REVIEW OF LAW AND SOCIAL SCIENCES
ISSN (O): 3078-1574, ISSN (P): 3078-610X
Vol. 3, No. 1, 2025, 39-49
https://doi.org/10.71261/rlss/3.1.3949

Climate Change Challenges on Environmental and Sustainable Development

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Abstract

The environmental unsustainability becomes constantly aggressive Globally and that causes threats to human life and nature in general. Climate change consists of multivariant like storms, heatwaves, floods, and earthquakes and all these are caused by human pollution to the environment. Recently, the Eastern Africa in 2024 April was severely attack by the floods where humanitarian were the casualties. In Kenya over 300 people were reported dead while in Tanzania, Malawi, Mozambique, and Sudan was also very high number of fatalities. People lost their homes and belongings, while agricultural damages were also very severe and that resulted in food shortages. South Africa and Brazil were also affected by the floods which killed and caused damages. The KwaZulu-Natal floods were so strong where 139 Schools were destroyed and both industrial and residential were demolished. The purpose of this article is to identify the causes of climate change and how to ensure environmental sustainability to eradicate this threat. The most affected population in African countries are the rural villages as they don't have quality household structures and infrastructures. Commonly, no household in rural villages is registered with the Deeds office in South Africa and again, they are not insured against natural disasters of this nature. There no such a thing of stormwater facilities and engineers in the rural villages. The methodology followed in this article is a pure reliable literature review analysis. The research employed non empirical research by deeply focusing on theoretical systematic and thematic analysis of literature. The findings of this research will contribute significantly to addressing the cause of aggressive climate change and to provide solution to sustainable rural villages living environment.

Keywords: Climate change, floods, heatwave, natural disaster, environmental design and sustainable development

Introduction

Climate change is one of the significant elements of progress influencing people's lives in African countries. Approximately 68 million people in Southern Africa suffered the effects of drought emerging from climate change and this caused an increase in agriculture and livestock and led to a shortage in food security in numerous countries (Aljazeera & News Agencies, 2024:n.p.). The Constitution of South Africa (Constitution,1996:108) in section 24, stipulates that Everyone has the right— (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that— (i) prevent pollution and

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ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Ecosystems and human cultures are greatly impacted by climate change, which impacts everything from public health and coastal infrastructure to food security and water supply (Mokwena, 2019:1). In East Africa heavy rains and floods affected countries including Ethiopia, Kenya, Somalia, Uganda, Burundi, Tanzania, Democratic Republic of Congo (DRC), Lybia and South Africa due to climate change and left many people dead, others displaced and disruption in schools, healthcare and infrastructure badly damaged (Nkatha, 2024:n.p.). In Kenya, 48,896 people were displaced, over 80,000 families suffered damage, and 160 individuals were reported missing. The complex issue of climate change has significant implications for rural development and sustainability.

Burundi estimates that 239,000 people were affected and about 36,900 individuals were displaced as a result of flooding. Floods negatively impacted northern South Africa causing numerous deaths, serious damage to infrastructures, power outages and displacement of residents (Ofoegbu, Chirwa, Francis & Babalola, 2017:4). In South Africa, provinces such as Kwazulu-Natal, Free State and Eastern Cape have experienced similarly detrimental consequences. This worsens the existing inequality, especially for women and communities in underdeveloped areas, who frequently lack access to resources and decision-making authority. This article aimed to explore the challenges of climate change on environmental and sustainable development.

Discussion

Maluleke and Mokwena (2017:3) outlined that climate change has the greatest negative impact on the African continent. Eastern African countries face several issues as a result of climate change, including an increase in extreme weather events heatwaves, droughts, flooding, and sea level rise that affects food and water security (Fawzy, Osman, Doran & Rooney, 2020:2070). According to the Office for the Coordination of Humanitarian Affairs OCHA (2021:1) an estimated 1.6 million people in Eastern African countries have been affected by the floods, leaving 473 dead and 410,350 displaced. South Africa is one of the countries facing the challenge of climate change, which compromises food and water security as the country is mainly dependent on natural resources and agriculture. Additionally, Eloff (2024:np.) outlines that in KwaZulu-Natal and Eastern Cape, many people were severely affected by floods, leaving others dead, injured, missing and displaced. These regions have experienced devastating floods lately where infrastructure, roads, bridges, schools and industries were badly damaged. Mokwena (2019:1) outlines that the country is experiencing an increase in rainfall and this led to natural disasters such as floods that cause damage to properties, infrastructure, crops, and drainage systems. Furthermore, climate change causes an increase in temperatures that may lead to heat wave and droughts that poses a risk of diseases and even death to people affected (Fawzy et al., 2020:2071). Masum and Klaus (2019:7) emphasize that climate change causes temperatures to climb, bringing about more continual and serious intensity waves, dry seasons, rural creation, food security, and rapidly spreading fires.

Table 1.1 Floods Death, dislocation of victims and households affected toll in African Countries

	Burundi	Ethiopia	Kenya	Uganda	Somalia	South Africa	Tanzania
Death	29	57	291	23	7	41	155
Dislocation	36900	13500	278380	3080	38730	N/A	126000
Households affected	N/A	57000	55676	8011	157000	1093	N/A
People affected	239780	560000	88552	52190	225760	7813	N/A
Injuries	N/A	N/A	188	241	N/A	N/A	N/A
Missing	N/A	N/A	75	28	N/A	N/A	N/A

Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA)/ International Federation of Red Cross and Red Crescent Societies

Methodology

The researcher used a qualitative research method and a non-empirical research design to identify relevant studies for this article. Numerous literatures were reviewed and analyzed, and reliable materials to explore the challenges of climate change were also sourced. Data collection used secondary sources which are documents relevant to this article. The inclusion criteria in this article were documents restricted to 28 years. This article used non-probability sampling which is purposive sampling to identify an overview of terms and data relevant to the goals of the article and the research problem. For data analysis, textual analysis was used to critically and carefully review documents.

Literature

Causes of climate change

Climate change is caused by increased emissions of greenhouse gases (GHGs), such as burning coal, oil, natural gas, carbon dioxide, heat and nitrous oxide, due to global population growth, industrialization, transportation, and urbanization. Madzivhandila and Niyimbanira (2016:93) alluded that climate change has reliably been viewed as quite possibly one of the most critical issues as it can cause climbing in temperatures, drought, storms, floods, and out-of-control fires which may lead to the risk of illness or even death. In addition, Green Economy in the Context of Africa (2011:2) illustrates that high-temperature increases on the continent due to climate change have been reliably higher than the worldwide normal and this has caused more frequent and serious heatwaves, draughts, damage to infrastructure, housing, and natural disasters.

According to Lee, Gjersoe, O'Neill and Barnett (2020:7) from their studies conducted with 26 participants, climate change is caused by “pollution”, however, particularly among the most common causes of climate change carbon dioxide was identified as a popular cause of climate change. Although the studies outlined that people have different perspectives about the causes behind climate change, it seemed to increase with the generation of the participants. Climate change is affecting both the ordinary world and human

culture. Kim (2012:3) further outlined that climate change derived from natural and human-induced, factors such as greenhouse gases, biosphere, and carbon dioxide, burning fossil fuels, and cutting down forests are the primary causes of climate change. Kaddo (2016:2) concurs with the above authors that greenhouse gases cause climate change. Climate change is a global phenomenon that affects society as a whole, especially those living in underdeveloped areas where their properties are not insured and not registered with the Deeds office.

Mitigation of the causes of climate change

Climate change has caused weather changing patterns that led to natural disasters and many people have died from this problem. Implementation of energy-efficient procedures and sector-specific technology that lower energy consumption, as well as the end-use fuel switch from fossil fuels to renewable fuels, may play a crucial part in mitigating the causes of climate change (Fawzy et al., 2020:2073). Climate change and the environment are closely related because they both involve the maintenance of a healthy and sustainable ecosystem by causing biodiversity to be intricate and sweeping and influencing both human culture and the natural world. The shift from fossil fuels to renewable energy sources like solar, wind, and hydropower can significantly reduce greenhouse gas emissions (Institute for Security Studies (ISS), 2010:10).

Ofoegbu et al. (2017:5) argue that population development in rural communities has made an irregularity between population density and available facilities, which has enhanced the individuals' vulnerability to climate change and has led to forced migration and displacement. According to the Institute for Security Studies (ISS) (2010:10) strengthening capacity at all levels is essential for African nations to address the challenge of climate change. Furthermore, global cooperation is essential in addressing climate change, as it can assist in reducing the factors contributing to this phenomenon. Climate change needs immediate action that requires adapting agricultural systems and cutting greenhouse gas emissions to mitigate its effects.

Drought

Drought has a severe detrimental influence on people's lives. According to Fawzy et al. (2020:2070) in 2018, 68.5 million people globally were impacted by natural disasters, including floods, storms, and droughts, making up 94% of the total affected population. The frequency of extreme weather events in particular sub-regions and the population impacted by floods and droughts has increased significantly during the past few decades (Institute for Security Studies, 2010:4). Changes in water supply, food security, and agriculture will be the most significant effects of drought due to climate change in rural areas. This can cause water scarcity, resulting in agricultural losses and food insecurity, and exacerbating disputes over water resources (Rural Development Report, 2019:199). The seriousness of drought due to climate change is causing changes in precipitation patterns and decreases in

agricultural production, prompting diminished crop yields and lower-quality harvests.

Fawzy et al. (2020:) outlined that climate change includes heatwaves, wildfires, cold spells, hurricanes, droughts, floods, and landslides. Lack of water adversely influences crop yields and animals, which thus adversely influences food security and this causes economic instability which may prompt the migration of millions of individuals around the world. Niang, Ruppel, Abdrabo, Essel, Lennard, Padgham and Urquhart (2014:1206) indicated that the temperatures have expanded by no less than 0.5°C over the last 50 to 100 years, with the lowest temperatures increasing quicker than the greatest temperatures in Africa, leading to drought. Furthermore, Kim (2012:1) believes that the influence of global warming on the earth has prompted the climb in temperatures overall and the greenhouse gas emissions by anthropogenic activities since the mid-20th century. Drought results in a shortage of water supplies, which dries out lakes and rivers and this can be harmful to the ecosystem. The economy and society may be further impacted by the loss of biodiversity as a result of habitat destruction. Underneath is the top 20 countries high emissions table.

Table 1.2 Emissions by Country- Worldometer

S. No	Country	CO2 Emissions (tons, 2022)	1 Year Change	Population (2022)	Per capita	Share of world
1	China	12,667,428,430	-0.39%	1,425,179,569	8.89	32.88%
2	United States	4,853,780,240	1.78%	341,534,046	14.21	12.60%
3	India	2,693,034,100	6.52%	1,425,423,212	1.89	6.99%
4	Russia	1,909,039,310	-1.22%	145,579,899	13.11	4.96%
5	Japan	1,082,645,430	0.65%	124,997,578	8.66	2.81%
6	Indonesia	692,236,110	13.14%	278,830,529	2.48	1.80%
7	Iran	686,415,730	1.27%	89,524,246	7.67	1.78%
8	Germany	673,595,260	-0.84%	84,086,227	8.01	1.75%
9	South Korea	635,502,970	-1.15%	51,782,512	12.27	1.65%

S. No	Country	CO2 Emissions (tons, 2022)	1 Year Change	Population (2022)	Per capita	Share of world
10	Saudi Arabia	607,907,500	2.93%	32,175,352	18.89	1.58%
11	Canada	582,072,950	3.57%	38,821,259	14.99	1.51%
12	Mexico	487,774,010	10.40%	128,613,117	3.79	1.27%
13	Turkey	481,247,520	3.10%	87,058,473	5.53	1.25%
14	Brazil	466,770,410	-7.30%	210,306,415	2.22	1.21%
15	South Africa	404,974,510	-3.34%	62,378,410	6.49	1.05%
16	Australia	393,162,550	1.31%	26,200,984	15.01	1.02%
17	United Kingdom	340,610,260	0.46%	68,179,315	5.00	0.88%
18	Vietnam	327,905,620	-2.90%	99,680,655	3.29	0.85%
19	Italy	322,948,740	0.68%	59,619,115	5.42	0.84%
20	Poland	321,954,000	-1.61%	38,385,739	8.39	0.84%

Source: Emission Database for Global Atmospheric Research (EDGAR)Carbon Dioxide (CO2)

Threat to food production and cost

According to the Institute for Security Studies (2010:4) in African countries, it is anticipated that 600 million people will experience malnutrition by 2080 and 1.8 billion more people will be affected by water scarcity, a decrease in agricultural production and livestock as a result of climate change. Dodman, Karapinar, Sarr and Vincent (2014:616) believe climate change directly affects infrastructure, health, droughts, floods, hurricanes, and other extreme weather events leading to more frequent and intense heatwaves and natural disasters. Additionally, de Haen (2007:4) outlined that climate change also negatively impacts, farmers, agriculture, livestock, crop yields, and food security, particularly for disadvantaged people who cannot adjust to the resulting increases in food costs. Furthermore, agricultural systems and global food security are in jeopardy as a result of climate change and immediate action is required to adapt agricultural systems and cut greenhouse gas emissions to mitigate its effects.

Sumelius, Bäckman, Kahiluoto and Rötter (2009:23) argue that climate change poses significant threats to worldwide food production, and the impacts are already being felt in many parts of the world. The relationship between soil fertility and yield, changes in the distribution of pests and

diseases, and the effects of climate change on the livestock industry and this has thread to food production and costs (Ziervogel, New, Van Garderen, Midgley, Taylor, Hamann, Stuart-Hill, Myers & Warburton, 2014:609). The feeding and breeding of livestock, the consumption of fertilizers, and forestry for agricultural purposes all add to the accumulation of greenhouse gases in the atmosphere.

Fonta, Edame, Anam and Duru (2011:209) alluded that climate presents huge dangers to worldwide food creation, and agriculture, as numerous African harvests are developed near their constraints of warm resistance, on the desert outskirts, or on the edge of not being financially feasible in any event, for means cultivating. Tadesse (2010:6) concurs with the above authors that climate change adversely influences livestock production, food security, jobs, housing, education and the arts or social status leading to poverty.

Ofoegbu et al. (2017:3) argue that climate change is anticipated to result in higher temperatures, irregular precipitation patterns, and frequent droughts. Climate change affects water security including the distribution and access to food leading to reduced food availability and increased food prices (Intergovernmental Panel on Climate Change, 2023:6). This can lead to high population growth, high energy prices and requisites which translate into the economy and political instability.

Findings

The effects of climate change, including severe droughts, water shortages, wildfires, rising sea levels, flooding, and melting polar ice, are not properly projected by the local, provincial and central governments. There is a lack of resources and knowledge to adapt to the effects of climate change as certain areas and populations experience it differently. Due to the low quality of residential structures in rural areas, climate change has a substantial influence on the infrastructure, posing serious financial and practical difficulties for those living there. Furthermore, most of the properties in rural areas are possibly not registered with the Deeds office and also not covered by insurance for such detrimental natural disasters. Due to a lack of stormwater infrastructure and engineers, vulnerable communities from disadvantaged groups, and the impoverished are most adversely affected by climate change.

- Displacement of humanitarian, causes of disease and ultimate death
- Destruction of household structures and infrastructure
- Lack of quality infrastructure in rural villages
- Severe impact on environmental destruction
- Impact on agricultural production decline

Recommendations

In addressing the challenges of climate change serious attention needs to be taken to reduce emissions of greenhouse gases, promote renewable energy, increase energy efficiency and safeguard natural resources. Immediate action is required to adapt agricultural systems, such as; cover cropping, changing agricultural practices, agroforestry and cutting greenhouse gas emissions to mitigate its effects. A review of existing policies and laws addressing the

challenges of climate change should be considered. The population in general should be educated regarding climate change, its impacts and the measures to mitigate it.

Conclusion

In conclusion, climate change poses great complex and numerous challenges to environmental and sustainable development. The effects of climate change could seriously damage residential structures in rural areas, infrastructure, agricultural systems and global food production as this may threaten the country's economy. The entire world is currently experiencing negative impacts of climate change such as heavy rainfall, floods, air pollution, drought, heatwaves, storms and rising sea levels. Building more resilient sustainable development will address the challenges of climate change effectively. The impact of climate change on hostile climate has severe effects on agriculture in different ways on crops and fruits. Any overexposure to snow, rain and sun causes a decline in production. Farmers experience losses due to these climate hostile and ordinary citizen feels the pressure of market goods increases. This is because when production declines, the price appreciates due to the cost of production.

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