

Impact of floods on internally displaced persons in Bosaso, Somalia

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Abstract

This study examines the impact of floods on internally displaced persons (IDPs) in Bosaso, Somalia. Using a mixed-methods approach, questionnaires were administered to 341 participants selected through simple random sampling, while six key informant interviews from local government officials and humanitarian agencies were conducted using purposive sampling. Data were analyzed using descriptive statistics and chi-square tests via SPSS (Version 20). The findings indicate that 49% of IDPs live in poor socioeconomic conditions, while 38% have moderate conditions. A chi-square analysis ($\chi^2 = 501.310$, P -value = 0.000) shows a strong association between socioeconomic status and political factors. Floods predominantly occur during the Deyr (48%) and Gu' (35%) seasons, with a significant association ($\chi^2 = 435.224$, P -value = 0.000) between seasonal flooding and flood frequency. Coping mechanisms employed include early warning systems (30%) and flood-resistant infrastructure (27%). Financial and logistical support was also found to be significantly associated with coping strategies ($\chi^2 = 698.488$, P -value = 0.000). The study concludes that floods negatively affect Bosaso IDPs socioeconomic conditions and they are increasingly vulnerable to floods. The study therefore recommends urgent economic development programs, improved flood monitoring, and enhanced disaster adaptation strategies to mitigate flood impacts.

1.0 Introduction

Flooding is a major cause of displacement globally, affecting over 21.5 million individuals annually (Saha, 2023). Africa, particularly East Africa, experiences frequent flood-related displacements, with over 1.8 million people affected annually (Kelly-Hope et al., 2024). According to the Internal Displacement Monitoring Centre (IDMC), approximately 3.4 million individuals in sub-Saharan Africa are displaced yearly due to floods (Hakim et al., 2024). Countries such as Kenya, Somalia, South Sudan, and Sudan have suffered severe flood-related displacements, exacerbating existing humanitarian crises (Krause, 2019).

Somalia has a particularly high number of IDPs, with over 3,300 IDP sites as of December 2022, and approximately 90% of these settlements are in major cities, mostly in informal settings on private land. A major driver of displacement in IDPs was frequently forcing thousands of people to flee their homes each year. Also, environmental vulnerability like floods and extreme weather events contributed IDPs crises (Sisto et al., 2019). Floods during the Deyr (October-December) and Gu' (March-May) seasons further exacerbate vulnerabilities. According to the 2023 Deyr Season Floods Situation Report, over 2.4 million individuals were impacted by heavy rainfall and floods in Somalia, with more than 1 million displaced and 110 fatalities recorded across 36 districts (Crawford et al., 2024; Sida et al., 2024).

Bosaso, located on Somalia's northeastern coast, is highly susceptible to floods due to its geography and climate. The combination of heavy rainfall and cyclonic activities results in frequent flash floods, particularly in low-lying areas and informal settlements where many IDPs reside (Dokken, 2024). These floods significantly disrupt livelihoods, damage infrastructure, and increase vulnerability among displaced populations. The flood impact on IDPs in Bosaso is shaped by a complex interplay of socioeconomic, political, and environmental factors, requiring urgent intervention and policy responses.

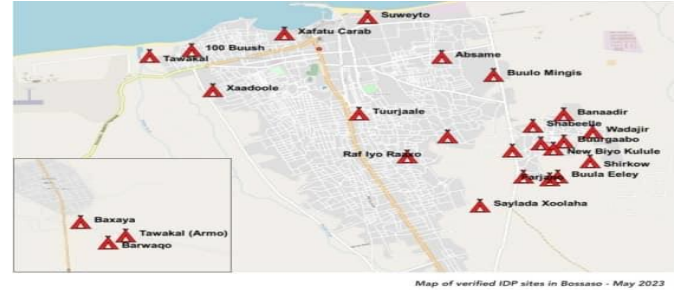
This study examines the socio-economic impact of floods on IDPs in Bosaso, highlighting key vulnerabilities and coping strategies. By understanding the underlying factors contributing to flood vulnerability, this research provides insights that can inform disaster risk reduction policies and sustainable intervention strategies.

2.0 Materials and Methods

A mixed-methods research design was employed, integrating both quantitative and qualitative approaches. Quantitative data were collected via structured questionnaires administered to 341 randomly selected IDPs, while qualitative insights were gathered through six key informant interviews with local government

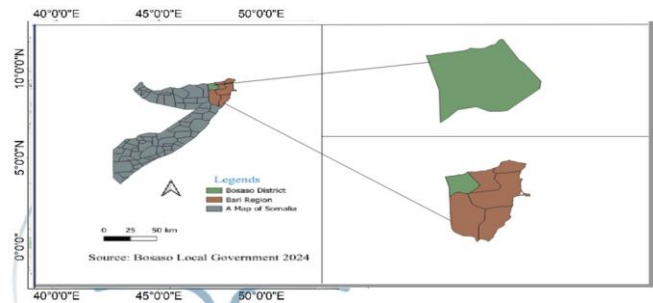
officials and humanitarian agencies. Simple Random Sampling was used for IDP respondents to ensure fair representation. And Purposive Sampling was applied for selecting key informants to obtain expert insights on flood-related challenges and interventions. The location of IDP camps and the study area are shown in figures 1 and 2 below.

Figure 1: IDPs Locations and study area in Bosaso, Somalia.



Source: (IOM, UNHCR, Puntland State of Somalia, 2023).

Figure 2: Map of study Area



Source: (Bosaso Local Government 2024).

Data were analyzed using SPSS (Version 20). Descriptive statistics were used to summarize demographic characteristics, while chi-square tests examined associations between socioeconomic conditions, flood patterns, and response mechanisms.

3.0 Results and Discussions

This section presents a comprehensive demographic analysis of survey respondents, examining four key variables including gender distribution, age composition, educational attainment, and occupational status.

Table 1 Socio-demographic Characteristics of Respondents

Variables of the Respondents	Frequency	Percentages %
Gender of the Respondents		
Male	147	43
Female	194	57
Total	341	100.0
Age of the Respondents		
16-25	71	21
26-35	127	37
36-45	108	32
46 and above	35	10
Total	341	100.0
Educational Levels of the Respondents		
No formal education	133	39
Primary education	106	31
Secondary education	96	28
University education	6	2
Total	341	100.0
Occupational Levels of the Respondents		
Employed	64	19
Unemployed	115	34
Self-employed	79	23
Student	57	16
Others	26	08
Total	341	100.0

Source: Field survey, 2024

The findings in Table 1 show that the sample comprised 57% females and 43% males. The majority (37%) were aged between 26–35 years. Notably, 39% had no formal education, and 34% were unemployed, indicating economic vulnerability. The higher proportion of female IDPs in Bosaso reflects how women disproportionately bear the burdens of displacement due to conflict-related male absence, caregiving responsibilities, and heightened vulnerabilities to exploitation and restricted mobility. The high unemployment rate among IDPs in Bosaso stems from limited job opportunities, discrimination against displaced

populations, lack of marketable skills for urban labor markets, and remote camp locations that isolate them from economic centers. The predominance of non-formal education among IDPs in Bosaso results from decades of disrupted schooling due to conflict, lack of accessible formal schools in camps, financial barriers to education, and families prioritizing immediate survival needs over long-term schooling.

Table 2 Socioeconomic and Political Factors Affecting IDP in Bosaso, Somalia.

Socioeconomic Condition	Frequency	Percentage %
Poor	167	49
Moderate	128	38
Good	39	11
Excellent	7	2
Total	341	100
Political Factors		
Limited access to resources and services	145	43
Disruption of infrastructure development	73	21
Increased displacement and informal settlements	91	27
Other	32	9
Total	341	100

Source: Field survey, 2024

In Table 2 the findings revealed that 49% of IDPs live in poor socioeconomic conditions, with limited access to essential services (43%). Political instability exacerbates these conditions by disrupting infrastructure and increasing displacement rates. The analysis in Table 3 reveals a strong correlation ($\chi^2 = 501.310$, P-value = 0.000) was found indicated association between seasons of floods and frequency of flood patterns a year. Existing literature confirms that political instability exacerbates flood vulnerability among IDPs by disrupting infrastructure and resource allocation (Crawford et al., 2024), while socioeconomic deprivation limits resilience to climate shocks (Kelly-Hope et al., 2023), aligning with this study's findings of a strong association ($\chi^2=501.310$, $p<0.001$) between these factors in Bosaso.

Table 3 Relationship between socioeconomic conditions and political factors that to floods in IDPs Bosaso, Somalia.

Socioeconomic Conditions	Main Impact of Political Instability				Total	(χ^2 – value, P-value)
	Disruption of infrastructure development	Increased displacement and informal settlements	Limited access to resources and services	Other		

Excellent	0 0.00%	0 0.00%	0 0.00%	7 100.00%	7 100.00%	(501.310, 0.000)
Good	0 0.00%	14 36%	0 0.00%	25 64%	39 100.00%	
Moderate	51 39.80%	77 60.20%	0 0.00%	0 0.00%	128 100.00%	
Poor	22 13%	0 0.00%	145 87%	0 0.00%	167 100.00%	

Source: Field survey, 2024 *- P<0.05 confirms statistically significant association

The findings in Table 4 reveal that the floods were most frequent during the Deyr (48%) and Gu' (35%) seasons, significantly affecting IDPs' livelihoods and settlement conditions. Flood frequency was high, with 49% experiencing annual floods and 33% facing multiple floods per year. The high frequency of floods during the Deyr season is due to heavy rainfall and cyclonic activity, which overwhelm drainage systems, and during the Gu' season, there is significant rainfall that leads to rivers overflowing and increased flooding.

Table 4 Flood Patterns and Seasonal Trends

Seasons of Floods	Frequency	Percentage %
Deyr (Wet/rainy with cyclone)	164	48
Jilaal (Dry with cold)	51	15
Gu' (Rainy with floods)	119	35
Xaga (Dry with hot)	7	2
Total	341	100
Frequency of Flood Patterns		
Rarely (Once every few years)	49	14
Occasionally (Once a year)	159	47
Frequently (Multiple time a year)	111	33
Very frequently (Almost every month)	22	6
Total	341	100

Source: Field survey, 2024

Table 5 Relationship between Seasons of Floods and Frequency of Flood Patterns on a Yearly

Seasons of Floods	Frequency of Flood Patterns a Year				Total	(χ ² – value, P-value)
	Frequently	Occasionally	Rarely	Very frequently		
Deyr (Wet/rainy with cyclone)	0 0.00%	115 70%	49 30%	0 0.00%	164 100.00%	(435.224, 0.000)
Gu' (Rainy with floods)	104 87%	0 0.00%	0 0.00%	15 13%	119 100.00%	
Jilaal (Dry with cold)	7 14%	44 86%	0 0.00%	0 0.00%	51 100.00%	
Xaga (Dry with hot)	0 0.00%	0 0.00%	0 0.00%	7 100.00%	7 100.00%	

Source: Field survey, 2024 *- P<0.05 confirms statistically significant association

The analysis in Table 5 shows the chi-square test reveals a strong correlation (χ² = 435.224, P-value = 0.000) was found indicated association between seasons of floods and frequency of flood patterns a year.

Table 6 Coping Mechanisms and Financial Assistance and Logistic Support provided

Coping Mechanism	Frequency	Percentage%
Accessing an early warning system	103	30
Constructing flood-away infrastructure	91	27

Relocating to safer areas	80	23
Selling personal belongings	53	16
Other	14	4
Total	341	100
Assistance and logistic support		
Food supplies	89	26
Financial aid	76	22
Temporary shelter	69	20
Health and hygiene kits	71	21
Others	36	11
Total	341	100

Source: Field survey, 2024

The findings in Table 6 indicated that the early warning systems (30%) and flood-resistant infrastructure (27%) were the most common responses. whereas IDPs received food supplies (26%), financial aid (22%), and health support (21%), respectively.

The analysis in Table 6 reveals a strong correlation ($\chi^2 = 698.488$, P-value = 0.000) was found between assistance and coping mechanisms.

Table 7 Relationship between Types of Financial Assistance and Logistic Support and Common Coping Mechanisms

Types of Financial Assistance and Logistic Support	Common Coping Mechanisms					Total	$(\chi^2 - \text{value, P-value})$
	Accessing an early warning system	Constructing flood-away infrastructure	Other	Relocating to safer areas	Selling personal belongings		
Financial aid	14 18%	62 82%	0 0.00%	0 0.00%	0 0.00%	76 100.00%	(698.488, 0.000)
Food supplies	89 100.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	89 100.00%	
Health and hygiene kits	0 0.00%	0 0.00%	0 0.00%	40 56%	31 44%	71 100.00%	
Others	0 0.00%	0 0.00%	14 39%	0 0.00%	22 61%	36 100.00%	
Temporary shelter	0 0.00%	29 42%	0 0.00%	40 58%	0 0.00%	69 100.00%	

Source: Field survey, 2024

*- P<0.05 confirms statistically significant association

4.0 Conclusions and Recommendations

The study highlights the precarious socioeconomic conditions as a result of flood impact and increasing flood vulnerability of IDPs in Bosaso. To mitigate these challenges, the following recommendations are proposed:

1. **Economic Empowerment:** Implement targeted livelihood programs, including vocational training and microfinance initiatives, to enhance IDPs' self-sufficiency.
2. **Early Warning Systems:** Establish an effective flood monitoring and alert system using radio, mobile networks, and community engagement programs.
3. **Infrastructure Development:** Construct drainage systems and flood-resistant housing to reduce flood impacts.
4. **Policy and Governance:** Strengthen disaster preparedness frameworks and collaboration between local and international agencies to improve flood response mechanisms.

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Declaration of conflict of interest

The authors declare no known conflicts of interest associated with this publication. No financial or personal relationships influenced

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