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Current climate change impacts and risks reviewed in Africa by giving especial emphasis in Ethiopia: Short review

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Abstract
Climate change is a long-lasting change in the weather arrays across tropics to polls. It is a global threat that has embarked on to put stress on various sectors in the world. Climate change represents a major threat to Africa. The climate change grave consequences of a temperature increase above 1.5°C, Rainfall patterns are disrupted, glaciers are disappearing and key lakes are shrinking. In all Africa in general, and east Africa in particular is the most vulnerable continent to climate change impacts under all climate scenarios. Despite that Africa having contributed the least to global warming and having the lowest co2 emissions, the continent faces exponential collateral damage, posing systemic risks to its economies, infrastructure investments, water and food systems, public health, agriculture, and livelihoods, threatening to undo its modest development gains and slip into higher levels of extreme poverty. By 2030, 108-116 million people be exposed to sea level rise risk and Drought. Similarly Ethiopia faces numerous development challenges that exacerbate its vulnerability to climate change, including high levels of food insecurity and ongoing conflicts over natural resources. Climate resolvase projects solve problems of increases in temperature, erratic rainfall and unpredictability of seasonal rain, drought and other extreme events. Therefore it is timely call to control and work on climate smart agriculture and adaptability practices that Climate change would have not negative impacts on agriculture, livestock, water and human health in Ethiopia. Thus the present reviews aims to point out climate impact and risk management with organizing publication from concerned scholars so that make easy for researchers, implementers and police makers working on climate resilient and mitigation as well as to support researcher for father gaze ring information about disaster of climate change.

Keywords: Africa Climate, Drought, Ethiopia, Livestock, Strategy

Introduction

Global Climate Risk Index 2021 analyses to what extent countries and regions have been affected by impacts of weather-related loss events (storms, floods, heat waves etc.). Human impacts (fatalities) and direct economic losses were analyzed (GCRI, 2021) [8], Developing countries are particularly highly affected by the impacts of climate change. They are hit hardest because they are more vulnerable to the damaging effects of a hazard but have lower coping capacity (GCRI, 2021) [8]. The year 2021 was either the third or fourth warmest years on record for Africa (IPCC, 2018) [10]. By 2030, 108-116 million people in Africa are expected to be exposed to sea level rise risk (AFDB, 2022) [1]. With similar scenario which is reported by (AMFAF, 2022) [2] that Agriculture, which provides a livelihood for about three-quarters of Africa's population, is mainly rain fed. Severe and prolonged droughts, flooding, and loss of arable land due to decertify cation and soil erosion are reducing agricultural yields and causing crop failure and loss of livestock, which endanger rural and pastoralist populations. The Horn of Africa's pastoralist areas (Ethiopia-Kenya-Somalia border) have been severely impacted by recurrent droughts (AFDB, 2022, AMFAF, 2022 and UNESCO, 2010) [1, 2, 16].

Communities in the Horn of Africa are facing the threat of starvation following four consecutive failed rainy seasons in parts of Ethiopia, Kenya and Somalia, a climatic event not seen in at least 40 year (WV, 2021). The Same Source Revealed that The October-December 2020, March-May 2021, October-December 2021 and March-May 2022 seasons were all marred by below-average rainfall, leaving large swathes of Somalia, southern and south-eastern Ethiopia, and northern and eastern Kenya facing the most prolonged drought in recent history. The March-May 2022 rainy season was the driest on record in the last 70 years—making the 2020-2022 surpass the horrific droughts in both 2010-2011 and 2016-2017 in duration and severity and early forecasts indicate that the October-December 2022 rainy season is also likely to fail as indicated by (WV, 2022) [24].
Drought in East Africa has worsened following consecutive failed rainy seasons combined with heightened conflict, related population displacement, and COVID-19 restrictions. Many parts of Northern Africa experienced extreme heat, which was accompanied by wildfires (WMO, 2022) [22]. Over the past 50 years, drought-related hazards have claimed the lives of over half a million people and triggered $70 billion in regional economic losses (AFDB, 2022) [1]. Increased temperature contributed to a 34 per cent reduction in agricultural productivity growth in Africa since 1961 – more than any other region in the world (USAID, 2020) [20]. Climate-related hazards continued to be a major driver of new displacement in Africa and only four out of 10 people are covered by Multi-Hazard Early Warning Systems (AFDB, 2022) [1]. The Horn of Africa is facing severe drought following four years of below-average rainfall and More than 18 million people are experiencing extreme hunger in Ethiopia, Somalia and Kenya (WEF, 2022) [21]. Therefor The United Nations is appealing for $42 million to provide urgent assistance, and other organizations are sending funds. According the report of (Brown *et al*., 2009**)** [4] that climate change indicated as low-warming, mid-warming and high-warming indicator scenario that illustrated in the table 1 below.

Table 1: The climate change impacts scenario in Africa

Factor affected	Low-warming scenario	Mid-warming scenario	High-warming scenario
CO2 atmospheric levels (ppm)	600 ppm	850 ppm	1 550 ppm
Global ToC increase	1.8° C	2.8° C	4.0° C
Global sea level rise	0.18–0. 8 m	0,21–0.48 m	0.26–0.59 m
Water availability	20–30% decrease H_2O availability in vulnerable area	Precipitation in subtropical areas falls by up to 20%, Annual mean rainfall increases by 7% in East Africa, Precipitation decrease of 20% along Mediterranean coast	30–50% decline in water availability in Southern Africa
Agriculture and food production	5–10% decline in crop yields	550 million additional people at risk of hunger	Decrease of 15–35% in agricultural yields across continent
Extreme events	Up to 10 million more people affected by coastal flooding globally and serious in Africa coast.	Coastal flooding affects between 11 and 170 million additional people per year globally, 10–20% increase in cyclone activity in the southern Indian Ocean	420 million people exposed to flooding globally, Tens of millions displaced by extreme weather events and climate processes

***Source*:** Adapted from (Brown *et al*., 2009) [4].

Therefore it is very important that shortly discussed as Critical Points of Climate Change Risk Observations. Thus objectives of the present reviews aims to point out climate risk with organize publications reported from concerned organizations, and to give hints to for farther investigation with references of research results to make them easy and quick to find and as well as, to explore issues in this area, propose an outline of research for future work compile previous literature on climate change, various sectors, and their mitigation measurement.it gives information for police makers too.

Methods of Review

This reviewed papers have worked used data based on research and secondary resources, used dates from the NGO and NON NGO organization situational reports, from google scholars and reputable news with humanitarian response document like of, AFDB, FAO, AMFAF, WMO, IPCC, UNESCO, USAID and WEF current and situational report based on climate disaster responses documents compiled.

Review Climate Change Impacts in Africa

Climate change is a long-lasting change in the weather arrays across tropics to polls. It is a global threat that has embarked on to put stress on various sectors in the world (Kashif, *et al*., 2021). Climate change represents a major threat to Africa achieving the Sustainable Development Goals. The Intergovernmental Panel on Climate Change report (IPCC, 2018) [10] that accessed on https://www.ipcc.ch/report/ar6/wg2/ highlighted the grave consequences of a temperature increase above 1.5°C, especially for Africa. From 2008 to 2011, drought caused economic losses equivalent to 3.9 percent of Djibouti's GDP per annum. United Nation Environment program (UNEP, 2017) [15] commission research estimates that the cost of adapting to climate change across Africa could reach $50 billion a year by 2050, if the global temperature increase is kept within 2°C above preindustrial levels. Climate change is having a growing impact on the African continent, hitting the most vulnerable hardest, and contributing to food insecurity (UNFCCC, 2020) [17].
The main longer-term impacts of climate change in Africa include changing rainfall patterns affecting agriculture and reducing food security; worsening water security; decreasing fish resources in large lakes due to rising temperatures and overfishing; rising sea levels affecting low-lying coastal areas with large populations; and rising water stress (AMFAF, 2022) [2]. Accordingly the same source illustrated that increasing water availability and increasing the reliability of water in agriculture, i.e. through irrigation, is one of the preferred options to increase productivity and contribute to

poverty reduction.

The State of the Climate in Africa 2021 reveals that rainfall patterns are disrupted, glaciers are disappearing and key lakes are shrinking (WMO, 2022) [22]. While the same source revealed that Africa accounts for only about two to three per cent of global greenhouse gas emissions, it suffers disproportionately from it. As millions of people in the Greater Horn of Africa have already "suffered the longest drought in 40 years," parts of the region are bracing for a fifth consecutive failed rainy season, the World Meteorological Organization (WMO) has reported. Climate change contributed to mounting food insecurity, poverty and displacement in Africa last year, the World Meteorological Organization and partners said in a report on (WMO, 2022) [22].

Africa is the most vulnerable continent to climate change impacts under all climate scenarios above 1.5 degrees Celsius. Despite having contributed the least to global warming and having the lowest emissions, Africa faces exponential collateral damage, posing systemic risks to its economies, infrastructure investments, water and food systems, public health, agriculture, and livelihoods, threatening to undo its modest development gains and slip into higher levels of extreme poverty. Why Africa being vernal able to climate change? According African development bank reports of (AFDB, 2022, and UNFCCC, 2007) [1, 18] revealed that factors contribute to Africa's vulnerability. Sub-Saharan Africa has 95% of rain-fed agriculture globally. A large share of agriculture in GDP and employment adds to vulnerability, as do other weather-sensitive activities, such as herding and fishing, leading to income losses and increased food insecurity. Seven of the 10 countries those are most vulnerable to climate change are in Africa. In 2015, four African countries ranked among the 10 countries most affected

According the report of (USAID, 202O) [20] climate protection funding indicated that over the past 10 years, Ethiopia has seen 10 percent annual gross domestic product growth. At the same time, its greenhouse gas emissions have increased over the period-growing 11 percent alone between 2008 and 2009. Similarly more than 85 percent of emissions are due to agriculture and deforestation, while the power, transport, industrial and building sectors contribute 3 percent each. Globally, Ethiopia accounts for less than 0.1 percent of emissions, yet it is already experiencing the adverse effects of climate change. Communities are suffering from greater variability and extreme weather events, increased temperature and declining rainfall in a country where 85 percent of farmers are dependent on rain-fed agriculture illustrated in the report of (USAID, 2020) [20].

Drought-Induced Loss of Livestock in Horn of Africa Will Impact Communities "For Years to Come More than seven million animals' dead in Ethiopia, Kenya and Somalia, thus Millions of people across the eastern Horn of Africa currently face the threat of starvation amid an unprecedented, multi season drought and compounding global shocks. Whereas As the Famine Early Warning Systems Network (FEWS NE, 2022) [6] and other food security organizations urge the international community to ramp up relief efforts, experts warn that the impacts of extreme livestock losses as a result of the drought will be felt for years to come which reflected significantly on pastoralists.

Pastoralists, by definition, are people who receive most of their income from the production of animal products, including meat, milk, blood and hides. In the eastern Horn of Africa as in much of the world's drylands pastoralists migrate with their animals in search of pasture and water sources for their herds. Pastoralism is uniquely suited to operate effectively in places with low rainfall totals and highly variable seasonal rainfall conditions (UNFCCC, 2007) [18].

Pastoralists are able to manage such geospatial and temporal extremes by accessing and integrating a variety of landscapes and species into their production systems. Herders typically move livestock to drier areas during the rainy season and to wetter areas during the dry season it is general truth that "This seasonal migration pattern allows pastoralists to exploit the resources of different ecoregions in response to a dry and increasingly variable environment those ultimately might create conflict with communities.

Review of Climate Change Impacts in Ethiopia

Ethiopia, home to more than 108 million people, is one of the world's most drought-prone countries. The country faces numerous development challenges that exacerbate its vulnerability to climate change, including high levels of food insecurity and ongoing conflicts over natural resources. Climate projects include increases in temperature, erratic rainfall and unpredictability of seasonal rain, increased incidences of drought and other extreme events (USAID, 2020) [20]. Un-less otherwise we control and work on climate smart agriculture and adaptability practices that Climate change would have negative and impeded to existences impacts on agriculture, livestock, water and human health in Ethiopia.

According the information gazered from google scholars and climate change risk assessment from https://www.daf.qld.gov.au/business-priorities/agriculture/disaster-recovery/drought/managing-recovery/managing/drought-strategy-beef cattle.

- Increased Frequency/Intensity of Extreme Weather Events
- Changes to Season Duration/ Seasonal Precipitation
- Increased Temperature
- Decrease Agriculture productivity and production
- occurrence of Human Health and disease problems
- negatively and drastically affected Livestock production
- Water shortage and unpredictable and uncontrolled flood existed

Drought Impact Areas in Ethiopian Situation

The drought affected areas of Ethiopia especially Somali Regional State, Borana Zone of the Oromia Regional State and South Omo Zone of the Southern Nations, Nationalities and Peoples' Regional State are most prunes once relatively compared with other regions of the country which required especially attention in designing of climate mitigation and resilience program according (USAID, 20220, AFDB, 2022, and WEF, 2022) [20, 1, 21]. Millions of animals have died in Ethiopia because of the current drought, aggravating food insecurity and human suffering, the UN Food and Agriculture Organization said it's in a statement released on report published on 15 May (FAO, 2022).

When animals die on a massive scale this will lead to severe food security problems in livestock dependent communities. Livestock production is crucial for the survival and welfare of pastoral communities. The pastoral communities are the most affected in eastern and southern Ethiopia which have had three consecutive years of little or no rainfall (FAO,

2022). Pastoralists depend almost entirely on livestock, and more than 90 percent of grain production in Ethiopia depends on draught power, mainly of oxen. In addition In addition to the lack of rain, deterioration of the rangeland, overpopulation and poor marketing facilities have aggravated the situation, according to the UN agency. The report of (FAO, 2022) warned that surviving animals after hitting of drought are less resistant to disease after once being weakened by a lack of feed and water. "The occurrence of any disease would have a disastrous effect on livestock. The direct effects of animal diseases on livestock productivity include reduced feed intake, changes in digestion and metabolism, increased morbidity and mortality and decreased rates of reproduction, weight gain and milk production.

Climate Change Impacts on Biodiversity

Biological diversity or "biodiversity" has been defined by the Convention on Biological Diversity (CBD) as: "the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems". In short, biodiversity refers to the variety of life on earth. This variety provides the building blocks to adapt to changing environmental conditions in the future (IBC, 2005). Global biodiversity is among the severe victims of Climate Change because it is the fastest emerging cause of species loss. The reviewed report of (Kashif, *et al*., 2021) demonstrated that the massive scale species dynamics are considerably associated with diverse climatic events. Both the pace and magnitude of Climate changes are altering the compatible habitat ranges for living entities of marine, freshwater, and terrestrial regions. Alterations in general climate regimes influence the integrity of ecosystems in numerous ways, such as variation in the relative abundance of species, range shifts, changes in activity timing, and microhabitat use (Bates *et al*. 2014) that reported in (Kashif, *et al*., 2021). The same sources revealed that the geographic distribution of any species often depends upon its ability to tolerate environmental stresses, biological interactions, and dispersal constraints. Hence, instead of the Climate change, the local species must only accept, adapt, move, or face extinction. So, the best performer species have a better survival capacity for adjusting to new ecosystems or a decreased perseverance to survive where they are already situated (Bates *et al*. 2014).

An important aspect here is the inadequate habitat connectivity and access to microclimates, also crucial in raising the exposure to climate warming and extreme heatwave episodes. For instances, the carbon sequestration rates are undergoing fluctuations due to climate-driven expansion in the range of global mangroves according to (Cavanaugh *et al*. 2014). It is particularly important as CC does not specify specific populations or communities. Eventually, this Climate change induced redistribution of species may deteriorate carbon storage and the net ecosystem productivity (Kashif, *et al*., 2021)). Among the typical disruptions, the prominent ones include impacts on marine and terrestrial productivity

Cattle Affected By Drought in Ethiopia

All animal negatively affected by climate change directly or indirectly while cattle are more prone than other animal in drought. In a drought is one of the climate change indictors that imposed negative impact on all animals but significantly illustrated in cattle, producing milk, even at low levels, rapidly depletes a cow's body reserves. The calf derives little benefit. Weaning the calf gives the cow a better chance of survival. However, the decision to wean must be made in relation to the time of year and age of the calf with the availability of feed resources too revealed in unpublished document of biodiversity in Ethiopia. According the report of (AFDB, 2022, and WEF, 2022) [1, 21] indicated that nearly 2.1 million livestock have died, while at least 22 million livestock are at risk and are very weak and emaciated with no or little milk production, the main source of nutrition for children and people existed in the area. Rainfall in the early part of the long rains season (March-May) has been broadly below normal and the limited rains are not expected to have replenished water sources (AFDB, 2022) [1]. Because of the It is general fact that large ruminants depends on their feeds depleted with short periods of time that not support them during drought

Ethiopia is experiencing one of the most severe La Niña-induced droughts in the last forty years following four consecutive failed rainy seasons since late 2020. The prolonged drought continues to compromise fragile livelihoods heavily reliant on livestock and deepening food insecurity and malnutrition, whereas, More than 8 million1 pastoralists and agro-pastoralists in Somali (3.5 million), Oromia (3.4 million), SNNP (1 million) and South-West (more than 15,000 people) regions are currently affected by the drought, of which more than 7.2 million people need food assistance and 4.4 million people need water assistance. As per the most recent weather forecast, the overall situation is not expected to improve soon with La Niña conditions expected to continue into late 2022 with low rainfalls, compounding impacts from recent dry seasons (AFDB, 2022) [1]. It is further projected that drought conditions will further worsen and expand to new geographic areas notably in the North-East of the country requiring continued, increased, and immediate life-saving response over the months to come to address increasing needs in scope and scale (WMO, 2022b) [23].

The humanitarian situation continues to worsen in drought affected areas and across sectors of intervention. During the first quarter of 2022, there has been an increase in the number of new severely acute malnutrition cases with more than 30,000 children being treated in health facilities compared to same period last year (UN-OCHA, 2022). The increased proportion is 37 per cent in Somali and 27 per cent in SNNP. Over the next months, a spike is forecasted in the number of acute malnutrition cases in drought affected areas of up from the first quarter of the year. Nutrition partners are targeting 1,064,668 people in drought affected areas for nutrition interventions including more than 185,000 children under five with severe acute malnutrition, more than 478,000 children with moderate acute malnutrition, and more than 206,000 pregnant and lactating women with acute malnutrition (UN-OCHA, 2022).

Children's education is increasingly affected with school dropout rate increasing due to families migrating to better-off areas and due to lack of water sources at schools. More than 2,000 schools are closed including 1,800 schools in Somali, 334 schools in East and West Hararge zones in Oromia regions alone, affecting more than 682,000 students. Worsened by the drought impact compounded with limited water, sanitation, and hygiene (WASH) interventions, there

is a fear of water borne diseases like cholera in some of the drought affected areas. The overall humanitarian situation in Ethiopia has significantly deteriorated since the beginning of the year leading to increased humanitarian needs across the country. The cumulative impact of ongoing conflict and violence, climatic shocks such as the prolonged drought, and more recently floods, constitute the main triggers of such a rise. More than 29 million people were estimated in need of humanitarian assistance and protection at the beginning of 2022, compared to 23.5 million people at the beginning of 2021, and 8.4 million people in 2020. Nearly three quarters of the people in need this year are women and children **(**UN-OCHA, 2022).

Climate Chang Impact on Grazing Lands

The impacts of climate change on grazing lands and the livestock operations that depend on them will vary by region, type of grazing land, vegetation community, and the type of livestock. Meanwhile these impacts are superimposed upon other factors such as land ownership, historical and current management, demographic changes and access to development programs (McCollum *et al*., 2017). For rangelands, warming temperatures and precipitation changes may change competitive interactions between plant species, favoring invasive species over native species. Rising CO2 is likely to enhance rangeland productivity while improving water use efficiency, but this could also benefit undesirable species over preferred native species (invasive spp.) or increased fire events are also likely, especially where invasive such as cheat grass become dominant (Izaurralde *et al*., 2011).more over the same source explained that of Climate change may also directly impact unsheltered livestock. Livestock can be vulnerable to sudden or dramatic environmental changes. Lack of conditioning to rapidly changing or harmful weather events can result in catastrophic deaths whereas rising temperatures and a longer growing season could improve forage production, whereas in others rising temperatures exacerbate drought by driving increased losses to evaporation. A trend to more extreme precipitation events will lead to increased flooding and erosion, especially in arid areas.

According the scholars advice there are ways of Responding to Climate Change in three elements that can impact the success of grazing operations include the seasonal distribution and quantity of forage, the inter-annual reliability of forage production, and forage nutritional value. Using conservative stocking rates, varied season of grazing, optimizing herd size and composition, identifying reserve forage, strategic distribution of water, proactive vegetation management and changes in enterprise structure are examples of rangeland management practices that can help livestock producers adapt to the negative impacts of climate change (Joyce *et al*., 2013) in addition most of these practices are also relevant to pasture systems too. However, because pasture systems are highly managed and often smaller in size than rangeland systems, there is more latitude in developing resilient management techniques that sometimes have more in common with cropland agriculture.

Drought is probably the main threat to crop diversity. During extended severe drought, farmers sometimes consume all of their seed resulting in loss of genetic diversity and entire crop varieties (IBC, 2005). Biodiversity and other Natural Resources research and Conservation Service providers could support the conservation programs to assist producers in adopting technologies that enhance the resilience and productivity of their grazing lands enable climate-smart decision making. By working together with concerned bodies Climate hubs information networks, grazing lands producers will be more prepared to adapt to a changing climate.

Recommendation as Strategy of Climate Change Risk Protection

Measures to improve the resilience of eastern African communities to climate shock and stresses meant that the overall impact of the 2016 drought was much lower than the mid-1980s and 1973 and also 2021s as droughts measure indicator of climate change impact. As resilience continues to improve, it should be possible to move from crisis management to risk management of droughts in the Horn of Africa in general and in Ethiopia in particular. Notably, the Climate Strategy recognizes nature as critical to climate solutions and integrates nature-based solutions throughout world and any critical concerned sectors will elevate nature-based solutions as key tools to reduce emissions and absorb carbon, reduce disaster risk, support livelihoods, and improve food and water security. Many of the forests, grasslands and rangeland, wetlands, and marine ecosystems those provide climate mitigation and adaptation benefits are also critical for biodiversity conservation.

In general as previous droughts have shown, even if upcoming rainy seasons perform well, full recovery of herds, soil moisture, and pastures will take years. This rings particularly true for the ongoing, multi-season drought in the eastern Horn of Africa, where communities have not had the opportunity to recover from the previous drought up to now. The international community like WEF, AFDB, and UN-FCCC must provide adequate assistance to the eastern Horn of Africa in the coming years to protect pastoral and agro-pastoral communities from further harm and the practice actions has to be based on each country resource and capacity.

Conclusion

Actions needed to wards climate risk management as conclusion of best strategy which focuses on achieving climate change mitigation benefits. The Strategy highlights several actions required likes:

- Conservation, management, and restoration of forests, mangroves, peatlands, and other high-carbon ecosystems.
- Protecting and supporting environmental and human rights defenders who advocate to preserve critical carbon-sequestering ecosystems.

Addresses strengthening the climate resilience of people, places, ecosystems, and livelihoods that are vulnerable to the impacts of climate variability and change. Illustrative actions include:

- Strengthening natural resource management to manage and reduce climate risks and to build local capacity for resilience and resource sharing, including through socio-ecological approaches.
- Supporting the implementation of nature-based solutions, including the conservation, management, and restoration of forests, mangroves, peatlands, and other critical ecosystems, to deliver adaptation, mitigation, and other co-benefits for people and biodiversity.
- It is not loo let to fix the climatic crises know about

climatic events and Emissions has to be halved by 2030s that need to be decreased by 43%.
- Government must move away from fossil fuel use as IPCC warned.
- Actions needs to come from every industries action as pillar of each sector response to the risk aversion.
- Even without taking in to account the financial benefits off avoiding total climatic disaster the suggested action needs to take to reduce net-zero carbon emission.
- Take in to account the importance of conserving biodiversity to maintain the ecosystem services that deliver climate mitigation and adaptation benefits.
- The Strategy also recognizes the importance of human rights and the critical role of Indigenous Peoples and local communities in conserving ecosystems and sustainably managing natural resources.

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Authors Declaration
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References
1. AFDB (Africa Development Bank). Climate Change in Africa. African Development Bank at COP25 Agenda of Bank events. 2022): https://www.afdb.org/en/cop25/climate-change-africa,2022.
2. AMFAF. The Impact of Climate Change in Africa. African Ministers of Foreign Affairs (2022). Forum, 2009, http://www.iisd.org/pdf/2009/climate_change_security_africa.pdf accessed August 2022.
3. Bates AE, Pecl GT, Frusher S, Hobday AJ, Wernberg T, Smale DA, *et al*. Defining and observing stages of climate mediated range shifts in marine systems. Glob Environ Chang. 2014; 26:27-38.
4. Brown, Oli, Alec Crawford). Climate Change and Security in Africa. A Study for the Nordic African Foreign Ministers Meeting 2009). Available at http: //www.iisd.org/pdf/2009/climate_change_security_africa.pdf. (Accessed August 2022).
5. Cavanaugh KC, Kellner JR, Forde AJ, Gruner DS, Parker JD, Rodriguez W, *et al*. Poleward expansion of mangroves is a threshold response to decreased frequency of extreme cold events. Proc Natl Acad Sci. 2014; 111(2):723-727.
6. Famine Early Warning Systems Network (FEWS NE, 2022). Ethiopia: Drought Update No. 4, June 2022 that accessed on https://reliefweb.int/report/ethiopia/ethiopia-drought-update-no-4-june-2022.
7. FAO 9 (Food and Agriculture Organization.)(). Food and agricultural report on climate impact Ethiopia 2022, published news may 2022.Accessed on https://www.climatehubs.usda.gov/grazing-lands-changing-climate.
8. GCRI (Global Climate Risk Index), (2021). https://reliefweb.int/report/world/global-climate-risk-index-2021. (Accessed Nov, 2022).
9. IBC (Institute of Biodiversity conservation). National Biodiversity Strategy and Action Plan 2005). Government of the Federal Democratic Republic of Ethiopia (NBSAP) Project, 2005. https://www.cbd.int/doc/world/et/et-nbsap-01-en.pdf accessed on Nov 2022.
10. IPCC (Intergovernmental Panel on Climate Change) 2018. https://www.ipcc.ch/report/ar6/wg2/ report 2018.accessed on IPCC_AR6_WGII_FullReport.pdf/ https://www.ipcc.ch/report/ar6/wg2/.
11. Izaurralde R, Thomson A, Morgan J, Fay P, Polley H, Hatfield J. Climate Impacts on Agriculture: Implications for Forage and Rangeland Production (2011). Agronomy Journal. 2011; 103(2):371-381.
12. Joyce L, Briske D, Brown J, Polley H, McCarl B, Bailey D. Climate Change and North American Rangelands: Assessment of Mitigation and Adaptation Strategies. Rangeland Ecology & Management. 2013; 66(5):512-528.
13. Kashif Abbass, Muhammad Zeeshan Qasim, Huaming Song, Muntasir Murshed, Haider Mahmood, Ijaz Younis. A Review of the Global Climate Change Impacts, Adaptation, and Sustainable Mitigation Measures. Environmental Science and Pollution Research. 2022; 29:42539-42559.
14. McCollum DW, Tanaka JA, Morgan JA, Mitchell JE, Fox WE, Maczko KA, *et al*. P Climate Change and North American Rangelands: Assessment of Mitigation and Adaptation Strategies. 2017). Ecosystem Health and Sustainability. 2017; 3(3):13.
15. UNEP (United Nations environment programme: frontiers (2017). From https:// www. Unenvironment. Org/news- and-stories/ press- relea se/ antimicrob ial-resis tance- environmental-pollution-among-biggest.
16. UNESCO (UN Educational, Scientific and Cultural Organization. Water for people, water for life, 2010: the United Nations world water development report, 2003, http://unesdoc.unesco.org/images/0012/001295/129556e.pdf.accessed June 2010.
17. UNFCCC (UN Framework Convention on Climate Change Climate Change Is an Increasing Threat to Africa (2020). UN Climate Change commission News 27 October 2020. https://unfccc.int/news/climate-change-is-an-increasing-threat-to-africa.
18. UNFCCC (UN Framework Convention on Climate Change). Climate change: impacts, vulnerabilities and adaptation in developing countries (2007), Bonn: UNFCCC, 2007, 12.
19. UN-OCHA Ethiopia - Humanitarian Update Situation. Report, 27 Jun 2022, UN Office for the Coordination of Humanitarian Affairs (UN-OCHA, 2022).
20. USAID Climate Projections and Impacts. A Global Knowledge Portal for Climate and Development Practitioners, 2020. USAID Climate Change Funding (2020). Accessed on https://www.climatelinks.org/countries/ethiopia.
21. WEF (World economic forum Drought. Is The Effect Of Climate Change: issues in the case of east Africa (2022). World economic forum https://www.weforum.org/agenda/2022/07/africa-

drought-food-starvation.(accesed Dec, 2022),
22. WMO (World Meteorology Organization) Climate change in Africa can destabilize 'countries and entire region 2022a). s: Un-news global perspective human stories. 8 September 2022.
23. WMO (World Meteorology Organization): Greater Horn of Africa drought forecast to continue for fifth year (2022b), 26 August 2022/ Climate and Environment. https://news.un.org/en/story/2022/09/1126221.
24. World Vision (WV) Horn of Africa Drought: Regional Humanitarian Overview & Call to Action 2022 Business Brief, July 2022. World Vision East Africa Region Situation Report #3 | June 2022: https://reliefweb.int/report/ethiopia/horn-africa-drought-regional-humanitarian-overview-call-action-published-4-july-2022.