogoro, Mtwara and Lindi. URT (2017) indicates that these regions have better climates than most regions in the country including Shinyanga region in the sense that the regions receive ample amount of rainfall annually. This is important for agriculture, the major livelihood option for the rural majority in the country. The regions are also among the best cereal producers in the country. Mbeya, for example, is known for rice and plantain production. Morogoro region on the other hand, is renowned for paddy and maize production (Trevor & Lewis 2015). Lindi and Mtwara are known for cashew-nuts production, accounting for 77% of cashew-nuts in Tanzania (URT 2017). Kigoma and Katavi regions are among the highest maize producing regions in the country (URT 2017). Rice and maize are important staple foods in Tanzania and cashew-nuts is an important cash crop in the country. This verifies an observation made earlier that people migrate in search of more agriculturally productive areas.

As Table 3 illustrates, very few people migrate to large cities (4.2%). This means climate change forced migration in the study area is typically rural to rural. One may hypothesize that this is so because of the nature of rural-based socio-economic systems vs. urban-based ones. Rural areas' socio-economic systems are mainly agricultural based whereas urban areas have formal employment and business based socio-economic systems (Sultangalieva 2010; McKinsey Global Institute 2001). As a result, people move to areas with similar socio-economic systems as they find it easy to cope. However, the future of these regions currently considered as "better places" remains questionable because persistent reception of migrants in these areas could result in their being overstretched as if their carrying capacity was nonfinite (Malthus 1986). Some of the questions that one may ask include: For how long and by how much can these regions continue to receive migrants without compromising their ability to support life? In fact, many of the people who out-migrate from the study area are both crop cultivators and livestock keepers (Table 4). Both activities require massive land clearance due to the low agricultural technology in the country. This suggests future degradation of the currently "better places". Ray and Ray (2011), for example, noted that rapid population growth is one of the major causes of the declining per capita agricultural land, forest and water resources in India whereby population pressure leads to land degradation and soil erosion.

Thus, land degradation in receiving areas will add to the ongoing global warming and its associated effects on people and their environment. Unfortunately, relevant policies in the country fail to identify climate change induced migration as a likely cause for further environmental degradation. The 2006 Tanzania national population policy, for example, categorically states:

> The natural resource base is continuously deteriorating. The underlying causes for this deterioration include deforestation, overgrazing, pollution, loss of bio-diversity, inappropriate agricultural practices and inadequate environmental awareness, population growth and inadequate financial resources. Inadequate integration of environmental concerns in the human, technological and planning processes also contributes to the deterioration of the natural resource base (URT 2006, p. 21).

Yet the same policy fails to provide clear directions on migration and environmental degradation, hence ignoring climate change-induced migration. In fact, the concepts of 'migration' and 'environmental degradation' seem not to exist in the policy, which is not healthy for sustainable adaptation to climate change. Indeed, clear policies on climate change-induced migration are required in the country to ensure that migration remains a sustainable adaptation option to climate change.

Table 3: Migration by Destinations *N=47*

Destinations	*f*	%
Nearby Village	11	23
Urban centers within Shinyanga	9	19
Large cities in the country	2	4.2
Other regions in the country	41	87
Others	5	10.6

Source: Field Data (2018)

It was established during the survey that in destinations (for permanent migration), migrants commonly engage in such economic activities as agriculture and casual labor (mainly in the agricultural sector) (Table 4). These findings are consistent with the results presented earlier that people out migrate mainly in search of more productive areas in terms of agriculture. The findings also justify the argument presented earlier that out-migration in the study areas is a typical rural-rural drift. The findings also confirm the relevance of the question: For how long will the receiving areas continue to support livelihoods among community members if in-migration trends persist? Studies to assess trends in in-migration and environmental management in receiving areas are highly important for determining policy intervention.

Table 4: Major Economic Activities in Destinations for Permanent Out-Migrants

Activities	No. of Respondents	%
Crop cultivation	34	73.9
Livestock keeping	10	21.7
Casual labor in the agriculture sector	1	2.2
Casual labor in sectors other than agricultural sector	1	2.2
Total	46	100.0

Source: Field Data (2018)

Pre-Conditions for Migration

There are several conditions that need to be met for people in the study area to afford permanent migration. This section presents a discussion on each of the pre-conditions identified during the study.

Information on Destination

Over 93% of all the respondents indicated that gathering information on destination is key prior to making migration decisions (Table 5). The study found that people who have relatives in the outward destinations are more likely to out migrate than their counterparts without such connections. This was supported by 76% of all the respondents (Table 5). Similar findings have been presented by Aker et al. (2011) who noted that in Niger, seasonal migrants with relatives who had already moved to town centers stood a better chance of out migrating as well since they could easily access information on job opportunities in destinations. Likewise, Luka (2015) argues that networking is important for migration whereby the ones who had settled earlier in the migrants' destination can prepare for housing and employment for their relatives and friends migrating from the same area of origin so that they can have a smooth landing. During in-depth interviews with key informants, interviewees explained that it was important for them to gather information generally related to the climate, but specifically, land and water resources availability; before deciding on moving to those destinations. Hence, having contacts in destination constitutes an advantage since through such contacts, one can easily access such information. This is an important finding since prior studies in Tanzania do not pay adequate attention to "information" as a crucial factor for internal migration in the country (see, for example, Msigwa & Mbongo 2013; Liwenga et al. 2012). However, as most migrants in the study areas move to the hinterlands, communication requires either mobile phones or physical site visits both of which have cost implications. The question is whether these poor rural farmers under study can easily afford such costs of communication. There is a need, therefore, to investigate the cost implications for communication on climate change-induced migration.

Resources

To afford migration, one needs to have some resources to meet the costs of migration including en route costs, food and shelter. In support of this, 91.3% of the respondents concurred with a statement that people with some assets find it easy to out-migrate than ones with no assets because the former are likely to sell such assets to raise funds for en route costs (Table 5). These findings are in line with findings by Lucas (2015) who noted that even a small addition to income can induce migration for people with poor income. Lucas' (2015) conclusion was based on findings of a study that was conducted in rural Bangladesh. Similarly, Bryan et al. (2013) observed that the poor were not ready to take the risk of migrating because of the danger of not having resources to pay for transport as well as meet costs of living in the destination prior to acquiring paid jobs but upon receipt of USD8.0 they were 22% more likely to out migrate. These findings confirm the argument that the poor are also vulnerable to the impacts of climate change since their adaptation options are limited. According to the World Bank (2015), for Tanzania, people who live below the basic needs poverty line are those who earn less than USD2 a day, the majority of whom dwell in rural areas. If people fail to out migrate (even if they are willing to do so) due to lack of the necessary resources, it means the only option for them remains to stay put and wait to perish or survive on nature's mercy. Under such circumstances, policy intervention is necessary to determine the means through which people in climate change hotspots in the country can be supported for the budding migrants to afford migration to their respective destinations.

Table 5 indicates that most of the respondents (91.3%) agreed with the statement that lack of means of survival is one of the characteristics of people who out migrate. These findings suggest that assets support out-migration whereas lack of means of survival forces people to out migrate. These findings are

consistent with Brown's (2008) theory which states that when climate stresses coincide with economic or social stresses, the potential for forced migration from rural areas increases significantly. Brown (2008) noted that in West Africa migration is typically not the first adaptive response households take when confronted by climate stress; rather it becomes an alternative when other means of adaptation (such as selling livestock) are too insufficient to meet their immediate needs and often when their communities or governments have proven incapable of giving assistance.

Table 5: Pre-Condition That Migrants Need to Meet to Afford Migration

Variable	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Information about area of destination	43(93.5%)	1(2.2%)	00	2(4.3%)		46
Relatives in areas of destination	35(76.1%)		1(2.2%)	10(21.7%)		46
Assets that can be sold to afford cost of migration	31(67.4%)	11(23.9%)	3(6.5%)	1(2.2%)		46
Lack of means of survival in origin	24(52.2%)	18(39.1%)	3(6.5%)		1(2.2%)	46
Capital to invest in destination	23(51.1%)	12(26.7)	9(20.0%)	1(2.2%)		45
Man power to work in areas of destination	23(50.0%)	15(32.6%)	7(15.2%)	1(2.2%)		46
Skills for employment in sectors other than agriculture in destinations	7(15.2%)	13(28.3%)	17(37%)	6(13.0)	3(6.5%)	46

Source: Field Data (2018)

The question here could be: How then do people with no means of survival afford migration? It has been pointed out earlier that in the study area there are both seasonal and permanent out-migration. Table 8 indicates that in many cases seasonal migration takes a form of search for casual labor openings in nearby villages during wet seasons where agricultural activities reign. But also people migrate to town centers seasonally especially during dry seasons to work as casual laborers (Table 6). The findings are supported by those of Brown (2008) who noted that in West Africa, extreme bad weather made households run out of resources. As a result, people could not afford migrating too far from their area of origin (which is a major characteristic of permanent migration). Instead, they tried to find paid work in local cities/towns. For Brown (2008) temporary migration in times of climate duress can help top a family's income up and reduce overdrawing on local resources. Brown (2008) concluded that the distance to the destination largely depends on their family resources, as with less resources people cannot afford to travel far. In this study, however, during in-depth interviews with key informants, it was established that seasonal migrations occur partly for gathering resources in readiness for permanent migration.

Permanent migration involves moving to other regions within the country. Given the regions where people migrate to, this form of migration means travelling over hundreds of kilometers to reach destination as opposed to few kilometers covered under seasonal migration. The driving distance from Shinyanga to Mtwara, for example, is 1,574 km (URT 2017); the approximate distance over which migrants would have to travel from the study area to Mtwara. According to Bushesha (2018), the average household size in the study area is composed of six people. And, according to URT (2017), travelling cost by road for one person from Shinyanga to Mtwara is TSH 48,200/- (approx. $22). This implies that such a household would require at least USD132 to afford fare costs, leave alone other en route needs. The reality is, very few households can afford this amount, especially in the face of widespread abject poverty, partly caused by crop failure resulting from adverse weather conditions. The proportion of people with incomes that cannot satisfy basic needs in Tanzania (i.e. food, shelter, clothing, primary education for children and essential health services) is 36%, with 87% of these living in rural areas depending on agriculture, particularly subsistence agriculture.

These findings so far suggest that climate change-induced migration is a process and not an overnight decision. It starts with the accumulation of experience on environmental change in the areas of origins; followed by information on destinations; gathering resources to cater for out-migration expenses; and finally, migration takes place. During in-depth interviews with key informants, it was noted that the process can take up to three consecutive years to come to fruition. This delayed departure was attributable to the need to gather resources among farmers under poor climate, which remains a daunting challenge for the poor. One informant said:

> I intend to leave this village but I need money to do so. This is my second year, I have been working here and there on wages... my bicycle is helping me a lot. I use it for hiring transport to my neighbor and I get good money… The only problem is that nowadays there are motorcycles. They really challenge us in getting passengers... but I hope by the end of next year I will make it… I intend to move to Katavi. My uncle and his family shifted there and it's about five years now and he has no plan to come back. He told me land is plentiful there and soils are so good for maize and paddy... I only need some money to buy a piece of land once I get there and life will be so easy since food is aplenty... I am really excited [about the prospect] ... (Key informant *M* in Isella village, 38 years old, interviewed on 21.05.2018).

With the verbatim quote presented above, the statement demonstrates that money is important in actuating migration. The informant showed that he will likely take three years before he solicits enough money for migration. This seem to suggest that generating ample money for migration is not easy since for some it takes years (3years for his case). This may be because the environment is degraded due to climate change hence land is less productive, especially for agriculture, which is the mainstay for the majority in rural areas of the country. The informant got assurance of land available by his contact (uncle) in the idealized destination. The only thing that he needs is money to buy that land. The informant is also informed about crop varieties which do well in destination. Hence, as he makes a decision to migrate to the destination (Katavi in this case), he already has enough information for him to plan for his future economic activities in the targeted destination. Two main points emerge from the statement above. One, information on the destination is important for migration decision-making. The second one is that soliciting capital to invest in the migration destination is key for one to embrace out-migration. Furthermore, under normal circumstances rural areas depend much on agriculture for income generation, yet the informant seems to depend on his other assets (bicycle) other than produce from agriculture for income generation. This suggests that the environment appears to be so highly degraded that it no longer supported income generating agricultural activities.

Table 6: Reasons for Seasonal Migration *N=47*

Reasons	*f*	*%*
Casual labor in nearby villages during wet seasons	38	80
Casual labor in nearby town centers during dry seasons	25	53
Cultivation of rented farms in nearby villages	15	31
Visiting relatives elsewhere when situation is difficult	7	14

Source: Field Data (2018)

Capital to Invest in the Destination

Another important factor for affording migration is capital to invest at the destination. This was positively reported by 77.8% of the respondents (Table 5). It was explained that since most people who out migrate aspire to engage in agriculture in destinations then land availability is crucial for successful migratory

settlement. That being the case, before out migrating, most people ensure that they have the relevant capital for buying land (see explanations by the informant *M* quoted above). And, in many cases, heads of household, especially in male-headed households, tend to visit destinations to confirm availability and access to arable land before they affirmed out-migration for their respective households. This finding further confirms that poor people are vulnerable to climate change since without capital to invest at the destination migration may not be a fruitful adaptation option for such people. Therefore, the government needs to follow up on the fate of poor people not only in places of climate change affected areas but also in areas of destination where poor people afford to out. Where there is no clear policy intervention to assist poor people, such people are likely to encroach on areas such as forest reserves since they cannot afford to buy land. Encroachment usually aggravates environmental degradation. In Uganda, for example, encroachment led to significant degradation of wetlands for the 2000-2018 period (Gideon & Bernard 2018).

Labor Availability

Ample manpower to work in areas of destination is another condition that favors out-migration in climate change prone areas. This was supported by 82.6% of the respondents (Table 5). During a discussion with key informants, one informant (see quote below by Informant *T*) explained that heads of household, especially old ones would out migrate only if they had enough young men in their households because that would assure them of labor, especially for agriculture (food production and livestock keeping) at the destination. Where there are no young people in a given household, the aged tend to have a sense of insecurity in destinations since less people would wish to offer a helping hand to a stranger. As a result, such aged people find out migrating without ample labor rather unattractive. In such circumstances (when situations get worse), the aged find it better to stay in the areas of origin as they have ample people on whom they would depend as opposed to the migration destinations. One of the in-depth interviewees said:

> ...yes I would love to move out of this village because I am told in such areas as Mpanda, Kigoma and Mbeya ...err and even Mtwara...food is not a problem at all, rainfall is plentiful and each year people have harvests in abundance. But look at me eh...I am old... I think I am now turning 78 years old this year [2018]; so I cannot afford shifting to new areas where there is no one who knows me... I am better off here because my fellow villagers know me. They always offer a helping hand, especially during bad times... Yes, weather is no longer supportive for us farmers, but I better stay here since there are relatives and friends who protect me and my wife during calamitous situations (Informant *T* from Mwalukwa village, interviewed on 04.05.2018).

The findings here call for serious policy intervention regarding the welfare of the aged in relation to migration and climate change. Currently, there is no single policy providing for the elderly's protection from the impact of climate change in the country.

Skills Other Than Agriculture

As Table 5 indicates, many of the people could not buy into the idea that skills outside the agricultural sector are an important factor for permanent out-migration. This could be explained by the fact that the majority of the respondents were non-professionals as most of them were primary school leavers (Table 7) for whom agriculture (popularly categorized as informal employment by locals in the study area) is the mainstay livelihood option (Table 8). Also, as it was pointed out earlier, migration in the study villages is

typical rural-rural phenomenon, with agriculture being the major livelihood option. As such, skills outside agriculture cannot secure employment easily.

Table 7: Respondents' Level of Education

	No. of respondents	%
Primary	35	74.5
Secondary	3	6.4
High school	2	4.3
Non formal	4	8.5
Dropout from primary schools	3	6.4
Total	47	100.0

Source: Field Data (2018)

Table 8: Respondents' Occupation

Education	No. of respondents	%
Formal	24	51.1
Informal	22	46.8
Total	46	97.9
Missing system	1	2.1
Total	47	100.0

Source: Field Data (2018)

Revisiting the conceptual framework, the study has identified the means through which resources are accrued for migration, that is, through seasonal migration to nearby areas which still offer opportunities, especially in terms of casual labor on short-term basis. The study findings clearly indicate that what is required for migration to take place is not only resources in terms of funding but rather a combination of issues starting with a realization that climate change is happening and that options for adaptations within are limited. Thereafter, the idea of moving out comes in but with a question—Where to? To answer the question, households usually send a family member to explore and gather information on possible places where the whole family can move to. In many cases, a matured male (mostly head of household) would be sent to explore. The study also found that linkages and networking are important for climate change-induced migration. Indeed, migrants who have relatives in destinations tend to get information easily on opportunities available (the recipient destination) and how to exploit them. The study also found that labor availability at the destination is another important factor supporting migration. Hence, households with ample young people stand a better chance of migrating than those without them. The study also observes that financial capital can buffer households with less human capital by hiring casual laborers in the destination; which explains why households with saleable assets stand a better migration chance than ones with less or without them.

Conclusions and Recommendations

Clearly, the study shows that out-migration is increasing in Isela and Mwalukwa villages in Shinyanga rural district. Village records have indicated more people out migrating in recent years than in the past, migration is partly induced by climate change. Migration is both seasonal and permanent. For seasonal migration, people move to nearby villages and urban centers in search of casual labor opportunities. People aged 25-45 years were found to out migrate more than other age groups. Also, males out migrate more than their female counterparts because, in Isela and Mwalukwa villages, females are usually more engaged with household chores. For permanent migration, people move to other regions within the

country and mostly to remote areas in a like-to-like migration; mainly in search for more productive agricultural land. Under this migration category, usually all the household members tend to out migrate. There are, however, several factors that migrants need to address prior to affording permanent out-migration. These include accessing information on the destination, soliciting resources to cater for en route expenses and start-up capital to invest at the destination. The study, therefore, contends that climate change impacts ignite the desire to migrate. However, for permanent migration to happen there are multiple facets that need to be addressed. Given the nature of destinations identified in this study, climate change-induced migration in the Isela and Mwalukwa villages is typically a rural-rural drift; migration to town centers are temporally and meant to gather resources necessarily for permanent migration.

This study also found that climate change-induced migration is not an overnight phenomenon but rather a process. Once people realize that their environment is no longer supportive enough for them to secure a living, they start scouting for opportunities elsewhere. After identification of destinations, they still need to ensure enough resources for en route expenses as well as for settling. Moreover, both human and financial resources are crucial for smooth landing and settling in the recipient destinations. A challenge is assurance on whether soliciting the required resources in preparation for permanent migration is affordable for many in Isela and Mwalukwa villages. This is a serious concern since most poor people in the country reside in rural areas as those in Isela and Mwalukwa villages. Such people need government assistance to afford a smooth life-changing migration in the face of climate change adaptation. Yet, there is no clear policy guiding migration in the country. That being the case, it is so far not clear how the government assists migrants when they fail to afford migration expenses. World Bank (2018) commented that internal climate migration is a reality, but a crisis can be averted if concerted and targeted action is taken now to better predict and prepare for its likely effects and to harness its potential as an adaptation strategy. Thus, it is the role of the government to plan for proactive policies that will enable smooth rural-rural migration as an adaptation strategy to climate vulnerable regions in the country. In this regard, people who need to move away from climate change vulnerable places should be enabled to move toward areas of lower risk and higher opportunity (World Bank 2018). Governments need to facilitate safe, orderly, and dignified migration among people who reside in areas where eco-systems are no longer supportive and adaptations options within eco-systems are no longer viable. People in Shinyanga rural district, for example, should be provided with proper information about destinations, especially on available opportunities so that they can make proper choices. Legal support is also recommended for internal migrants for their safety en-route as well as for smooth settling in destinations.

Based on the conceptual framework presented in this study, the findings may be of use when one intends to establish a theory on necessary conditions for migration to happen in climate change affected areas. One may note that the study has generated information that fills the gap on the processes and mechanisms which make climate change induced-migration possible. Early in this study, the puzzle focused on how people afford migration since it is universally agreed that climate change degrade the environment making it less productive and less supportive to social economic systems. Subsequently, the study has identified the processes and mechanisms which make migration possible in such circumstances, that is, people need to realize that the environment is no longer supportive of hitherto established socio-economic systems; a reality that induces many people to identify and embrace opportunities available elsewhere. To solicit resources for on-transit facilitation, employment as casual laborers in nearby areas is important. Finally, contacts residing in migration destination is important for opportunity identification and smooth landing. The study recommends policy intervention to improve access to information for people in climate change affected areas about opportunities available in less affected areas.

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