



(REVIEW ARTICLE)



Climate change-induced floods and storms: Impacts of changing rainfall patterns in Somalia

Abdullahi Mohamed Sheikh Ali ¹ and Mohamed Omar Mohamed ^{2,*}

¹ Department of Civil Engineering, College of Engineering and Technology, Abrar University, Hodan district, Mogadishu, Somalia.

² Institute of Informatics and Communications, University of Delhi South Campus 110021 Delhi, India.

World Journal of Advanced Research and Reviews, 2023, 20(01), 1229–1233

Publication history: Received on 16 August 2023; revised on 21 October 2023; accepted on 24 October 2023

Article DOI: <https://doi.org/10.30574/wjarr.2023.20.1.1998>

Abstract

Flooding is a widespread natural disaster that affects millions of people globally. It happens when bodies of water flood into typically dry land. Numerous negative effects result, including the destruction of buildings and residences, the erosion of productive topsoil, the contamination of drinking water supplies, and frequently, public health emergencies. Rivers, lakes, and seas are just a few of the water bodies that may cause flooding, which can be extremely dangerous for both ecosystems and people alike.

Somalia has seen a wide range of extreme weather occurrences over the last thirty years, chief among them being frequent and destructive droughts and floods. Of particular worry is the frequency with which storms and floods brought on by the summer (xagaa) rains have occurred in recent years. In much of Somalia, these climate extremes have had a significant impact, disproportionately affecting those who live close to rivers.

Flooding occurs once a year, which sets off a series of problems that include communities being forced to leave their homes, suffering significant financial losses, and declining agricultural production. It is critical to distinguish between the consequences of droughts and floods in Somalia since each poses unique difficulties for the people residing there and the authorities.

This study explores a concerning pattern that shows increasing flood intensity in all three of Somalia's rainy seasons: Xagaa (summer), Deyr (autumn), and GU (spring). This not only highlights the growing environmental challenges, but also the need for swift action to strengthen resilience, adopt adaptive measures, and promote international cooperation to address the growing effects of storms and floods brought on by climate change in Somalia and other similar vulnerable regions of the world.

Keywords: Rainfall; Floods; Climate change; Somalia

1. Introduction

According to Chow (1956), a flood is a relatively high flow that overtakes the natural channel provided for the runoff. Rostvedt and others (1968), defined flood as any high stream flow which overtops natural or artificial banks of a stream.

Ward (1978) defined a flood as "A body of water that rises to overwhelm land that is not ordinarily submerged," as well. When a body of water fills ordinarily dry terrain, it is called a flood. Millions of people worldwide may be impacted by

* Corresponding author: Mohamed Omar Mohamed

floods, which are frequent natural calamities. Houses and other structures are destroyed, and fertile farmland has its soil removed.

In addition to causing sickness, floods may pollute drinking water. Flooding can also result from overflowing lakes and oceans, however, rivers are frequently caused.

Heavy rainfall is frequently associated with flooding, however, other situations might cause flooding that is not directly tied to current weather conditions. (University of Oklahoma, 2003).

The presence of water in typically dry places; a "flood disaster" is a flood that seriously impairs or interferes with social and economic activities; a rise in water in a reservoir or coastal region; or any situation where land that isn't ordinarily covered by water becomes so. (WHO, 2013).

2. Climate change

Despite other unquestionably natural elements, the globe has frequently been warmer than previously due to humans meddling with the natural environment. According to the Intergovernmental Panel on Climate Change, the Industrial Revolution raised the atmospheric concentration of CO₂ (carbon dioxide), which led to climate change and disturbed the ecosystem's natural equilibrium. (IPCC).

There is no certainty that the wildfires you rightly heard about, as well as the unprecedented droughts, torrential downpours, flooding, increase in sea levels, coral bleaching, ice melting, and other severe weather occurrences, are being purposely caused by global warming.

3. History of Somali Floods

Somalia has been confronting climatic events over the previous three decades, such as recurrent droughts and severe floods. Nonetheless, there were floods and rainstorms in most of Somalia as a result of summer (xagaa) rainfalls over the past several months.

Those who live near rivers must contend with flood damage every year, which can result in the eviction of farmers and regular citizens, financial loss, and a lack of agricultural output. In Somalia, there are two contrasting natural phenomena: floods and drought.

The worst floods in Somalia's recent history occurred in 2006, 2011, and 2012. Because of this, humanitarian organizations are closely monitoring the current situation in Somalia. (Flood list, 2013).

In actuality, according to records, Somalia experienced floods for the first time in 2018, 2019, and 2020. It also marked the first time that two floods happened in a single year. In a few exceptional cases, in May and July 2020, flooding occurred back-to-back. As of 24 May, 411,905 people had been forced to leave their homes due to floods in Somalia, and 24 people had perished in 29 districts, according to the FAO.

Almost 100,000 people have been impacted by flash flooding and severe rains in various parts of Somalia from March to July. Jubaland State's Baardheere area is the worst hit; according to reports, 21 people, including six children, have died there. Over 13,000 households, or roughly 78,000 people, have been impacted; 8,945 families, or roughly 53,600 people, had their shelters damaged or destroyed. Since the start of the rainy season, approximately 175,000 individuals in Somalia have been impacted by floods, of which 140,000 have been forced to flee. ("Somalia: Floods - Mar 2023 | ReliefWeb," n.d.)

Ever wonder how rain, floods, and storms are impacted by climate change? As a result of climate change, global warming raises the average temperature and causes water to evaporate (sea, rivers, lakes, etc.). Also, an increase in the amount of water vapor on the planet can increase both the intensity and frequency of rainfall, which can even result in storms, floods, and an increase in sea levels.

It indicates that climate change is having an impact on Somalia's three rainy seasons, GU (spring), Deyr (autumn), and xagaa (summer), which are caused by flood disasters. (Bashir A, 2021)

4. Flood affected areas

The main causes of the Juba and Shebelle Rivers flooding are climate and human-made activities. These are the results of natural floods and rains caused mostly by drainage from catchment regions situated in the Ethiopian highlands, which often suffer greater than usual and more frequent precipitation than happens in Somalia.

Artificial flooding of agricultural land is mostly caused by unlawfully built holes in dikes and high natural embankments to create an exit for irrigation water during the dry season. Before the Civil War, structural methods to reduce and regulate floods included the building of dikes, barrages, and flood relief canals. These regulatory institutions are in disarray and are no longer reliable. When the river has greater water levels, water that would ordinarily flow down the river without causing any harm finds its way out via the constructed holes and inundates extensive agricultural regions. (SWALIM, 2009).

5. Effect of Floods on Agriculture Production

5.1. Juba (Riverine agriculture) Upper (From Dollow to Baardheere)

According to the (FAO, 2018) Farms along the river are inundated in all districts, assessment, with 5 000-6 000 hectares of cultivable area under water. 1 500 hectares were destroyed due to early cultivation, including 500 ha of early irrigated maize and 1000 ha of cash crops (onion, tobacco, tomato, and, watermelon). Most pumps, which riverine farmers rely on to irrigate their crops, have been destroyed or damaged. Both flash and river floods have killed people and cattle.

5.1.1. Lower (from Sakow to Kismayo)

In the Middle Juba region, off-season crops have also been impacted by river flooding. Crop losses are expected to be 3 300 ha of maize, 3 200 ha of sesame, and 1 500 ha of cowpea in Sakow/Salagla, Buale, and northeast Jilib. Except for the exception of Jilib, the majority of the Middle Juba region is inaccessible owing to blocked highways, a lack of food imports, and a lack of humanitarian aid as a result of rising civil unrest. Several businessmen and wealthy farmers have had their stocks of sorghum ruined by flash floods. River floods mostly affect the lower Juba area. For instance, 500 riverine agricultural households have been relocated to Jamame town while 1,000–1,500 acres of farmland (both cultivated and unplanted fields) have been submerged in the Jamame district.

5.2. Shebelle (Riverine agriculture) Upper (from Belad Weyne to Jalaqsi)

At Belet Weyne town, the effects of river flooding are extremely severe (lack of clean water, shelter, and food). 4,000–5,000 residents of rural Belet Weyne have been uprooted, frequently to higher-altitude rural regions close by. Agri-infrastructure, such as irrigation pumps, canals, and culverts, are destroyed, and some 10,000–15,000 acres of arable land are submerged. The floodwaters only partially devastated early irrigated and established crops (maize, sorghum, and vegetables). As a result, there are now fewer job prospects in agriculture.

5.2.1. Lower (from Jowhar to Sablale)

A total of 15,000 hectares are thought to be underwater, including 3 500–4 500 ha that is primarily in Lower Shebelle and is used to grow grains (maize and sorghum). Before the floods, the remaining 10 500–11 500 acres were being prepped for planting. 500 tonnes of sorghum are said to have been kept as home food reserves underground but washed away.

In the Middle Shebelle Region, At the Mandheere village of Jowhar, there has reportedly been a large river breach (a flood-prone area for successive seasons). The flood may cut off the route that connects Jowhar and Mogadishu if the damaged area is not quickly rebuilt, which would raise the cost of imported goods. Also, it can seriously harm any standing crops in adjacent communities.

In the Lower Shebelle Region, Due in large part to major breakages upstream in Jowhar, flash floods are more severe than river flooding. Nonetheless, considerable areas are underwater, which will postpone planting and probably lead to an increase in the production of cash crops and off-season maize, especially in the rainfed agro-pastoral areas of the two regions. (Message, Messages, & Rural, 2018).

5.3. Prevention of floods

Flood prevention should not be the focus of flood management techniques and policies; rather, flood damage should be mitigated. Resources should be dedicated to encouraging individuals to live in their natural surroundings. Flood damage may be decreased by adopting measures like altering crop patterns and house construction.

5.4. Protect your health during a flood by:

- **Understanding the warning signs and evacuation routes in your neighborhood, as well as the locations that are vulnerable to landslides or flooding.**
- **Chlorinating or boiling all water for drinking and food preparation.**
 - The most crucial precaution to take after floods to lessen the likelihood of water-borne illness epidemics is to guarantee a continuous supply of clean drinking water.
- **Encouraging the use of safe food preparation methods and excellent hygiene.**
 - It is not recommended to clean dishes, brush teeth, or prepare meals with floodwater. After coming into touch with floodwater, always wash your hands with soap and water.
- **Avoid going across flooded regions and driving over standing water.**
 - There are serious risks associated with even small amounts of water. You have no idea whether there are dangerous substances there or whether electrical cables have fallen into the water. During a flood, people and cars might easily be carried away.
- **Throwing out any food that has come into contact with floodwater.**
 - It is unsafe to eat and raises your chance of contracting water-borne illnesses if your food has come into contact with floodwater.
- **If floodwater has come into touch with your home, clean it safely.**
 - Mattresses and pillows that are not able to be cleaned with bleach should be thrown aside. Use soap and water together with bleach to clean all the walls, floors, and other surfaces.
- **Protect against mosquitos**
 - If the region where your residence is located has standing or stagnant water, put mosquito repellent on your skin or clothing, according to the directions on the packaging. In addition, while you sleep, cover your bed with a mosquito net and wear long sleeves and pants.

According to the World Health Organization (WHO), the most frequent problems connected to floods are the tainting of drinking water sources and standing water, which can harbor mosquitoes, carry chemicals, and result in injury. ("Floods: How to protect your health," n.d.)

Recommendations

Finally, it points out the following approaches for dealing with such floods:

- When there is a risk of flooding, do not enter basements or underground parking garages, and do not drive or ride a bicycle on flooded roadways.
- Avoid rivers and lakes that contain floodwater. Surging water might not only catch you off guard, but it can also erode topple banks.
- Store water-polluting and flammable substances (chemicals, fertilizers, fuels, lubricants, paints, thinners, etc.) outside the critical zone develop national and regional programs to provide information to and increase the awareness of the various groups involved – government authorities, professionals, social leaders, and the society at large - to make the decision-making process better and more efficient. , Etc.
- Assess places sensitive to flooding or landslides, and understand your community's exit strategy and warning signs.

6. Conclusion

In light of the increasing frequency of floods and storms brought on by climate change, the effects of shifting rainfall patterns in Somalia highlight the critical need for preventative action to tackle this pressing environmental issue. It is impossible to overlook the disastrous effects, which include food shortages, infrastructural destruction, and relocation. Going forward, it will be imperative that governments, local communities, and international organizations collaborate to create resilient policies and implement sustainable practices that might lessen the negative impacts of these changing weather patterns. To further ensure the safety and well-being of the Somali people in the face of an increasingly unpredictable environment, investments in early warning systems, disaster preparedness, and community education

are crucial. To ensure a more sustainable future for Somalia and the entire globe, even if climate change is a global issue, localized solutions, and international cooperation are essential. Simply publishing a few words on social media that have a large impact on many people or reposting what experts have written on climate change can save millions of lives while you are at home.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

References

- [1] Floods: How to protect your health. (n.d.). Retrieved March 18, 2023, from Chow, V. Te. (1957). Report of the Committee on Runoff, 1955–1956. *Eos, Transactions American Geophysical Union*, 38(3), 379–384. <https://doi.org/10.1029/TR038i003p00379>.
- [2] ROSTVEDT JO. (1970). Summary of Floods in the United States during 1965. US Geological Survey Water-Supply Paper.
- [3] https://www.who.int/news-room/questions-and-answers/item/how-do-i-protect-my-health-in-a-flood?Gclid=CjwKCAiA5sieBhBnEiwAR9oh2vrOfL4M-cVcQSuA1VeT9I0R6VSB4d0P85bW2ba1dw aHV1g5xi2vQRoCiTsQAvD_BwE#.
- [4] Devilliers, G. D., & Maharaj, R. (1994). Human Floods: How to protect your health. (n.d.). Retrieved Perceptions and Responses to Floods with Specific Reference to the 1987 Flood in the Mloti River near Durban, South Africa. *Water SA*, 20(1), 9–13. Retrieved from http://reference.sabinet.co.za/webx/access/journal_archive/03784738/2068.pdf. March 18, 2023, from <https://www.who.int/news-room/questions-and-answers/item/how-do-i-protect-my-health-in-a-flood?gclid=CjwKCAiA5sieBhBnEiwAR9oh2vrOfL4>.
- [5] Floods - Causes and Effects of Flooding | Flood50,000 Displaced in Somalia Floods – Flood List. Protection. (n.d.). Retrieved March 18, 2023, from <https://www.english-online.at/geography/floods/floods-and-flooding.htm>. (n.d.). Retrieved March 18, 2023, from <https://floodlist.com/africa/somalia-floods-may-2013>. Somalia - Flood (UN OCHA, FAO, NOAA-CPC)
- [6] Penning-Rowsell, E. C., Priest, S. M., & Cumiskey, L. (2022). Flooding. *Rutledge Handbook of Environmental Hazards and Society*, 88–105. <https://doi.org/10.4324/9780367854584-7>. (ECHO Daily Flash of 27 May 2020) – Somalia | Relief Web. (n.d.). Retrieved March 18, 2023, from <https://reliefweb.int/report/somalia/somalia-flood-un-ocha-fao-noaa-cpc-echo-daily-flash-27-may-2020>.
- [7] (PDF) Climate change: Summer rainfalls have caused floods and heavy storms in Somalia. (n.d.). Retrieved March 18, 2023, from https://www.researchgate.net/publication/356929520_Climate_change_Summer_rainfalls_have_caused_floods_and_heavy_storms_in_So
- [8] Abdullahi Mohamed, S. A., Abdikafi, E. A., Abdifitah, M. A., & Ahmed, M. H. (2022). Environmental Impact Assessment in Construction Activities for Dahab Tower Building Mogadishu. *American Journal of Environment and Climate*, 1(3 SE-Research Articles), 1–5. <https://doi.org/10.54536/ajec.v1i3.773> mail/citations.
- [9] Message, T., Messages, K. E. Y., & Rural, I. N. (2018). Somalia floods update 7. (May). SWALIM. (2009). Flood Risk and Response Management.
- [10] Mohamed, A. et al. (2022). Water Supply Management and Sustainability in Afgoi District, Somalia Water Supply Management and Sustainability in Afgoi District, Somalia, (April), pp. 0–1. <https://www.hilarispublisher.com/abstract/water-supply-management-and-sustainability-in-afgoi-district-rnsomalia-84203.html>
- [11] Somalia: Floods - Mar 2023 | Relief Web. (n.d.). Retrieved October 27, 2023, from <https://reliefweb.int/disaster/ff-2023-000044-som>
- [12] Floods: How to protect your health. (n.d.). Retrieved October 27, 2023, from <https://www.who.int/news-room/questions-and-answers/item/how-do-i-protect-my-health-in-a-flood?>