

Opportunities and Constraints for Disaster Risk Reduction and Resilience Building among the Kenyan Pastoral Communities, Mandera County, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Climate-related hazards have been recorded as the main triggers for major disasters worldwide. However, extensive research in Opportunities and Constraints for Disaster Risk Reduction Interventions is greatly lacking. This study sought to research on this gap among pastoral communities of Mandera County. Three sampling techniques; stratified sampling, simple random and purposive sampling were used to collect data and information from key informants with a sample size of 157. The findings were analysed with Statistical Package of Social Sciences and Excel. Data were presented in tables, pie-chart and graphs. The hypothesis was tested by Chi-Square (χ^2). The null hypothesis of drought shocks had no association with effective and affordable practices of drought mitigation and preparedness in Mandera County, $\chi^2 = 4.468$, $DF=6$, $P=0.624$, failed to be rejected.

Keywords: *Disaster risk reduction; drought risk; climate variability; resilience building; vulnerability assesment and early warning.*

1. INTRODUCTION

Climate change and variation is a worldwide problem whose challenges have been encountered locally and at the regional level. Climate change is being reported among the drivers that exacerbate disaster risk [1]. Researchers have predicted its effects to include variations in rainfall, amplified extent of extreme weather events in addition to disaster intensity, heat waves augmented inundation and flooding, reduction in fresh water resources, rise in sea level, vagaries in disease patterns, among others [2]. As much as the world is able to keep in check the worldwide greenhouse gas emissions, the mean sea levels is to raise between 26-54 cm by the year 2100 under conservative scenarios though most forecasts are higher [3].

The Northern part of Kenya is mostly a dry lands inhabited by residents who practice pastoralism as their main activities for their livelihood. This livelihood activity has by far emerged as a preferred economic activity since it is productive and environmentally sustainable in such marginal regions [4]. As economies and populations in North-Eastern region continue to develop, they are likely to play a major part as vital sources of dairy products such as meat, hides and milk [5]. However, in recent time, the dry lands of North Eastern part of Kenya have been reported among the record disaster prone globally [6]. As much as the region is susceptible to numerous and intricate shocks compounded by prolonged poverty, drought has been reported as impacting majority of inhabitants recurrently compared to other types of disasters [7]. The socio-economic and ecological effects on dry land inhabitants have been recorded as being extreme. The nationwide costs and losses experienced similarly impend and destabilize the broader economic progress among other developments being experienced in several countries within this region [8]. Drought is expected to remain a persistent hazard in midst of climate variability. If Disaster is not contained and the communities' resilience built, catastrophes within these marginal lands of the region is expected to upsurge in magnitude as populaces raise [9].

Considering the unavoidable and prolonged recurring drought in the North Eastern part of Kenya, it is extensively recognized essential to assimilate Disaster Risk Reduction to all facets of growth, humanitarian strategies, policies, and plans together with programs [10]. Regrettably,

the 2011 drought calamity within this region revealed that Disaster Risk Reduction determinations to current time are evidently not adequate. Intergovernmental Authority on Developments (IGAD) Ending Drought Emergencies ingenuity offers administrations within the region with a fresh incentive to scrutinize and review policy, plans and programs from a Disaster Risk Reduction standpoint. Within this resourcefulness, IGAD made the Drought Resilience stage with the crucial aim to assemble funds, encourage information management, and frame common local goals and approaches [11].

2. METHODOLOGY

2.1 Study Area

The study was carried in Mandera County, North Eastern region, Kenya, as per the Fig. 1.

The study area is home to 125,763 houses and 33 persons per square kilometre (Kenya National Bureau of Statistics, 2019). The area borders Somalia and Ethiopia and it is made up of six sub-counties namely: Mandera East, Mandera North, Mandera West, Lafey, Banisa and Kutulo.

Mandera County has low rocky hills, Savana-like flora, with solitary hills covered with exotic *Prosopis juliflora* shrubs. The study area has an annual temperature of 24°C in July to 42°C in February and annual average rainfall of 191.7 mm with short rains season occurring in April to May with average of 69.1 mm, and long rains from October to December with an average of 122 mm [10].

2.2 Research Design

A descriptive research survey design was used by the study. The study utilized a descriptive research design to describe the features of a certain person or groups [12]. The descriptive survey design was designed to formulate goals, develop tools for data collection, selection of samples, data collection, processing, analysis and reporting results.

2.3 Target Population

The study area has a population of 867,457 (KNBS, 2019) spread over an area of 25,939 km². The study employed stratified sampling method to get the sample size from the main population size and the researcher used a

formula by Mugenda and Mugenda (2003) which suggests that a sample size of 10-30% of the target population should be used in a descriptive study. From the formula below, by Mugenda and Mugenda (2003), from a targeted 1,569 households (N) the researcher interviewed 157 (n) households from the three sub-counties of Mandera County namely; Banisa, Mandera West and Mandera East.

$$n = \frac{10}{100} N \quad (\text{Mugenda and Mugenda, 2003})$$

Where N is the target households and n is the sample size.

$$\text{Therefore; } n = \frac{10}{100} \times 1,569 = 156.9$$

This study rounded off the figure to 157 households and used it as the sample size.

The household population of the three sampled sub-counties in the study area is captured in the table below. The data is as per the KNBS, 2019, census report.

2.4 Data Collection Instruments

The study employed household survey, key informant, interviews and secondary data from Kenya Metrological Department. The study also employed the use of structured questionnaires, pilot testing and filling of observation checklists by the researcher at the study area.

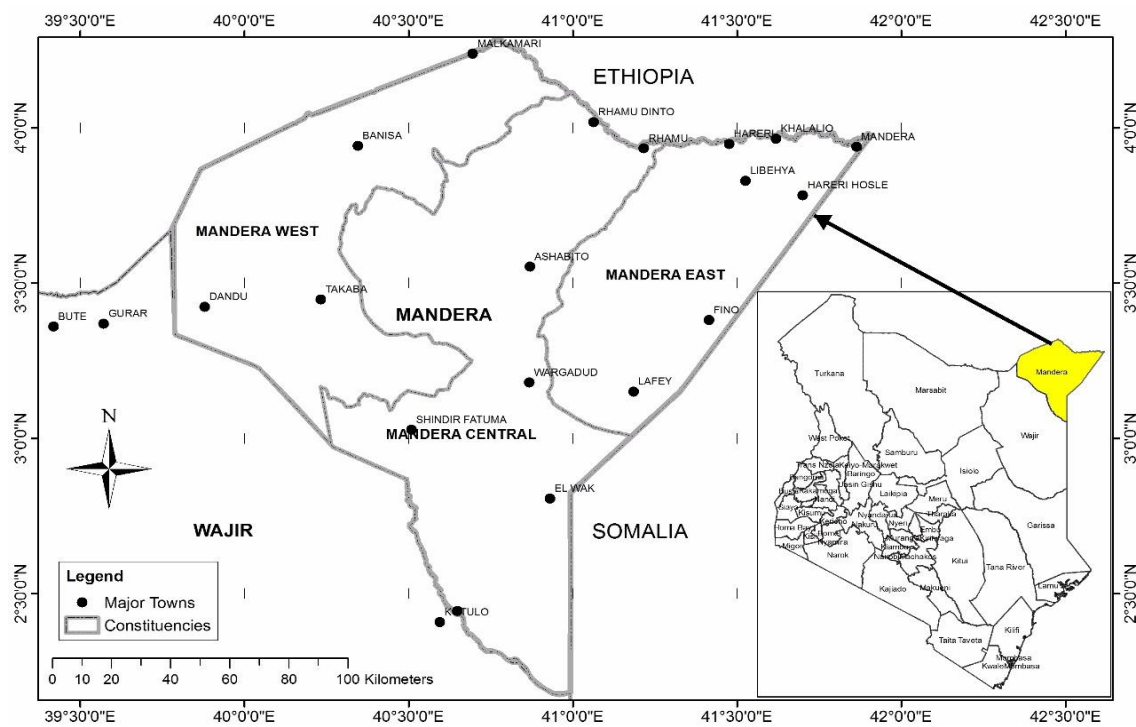


Fig. 1. Study area map (Source; Author, 2021)

Table 1. The data is as per the KNBS, 2019, census report

Constituency	Ward	Village	Household population	% Household (125,497)	Target Village Household population	Target Sample size
Banisa	Banisa	Tarama	19,327	15.4	499	50
Mandera West	Takaba	Takaba	19,828	15.8	514	51
Mandera East	Township	Bulla Mpya	21,836	17.4	558	56
Total			60,991	48.6	1,569	157

3. RESULTS AND DISCUSSION

3.1 Demographic Information

Table 2. The table below shows the rate of gender response from the study area

Village	Gender					
	Male		Female		Total	
	F	%	F	%	F	%
Bulla Mpya	29	61.7	18	38.3	47	83.9
Takaba	29	67.4	14	32.6	43	84.3
Tarama	24	58.5	17	41.5	41	82.0
Total	82	62.6	49	37.4	131	100.0

The number of overall household respondents by gender comprised of 62.6% (n=82) male and 37.4% (n=49) female. The cultural household heads in Mandera are male only in rare occasions where a female heads the household. Therefore, this informed our gender sample outcome. This gender parity confirmed that we could rely on in assessing Disaster Risk Reduction Interventions for enhancing Resilience among Pastoral Communities of Mandera County.

3.2 Respondents Educational Level

The results of the survey showed that most of the interviewees received basic primary education. The study found out that 55.7% of the respondents had elementary school education,

18.3% high school education, 11.3% tertiary education, 3.8% university education and the rest had not attended any formal education system. Most participants believe that their low education can be ascribed to the way they live because they move from one place to place in search of food, water and grazing for their animals.

3.3 Opportunities and Constraints for Disaster Risk Reduction Resilience Building

To answer the research question on the opportunities and constraints for DRR, this study used the following conceptual framework which was adopted and modified from Barton et al., [13].

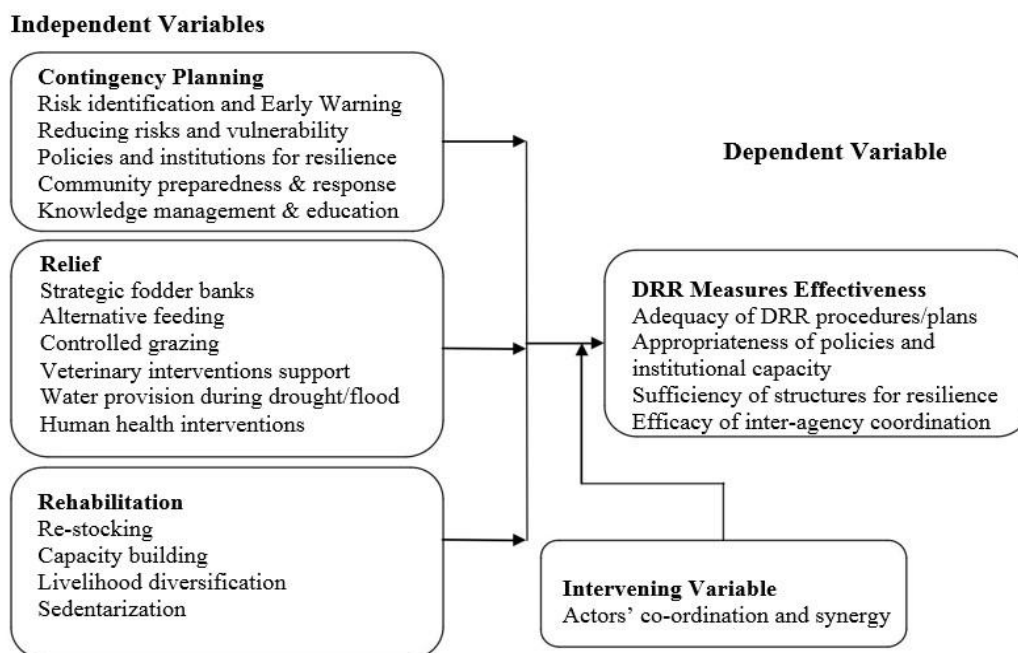


Fig. 2. Research conceptual framework

From the conceptual framework, the interaction of the three variables; independent, intervening and dependent variables, helped the researcher to have informed and scholarly data which assisted in coming up with clear answers for the research objectives and questions.

3.4 Drought and Risk Management Interventions

The study evaluated the drought risk management strategies in the study area. The findings showed that a majority of 62.6 per cent (82) of respondents said there were interventions in their areas for drought risk management, compared to 26.0 per cent (34) for those who stated that the risk management interventions for drought were not being undertaken. A minor number of 11.5% (15) of respondents did not know of the proximity of drought risk management actions.

3.5 Sources of Drought Risk Management Interventions

The research investigated how pastoralists manage the drought situation to determine the potential and constraints of Mandera County drought/disaster risk reduction. Risk knowledge relates to personal understanding and processing of danger information [8]. The study findings as per the figure below found out that 39.7% of the respondents got the information

from family or own initiatives, while 32.1% got it through relative assistance and 28.2% from the relief authorities in the area.

3.6 Resilient Mechanisms towards Drought Risk Reduction

Coping, adjustment and resilience comprise portfolios and avenues for people to achieve their livelihood objectives. The strategies are divided into three basic categories: intensification and extension, diversification and migrations [5]. The reason is that the better one knows the hazard process, the better prepared response and preparedness measures are used to reduce vulnerability and hence catastrophe risk [14,15].

As per the detailed graph below, the findings of this study on the coping, adaptation and resilient mechanisms employed by the Mandera county residents towards drought risk reduction.

Based on food insecurity, the respondents ranked selling of livestock and other assets at the top as attributed by 35.9%, followed by reliance on food aid/donation with 28.2%, then cash or food for work by 24.4% and reduced food portions/meals by 11.5%. Water scarcity were curbed by migration towards water point as reported by 75.6%, reduced water uses as alleged by 16.8% and buying from water venders as suggested by 7.6%.

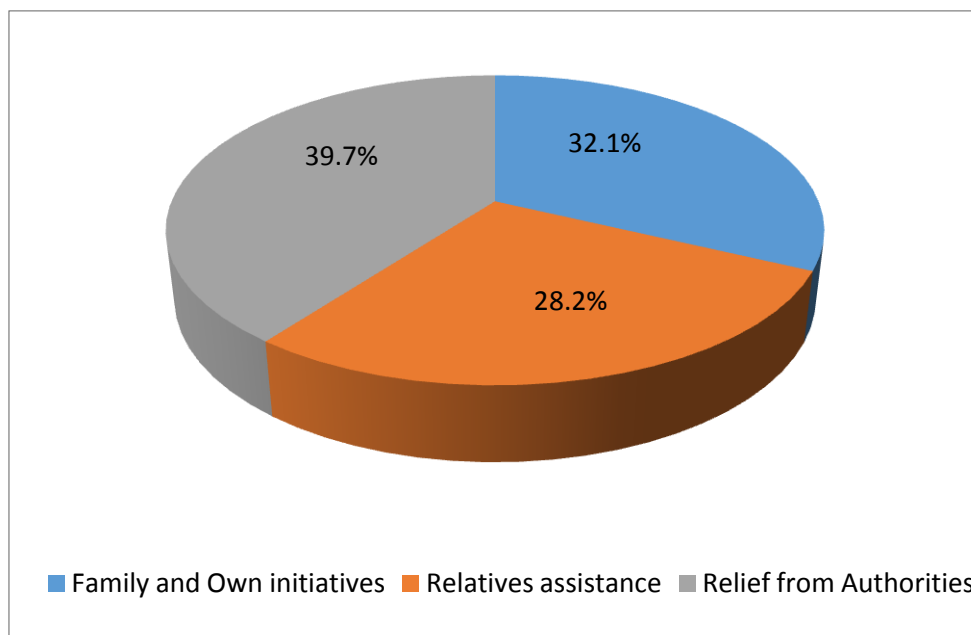


Fig. 3. Drought Risk Management Interventions

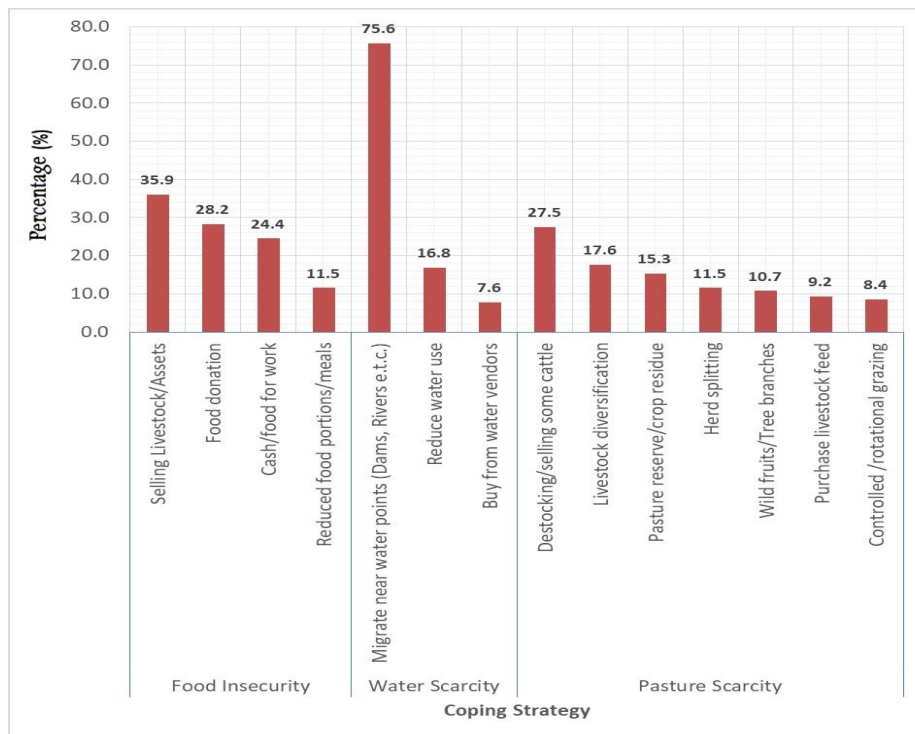


Fig. 4. Resilient building mechanisms

The problem of pasture scarcity attracted a number of resilient mechanisms ranging from destocking or selling of some livestock as noted by 27.5% of respondents to livestock diversification (rearing of more resistant stock like camels) as suggested by 17.6%. Also, 15.3% reported on the use of pasture reserve and crop residue, 11.5% were for herd splitting, 10.7% suggested desperate measures of using wild fruits/roots and tree branches to feed their livestock, 9.2% opted to buying livestock feed and at the least were 8.4% cited controlled or rotational grazing to avoid overgrazing.

Some of the main informants interviewed commented on coping with the challenges of throughout the drought that herders, Mandera County Government, NGOs reacted to the crisis in a number of previously discussed techniques. The recovery time has been characterized as harder for the less favoured/poor community members, given the majority of their assets are lost during the drought. Drought-prone residents are able to replenish bank savings or animals borrowed from others during drought.

3.7 Impediments Hindering Efforts towards Drought Risk Reduction

The study investigates the impediments hindering efforts towards drought risk reduction

in Mandera County, the respondents stated and rated what they consider as huddles.

The study indicated that most respondents (38.9%) cited Low/Lack of technical capacity at the local level, followed by 35.9% moderate, 24.4% extremely large, and 0.8 % minor. Poor inter-agency coordination and political will was cited as a hindrance by up to 37.4% of respondents, 28.2% by large, 26.72% by very large, and 7.6% by little. Also, 45.8% acknowledged very much, 37.4% acknowledged very much, and 16.8% acknowledged somewhat the lack of drought mitigation money. In most cases 48.1% of respondents suggested that the measures for reducing risk of drought were in a very moderate way a barrier, 35.1 percent to a significant extent and 8.4%, for very big and small amounts correspondingly. With regard to the unrestricted relation between readiness, advance detection and better communication

strategies, 56.5 percent maintained a significant barrier, 34.4 percent claimed to be very extensive, 8.4% was moderate and 0.8 percent to a small level. Other Mandera County priorities have been recognized as a hindrance to 69.5% of respondents to a big degree, 21.4% to a moderate degree, 6.1% to a small degree, and 3.1% to a really significant level.

Table 3. Drought risk reduction

Impediment	Little Extent		Moderate extent		Large Extent		Very Large		Total	
	F	%	F	%	F	%	F	%	F	%
Low/Lack of technical capacity	1	0.8	47	35.9	51	38.9	32	24.4	131	100.0
Poor inter-agency coordination	10	7.6	49	37.4	37	28.2	35	26.7	131	100.0
Lack/Limited funds	0	0.0	22	16.8	60	45.8	49	37.4	131	100.0
Lack/limited DRR measures	11	8.4	63	48.1	46	35.1	11	8.4	131	100.0
Lack/Limited preparedness	1	0.8	11	8.4	74	56.5	45	34.4	131	100.0
Other priorities	8	6.1	28	21.4	91	69.5	4	3.1	131	100.0

Table 4. Test hypothesis

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	4.468 ^a	6	.614	.624
Likelihood Ratio	5.591	6	.470	.574
Fisher's Exact Test	4.764			.533
N of Valid Cases	131			

3.8 Hypothesis Testing

This research employed statistical analysis to test the null hypothesis which was; Drought shocks has no association with effective and affordable practices of drought mitigation and preparedness in Mandera County, Kenya. The Table 4 shows the analysis.

The cause of drought risk and the effective, cost-effective strategies of drought mitigation and preparedness were not significantly related to global warming; χ^2 (6, N=131) = 4,468a, P=0,624. Fisher's Exact Test, p=0.533, indicated that the two variables are not statistically associated. Both phi and Cramer's V have reported the precise significance of P=0.624, which implies that the hypothesis is null and that there is a notable link between climate change as the reason for the risk of drought disasters and effective and affordable dryness mitigation and preparedness activities.

4. CONCLUSION

The study explored the opportunities and constraints for Disaster risk reduction and resilience building, and from the findings, the study concludes that most respondents highlighted low/lack of local technical competence as a major barrier to reducing drought risk. Poor inter-agency coordination and political will were also mentioned up by

respondents. Some responders said lack of/limited drought risk reduction strategies was a hindrance. The absence of/limited relationship between readiness, early warning, and early response was major hurdle.

Consequential climate change vagaries have proliferated overtime with noted climate variability effect in Mandera County where from the retrospective study of rainfall and temperature study. The notable climatic changes have intensified overtime that affects the socio wellbeing of pastoral activities with change of weather patterns in the area that is no longer predictable.

Drought impact has proliferated in Mandera that not only affect livestock but endangers the lives of the pastoral communities. These communities practise pastoralism as a primary economic activity as their source of livelihood. However, this keeps plunging as more deaths of livestock is witnessed, difficulty on access to reliable pastures to better their livestock. With this drought impact, the foot security model is become chronic within its access, availability and affordability.

Even with drought vulnerabilities in pastoral communities especially in Mandera County, we need proper holistic support and knowledge to mitigate this recurrent and emerging effects. For the pastoral communities to curb or reduce

surging drought impacts, they need government and county government support to build sustainable resilient. This can be through education and transitioning to sustainable pastoral practices that can withstand perennial droughts.

Finally, giving support to pastoralist in the event of drought is not the solution to problem. Money or financial aid cannot save pastoralist from drought but rather building capacities that are sustainable. Proper climate smart models like water access to livestock should have dealt with for proper mitigation drought shocks in ASAL areas that are being heightened by climatic changes.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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