ISSN: 2455-2631 October 2024 IJSDR | Volume 9 Issue 10

The Impacts of Climate Change on the Socio-Economic Development of Torwama Community

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Abstract
This study investigated the impact of Climate change on the socio-economic development of Torwama Community.From the study, it was revealed that climate change manifests in various forms, including increased frequency of extreme weather events, rising sea levels, and shifts in agricultural productivity. The finding revealed that climate change disproportionately affect vulnerable populations, exacerbating existing inequalities and hindering economic growth.
This research explored through a mixed-method approach, combining quantitative and qualitative data to analyze the impact of climate change in the study area. The study used statistical analysis to examine the relationship between climate change variables and socio-economic outcomes, as well as conduct interviews and focus groups with local residents to gather qualitative data on the impact of climate change on their lives and livelihoods.

The research also indicated that extreme weather events, rising temperatures, and shifting rainfall patterns posed threats to Torwama community with fragile social, economic, and political structures. It was also revealed that challenges such as food insecurity and loss of livelihoods, were seen prominent. As a result, children and parent struggle with the little resources available. Moreover, the strain on resources may heighten competition and conflict further destabilizing communities.
Climate change has far-reaching implications on socio-economic development affecting various aspects of human life, including health, food security, water availability, infrastructure, and economic productivity.
Additionally, the research identified opportunities that accompanied climate related problems which are not limited to innovation and sustainable development through investment in green technologies and infrastructure. Transitioning to low-carbon economy can stimulate job creation and promote climate resilience, highlighting the need for integrated policies that balance environmental sustainability with economic growth.

Key Words: Climate change, socio- economic, livelihood, Community

1.0 Introduction

Climate change is a global phenomenon with far-reaching implications of socio-economic development, particularly in vulnerable regions such as Sierra Leone. The Torwama community in Sierra Leone serves as a poignant case study to explore the intricate relationship between climate change and socio-economic development.

Sierra Leone, located on the West African coast, is particularly susceptible to the impacts of climate change due to its geographical location and socio-economic vulnerabilities. The country faces a myriad of challenges, including deforestation, coastal erosion, erratic rainfall patterns, and increased frequency of extreme weather events such as floods and droughts.

The implications of climate change on the Torwama community are multifaceted and profound. As a predominantly agrarian society, the community heavily relies on agriculture for its livelihood. However, changing weather patterns and unpredictable rainfall have led to decreased agricultural productivity, food insecurity, and loss of livelihoods. This, in turn, exacerbates poverty and hampers overall socio-economic development in the community.

The impacts of climate change extend beyond the agricultural sector, (Valenzuela and Anderson, 2011) affecting other aspects of the community's socio-economic fabric. For instance, increased flooding and erosion pose significant threats to infrastructure, housing, and public health, leading to displacement, increased vulnerability to diseases, and disruption of essential services. The unequal distribution of resources and vulnerabilities within the community exacerbates the socio-economic impacts of climate change, with marginalized groups such as women, children, and the elderly bearing the brunt of the consequence

Addressing the implications of climate change on the socio-economic development of the Torwama community requires a multi-faceted approach that integrates climate adaptation and mitigation strategies with sustainable development initiatives. This could involve implementing climate-resilient agricultural practices, enhancing early warning systems, promoting community-based adaptation measures, and fostering sustainable livelihood diversification.

The case of the Torwama community in Sierra Leone underscores the urgent need to address the implications of climate change on socio-economic development in vulnerable regions. By adopting a holistic and community-centered approach, stakeholders can work towards building resilience, reducing vulnerabilities, and fostering sustainable development in the face of a changing climate.

Climate change (Solomon et al.., 2021)is a global phenomenon that poses significant challenges to the socio-economic development of countries like Sierra Leone. Rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events are already having an impact on the country’s natural and human systems. In the Bo District, which is one of Sierra Leone’s most populous and economically vibrant regions, climate change is exacerbating existing development challenges and creating new ones.

The Torwama section of the Bo District is particularly vulnerable to the impacts of climate change. This area is known for its rich agricultural land and diverse ecosystem, which support the livelihoods of thousands of people. However, changing weather patterns and increased temperatures are already affecting crop yields, water availability, and the overall resilience of the local community. As global temperatures continue to rise, the Torwama section and other parts of the Bo District are likely to face even greater challenges in terms of food security, water access, and economic opportunities.

This research aims to contribute to this effort by examining the various ways in which climate change is affecting the Torwama section and the Bo District, and by proposing evidence-based solutions to help build resilience and promote sustainable development in these vulnerable areas.

1.1 Problems Statement

Climate change poses a significant threat to the socio-economic development of Sierra Leone's Southern Region, Bo District, and Torwama Section. The impacts of climate change, including changes in temperature and precipitation patterns, increased frequency of natural disasters, and degradation of natural resources, have the potential to disrupt the region's economy, society, and environment. This disruption could have long-lasting consequences for the region's residents, including increased poverty, inequality, and vulnerability to environmental shocks.

Climate change is the single biggest health threat facing humanity. Climate (Mariara and Karanja, 2007) impacts are already harming health, through air pollution, disease, extreme weather events, and forced displacement, pressures on mental health, and increased hunger and poor nutrition in places where people cannot grow or find sufficient food.

Climate change affects the socio-economic development of Torwama community in Bo District. Here are some ways in which climate change can affect the socio-economic development of this area (Torwama Community):

Agriculture and Food Security:Climate change (Schmidhuber and Tubiella, 2007) can lead to changes in rainfall patterns, increased frequency of extreme weather events like droughts and floods, and the spread of pests and diseases. These changes can negatively affect agricultural productivity, leading to food shortages, increased food prices, and loss of income for farmers in Torwama community who rely on agriculture as their primary source of livelihood.

Fischer, Shah, Tubiellaand Velhuizen (2005) found that crops can significantly adapt to increased CO2 levels amid climate change, even though high temperatures and challenges such as droughts and floods can impede high yields and production in many areas of the world.The adverse impact of climate change also deprives agricultural activities which leads to socioeconomic constraints. Many vigilant youths have shifted their focus from agriculture to motorbike (Okada) riding, petty trading, and involved in numerous illegal acts in the named community, justification to this is that agriculture is no longer making sense as in the past.

Water Resources(De Moura et al.., 2020) changes in rainfall patterns and rising temperatures can affect water availability and quality in the community. This can affect the access to clean water for drinking, sanitation, and agricultural use, leading to health problems and reduced productivity in Torwama community.

Sustainable Development Goal 6, one of the 17 global objectives, emphasizes the urgent issue of access to clean water. Billions of people lack this essential resource, particularly in developing countries. The increasing temperatures and contamination of water sources have significantly affected water availability, leading to inadequate environmental sanitation in communities like Torwama.

Health (Aboubakri et al.., 2020).Climate change can exacerbate health issues in the region by increasing the prevalence of waterborne diseases, vector-borne diseases, and heat-related illnesses. This can lead to increased healthcare costs, reduced productivity, and loss of lives in the Torwama community.

Climate alteration has pioneered emerging disputes associated withH2O quality, accessibility, and affordability as the rise in temperature minimizes access to purified drinking water. The pollution from agricultural runoff and inadequate waste management practices contributes to the contamination of local water sources, making them unsafe for consumption. This situation not only threatens public health but also hinders economic development and exacerbates poverty in the community.

Boned et al (2021) explain that Climate variability, extreme weather events, and natural disasters are frequently highlighted, but the role of seasonal changes as a significant factor in food insecurity and malnutrition is often overlooked. Despite being a common cause, its effects can be substantial and should not be underestimated. Food is paramount to good health and its limitation gives way to malnutrition in society. The impact of climate change has lessened food availability in Torwama Community inTinkokoh Chiefdom Bo district of Sierra Leone.

Infrastructure and Housing: Extreme weather events like floods and storms can damage infrastructure, homes, and public facilities in the community. Rebuilding and repairing infrastructure can be costly and divert resources from other development projects.

Erosion, drought, strong winds, and persistent rainfall pose significant challenges to infrastructural progress in the Torwama community. These environmental factors compromise the reliability and durability of infrastructure and other assets, making them prone to destruction. Seasonal yet widespread soil erosion, which washes away the top layer of soil, undermines the foundation and stability of buildings, roads, and other essential structures. This socio-economic impact urged by climate modification pose serious threat on the social and physical progress of Torwama community.

Livelihoods: Climate change can disrupt traditional livelihoods in Torwama community, such as farming and fishing, leading to loss of income and increased poverty. This can also result in migration to urban areas in search of alternative livelihoods, putting pressure on already strained resources and services.

In the Torwama community, many customary undertakings that were once popular among the youth, such as farming, coal burning, and lumbering, have significantly declined due to adverse climatic conditions. As a result, young people are increasingly engaging in harmful activities such as gambling, smoking, and petty crime, which endanger their future and the well-being of the community. Also, support for household livelihoods has sharply decreased, mainly because of insufficient agricultural assistance, leaving many families struggling to sustain themselves. This shift not only threatens the cultural fabric of the community but also undermines its economic stability and prospects for growth.

Natural Resources: Climate change can impact natural resources such as forests, rivers, and (WMO, 2022) conducted a study on biodiversity in the region. Deforestation, soil erosion, and loss of biodiversity can have long-term negative effects on the ecosystem services that communities rely on for their livelihoods. In order to address the impacts of climate change on the socio-economic development of Torwama community, it is important for local authorities, community members, and relevant stakeholders to work together to implement adaptation and mitigation measures. These may include promoting sustainable agricultural practices, improving water resource management, strengthening healthcare systems, building climate-resilient infrastructure, and supporting alternative livelihood options. Additionally, raising awareness about climate change and its impacts can help communities better prepare for and respond to the challenges posed by a changing climate.

This research question explored through a mixed-methods approach, combining quantitative and qualitative data to analyze the impact of climate change on these areas. The study used statistical analysis to examine the relationship between climate change variables and socio-economic outcomes, as well as conduct interviews and focus groups with local residents to gather qualitative data on the impact of climate change on their lives and livelihoods.

This research aims to contribute to the growing body of knowledge on the impacts of climate change on developing countries and to provide insights into the specific challenges faced by Sierra Leone's Southern Region, Bo District, and Torwama Section. The findings of this study could inform the development of effective adaptation and mitigation strategies to promote sustainable development in these areas and help build resilience to the impacts of climate change.

METHODOLOGY

The sample size was selected randomly and some respondents were selected for the research. The sample population was from the age 18 to 45 years that were currently engaged in agricultural activities or issues of climate change. The research was mainly conducted using qualitative and quantitative research methods. Participants in this research were drawn from all aspects of live.

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The selection technique randomly involved stakeholders, farmers, organizations, government agencies and local NGOS for a solid information related to climate and it implications to Torwama community.

3.0 REVIEW OF RELATED LITERATURES

Climate change is an alteration in Earth's climate caused by factors such as the burning of fossil fuels, deforestation, and the emission of greenhouse gases. These human activities have led to an increase in the

Earth's average temperature, resulting in more frequent heatwaves, droughts, and extreme weather events. Climate change has significant implications on socio-economic development, both positive and negative.

On the positive side, climate change can stimulate innovation and technological advancements in renewable energy, energy efficiency, and sustainable practices. Governments and organizations are investing heavily in research and development to find solutions to climate change, which can lead to job creation and economic growth. Additionally, climate change can encourage sustainable agricultural practices, such as crop diversification and water conservation, which can improve food security and reduce poverty in developing countries.

However, climate change also has numerous negative implications on socio-economic development. Rising sea levels, more frequent natural disasters, and changing weather patterns can displace populations; disrupt supply chains, and damage infrastructure, leading to significant economic losses. Climate change can exacerbate existing social inequalities, as the most vulnerable populations are often the most affected by its impacts. For example, droughts can lead to food shortages and water scarcity, which can worsen poverty and malnutrition in already disadvantaged regions.

Rising Temperatures: Global temperatures have risen by approximately 1.2°C above pre-industrial levels. This trend is leading to more frequent and intense heatwaves. Increased Extreme Weather Events: There's a noticeable increase in the frequency and severity of extreme weather events such as hurricanes, floods, and droughts. These events disrupt communities and economies (IPCC, 2021).

Changes in temperature and precipitation patterns affect crop yields and livestock productivity. This can lead to food shortages and increased prices. Infrastructure: Extreme weather events and sea-level rise can damage infrastructure, leading to costly repairs and increased insurance premiums.Energy: There is a shifting demand for energy. For example, increased cooling needs in hotter climates and potential disruptions in energy supply due to extreme weather. (FAO, 2022).

Additionally, the implications of climate change on the socio-economic development are global issues that are disturbing the fabric of many communities around the globe. The significant impacts of climate change is less positive compared to the benefit to individuals or community, looking at the agricultural sector how climate change has affected the regular activities. The effective involvement of deforestation and burning down forest have impacted the less productivity of food stuff.

The implications of climate change on socio-economic development are far reaching and devastating, the rising temperatures and changing patterns and increase in frequency and extreme weather events can disrupt food production, leading to food shortages and malnutrition. Climate change also have a significant risk to water resources, with the changing pattern and increased evaporation rates leading to reduced water availability in some regions, while others experience increased flooding and storm. Climate change is a global challenge with significant implications on the socio-economic development, it poses risks to food and water security, existing social and economic inequalities and disrupts trade and transportation network.

In conclusion, climate change presents both opportunities and challenges for socio-economic development. While it can stimulate innovation and growth, it also poses significant risks to economies, societies, and individuals. Addressing climate change requires a comprehensive and coordinated approach that balances economic development with environmental sustainability and social equity.

3.1 Identify potential strategies and interventions that can help build resilience to climate change and promote sustainable socio economic development

Climate-smart agriculture: Promoting climate-smart agricultural practices, such as crop diversification, agroforestry, and improved irrigation systems, can help farmers adapt to changing weather conditions and reduce their vulnerability to climate-related shocks. Innovation Invest in the development and deployment of technologies that enhance resilience, such as early warning systems and climate-smart agriculture tools.

Renewable energy: Encouraging the adoption of renewable energy sources, such as solar and wind power, can help reduce dependence on fossil fuels and mitigate greenhouse gas emissions.

Sustainable water management: Improving water management practices, including rainwater harvesting and water conservation can help communities adapt to changing precipitation patterns and reduce the risk of water scarcity.

Ecosystem restoration: Restoring degraded ecosystems, such as forests and wetlands, can help enhance resilience to climate change by improving water retention, reducing erosion, and providing natural buffers against extreme weather events. Support large-scale reforestation and afforestation projects to sequester carbon and restore degraded lands (IPCC, 2021).

Early warning systems: Establishing early warning systems for natural disasters, such as floods and droughts, can help communities prepare and respond to climate-related shocks more effectively.

Climate education and awareness: Raising awareness about climate change and promoting climate education can help empower communities to take action and adapt to changing climate conditions. Raise awareness about climate change impacts and resilience measures through education programs.

Infrastructure development: Investing in infrastructure, such as roads, bridges, and energy systems, can help improve resilience to climate-related shocks and support sustainable economic development. Design and build infrastructure to withstand extreme weather and rising sea levels (e.g., flood defenses, elevated buildings).Green Infrastructure Integrate natural systems such as wetlands and forests into urban planning to absorb excess water and reduce heat.

International cooperation: Collaborating with international partners can help Sierra Leone access technical assistance, financial resources, and knowledge-sharing to support climate resilience and sustainable development efforts. Participate in and adhere to international climate agreements and frameworks such as the Paris Agreement to drive collective action (UNFCCC, 2015).

Community-based adaptation: Empowering local communities to take ownership of adaptation efforts can help ensure that interventions are context-specific, culturally appropriate, and sustainable in the long term. Local Empowerment Engage communities in developing and implementing adaptation plans tailored to local conditions.

Gender equality: Promoting gender equality and empowering women can help ensure that climate resilience and sustainable development efforts are inclusive and benefit all members of society.

4. 0 DISCUSSION OF RESULTS

In your opinion do you agree that climate change have huge implication on the lives of people?

Responses	Frequency	Absolute frequency %
Strongly agree	41	45
Agree	43	47
Neutral	2	2
Disagree	1	1
Strongly disagree	4	5
Total	**91**	**100**

The data in the table above illustrated that majority 43(47%) of the study respondent agreed, whereas 41(45%) of the study population chose strongly agreed, and 4(5%) of the study participant strongly disagreed, while 2(2%) of the research study chose neutral, and 1(1%) of the study disagreed**.** Therefore, it was clearly shown that climate change has a huge implication on the lives of the people in the Torwama community.

What were the strategies put in place that minimized climate related damage in your environment

Responses	**Frequency**	**Absolute frequency %**
Engage in public awareness	18	20
Public policies	30	33
Avoid deforestation	19	21
Community mobilization	18	20
Other specify	6	6
Total	**91**	**100**

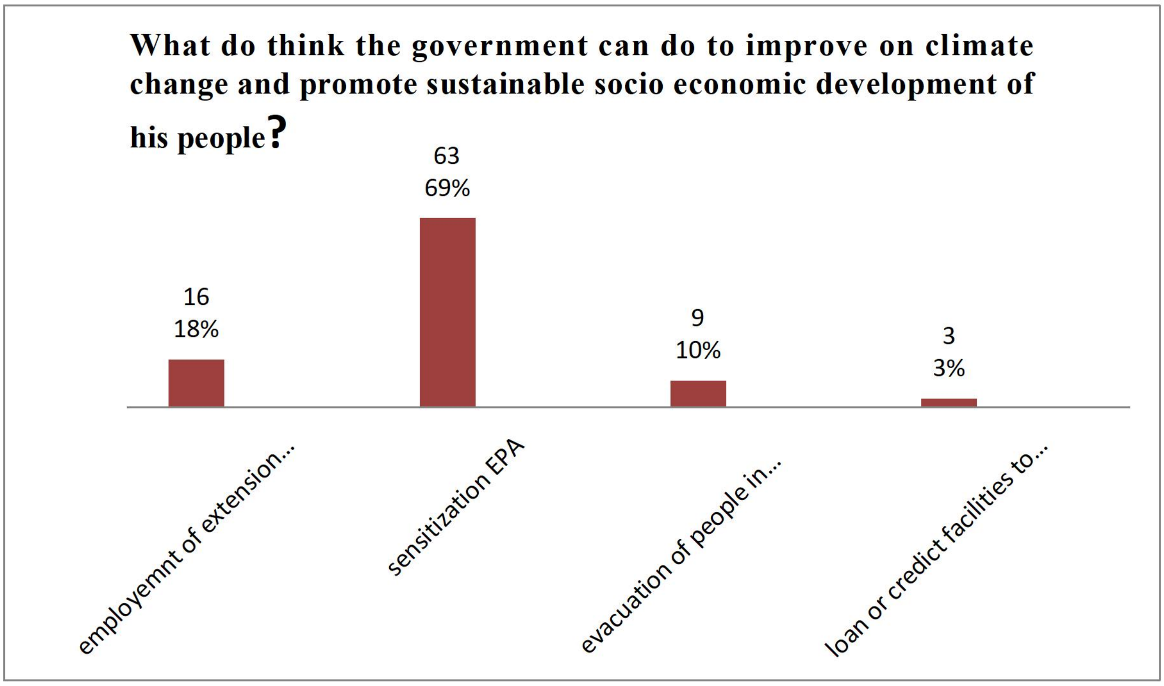
The table above shows 18(20%) of the study population engaged in public awareness, whereas 30(33%) of the respondent chose public policies, and some 19(21%) of the participant chose avoid deforestation, while 18(20%) of the respondents indicated community mobilization, and 6(6%) of the respondents chose others specify.

What impacts, if any do you think climate change may have?

Responses	**Frequency**	**Absolute frequency %**
Climate change negatively impact the agricultural sector, loss of species, increased drought and more health risk.	37	41
It improved soil structure, economic impact, cultural impact and social impact for the environment economically	22	24
It increases hot in temperature, flood, drought, and water shortage that cause threat to wide live.	26	29
Climate change impact by harming health through air pollution, disease extreme, weather event	6	6
Total	**91**	**100**

Data from the above table shows that majority 37(41%) of the study indicated Climate change negatively impact the agricultural sector, loss of species, increased drought and more health risk, and some 22(24%) of the study respondent chose, it improved soil structure, economic impact, cultural impact and social impact for the environment economically, 26(29%) of the study population stated, it increased hot in temperature, flood, drought, and water shortage that cause threat to wide live, while 6(6 %) of the study respondent mentioned climate change impact by harming health through air pollution, disease extreme, weather event.

What do you think the government can do to improve on climate change and promote sustainable socio-economic development of his people?



Data collected from the above figure indicated that majority 63(69%) of the respondent mentioned employment of extension worker, whereas 16(18%) of the study population chosesensitization by EPA, and 9(10%) of the respondents maintained evacuation of people in risk areas, while 3(3%) of the research respondent stated loan or credit facilities to farmers.

5.0 Conclusion

This study investigated the implications of climate change on the socio economic development of Torwama Community. Climate change can strain resources, infrastructure, and ecosystems, hindering economic growth and development and societies through events such as extreme weather, natural disasters, and food, water shortages. This can lead to increase of poverty, inequality and social unrest.

On the other hand climate change can also create opportunities for innovation, entrepreneurship, and sustainable development. By investing in renewable energy, green technologies and sustainable practices, countries and businesses can create new industries, jobs and economic growth. Climate change can also enhance social and political change, fostering greater cooperation, solidarity, and collective action.

Furthermore, climate change is a threat to energy security, particularly in developing economies. The effect is more obvious on the demand side, where there is general agreement that global warming will increase energy consumption. Regarding the supply side, however, the evidence is mixed and depends on the location and energy source. There is general agreement on the negative effects of climate change on the generation potential of some energy sources, such as solar, wind, and thermal, but there is no consensus on the potential effect of climate on the generation potential of other energy sources, such as hydropower and bioenergy. Particularly for solar energy, the impact of climate change is minimal

Ultimately, the implications of climate change on socio economic development depend on how individuals, communities and nations respond to the challenges and opportunities it presents. Proactive measures have been taken by government, non-governmental organizations and community stakeholders to mitigate the implication of climate change and adapt to the challenges of its effect. We can build a more sustainable, resilient, and equitable community through a climate resilient approaches.

6.0 Recommendations

6.1 Recommendations to central government and policy makers

- The central government and policy makers should develop comprehensive climate policies and implement integrated policies that address both climate mitigation and adaptation, these should include emissions reduction targets, renewable energy incentives, and strategies to enhance climate resilience in various sectors.
- The policy makers should also ensure that they create policies that promote sustainable agriculture that support farmers to enable them undertake agricultural practices that both climate-resilient and environmentally sustainable, this include encouraging soil conservation, efficient water use, and the adoption of climate smart farming techniques.
- They should also provide space that facilitates research and innovation that will help develop new technologies and solutions that address climate change. This includes supporting innovations in clean energy, carbon capture, and climate resilient materials.
- The central government should also collaborate with other countries to address climate change and promote international cooperation on climate change mitigation and adaptation.

6.2Recommendations to Environmental Protection Agency (EPA)

- The environmental protection agency should enhance risk assessment and mapping in other to develop and update comprehensive climate risk assessments and hazard maps to identify vulnerable areas and populations, this can help in prioritizing protection measures and planning for future risks.
- They should also strengthen emergency preparedness plans and response plans to account for climate change impacts, ensure these plans include protocols for extreme weather events, rising sea levels, and other climate related disasters.
- Invest in early warning systems and improve and expand on early warning system for natural disasters and extreme weather events, ensure these systems are accessible to all populations' especially vulnerable communities.
- They should also coordinate with local and regional authorities, work closely with local and regional authorities to align protection strategies with the ground needs and conditions, encourage community based approaches to enhance local resilience.
- Promote public awareness and education, environmental protection agency should increase public awareness about climate risks and safety measures, use various communication channel to educate citizens on how to prepare for and respond to climate related emergencies.

REFERENCES

1.Arnell, N. (1999). Climate change and global water resources. Global Environmental Change, 9, S31–S49. 13.

2. Astone, R., and Vaalavuo, M. (2023). Climate change and health: Consequences of high temperatures among vulnerable groups in Finland. International Journal of Social Determinants of Health and Health Services, 53(1), 94–111. 14.

3.Baarsch, F., Granadillos, J.R., Hare, W., Knaus, M., Krapp, M., Schaeffer, M., and Lotze-Campen, H. 2020. The impact of climate change on incomes and convergence in Africa. World Development, 126, Article 104699. 15.

4.Balcha, S.K., Awass, A.A., Hulluka, T.A., Bantider, A., and Ayele, G.T. (2023). Assessment of future climate change impact on water balance components in Central Rift Valley Lakes Basin, Ethiopia. Journal of Water and Climate Change, 14(1), 175–199. 16. Batten, S. (2018).

5.Climate change and the macro-economy: A critical review (Working Paper No. 706). Bank of England. http://dx.doi.org/10.2139/ssrn.3104554 17.

6. Ben Mohammed, A., Van Duivenbooden, N., and Abdoussallam, S. (2002). Impact of climate change on agricultural production in the Sahel – Part 1.

7.Methodological approach and case study for Millet in Niger. Climatic Change, 54: 327–348. Berhane, A. (2018).

8.Climate change and variability impacts on agricultural productivity and food security. Journal of Climatology and Weather Forecasting, 6, 240. 19. Bibi, T.S., and Tekesa, N.W. (2023).
9. Impacts of climate change on IDF curves for urban stormwater management systems design: The case of Dodola Town, Ethiopia. Environmental Monitoring and Assessment, 195, 170. https://doi.org/10.1007/s10661-022-10781-7 20.
10. Bombelli, G.M., Tomiet, S., Bianchi, A., and Bocchiola, D. (2021). Impact of prospective climate change scenarios on the hydropower potential of Ethiopia in GERD and gibe dams. Water, 13(5), 716. https://doi.org/10.3390/w13050716 21.
11. Boojhawon, A., and Surroop, D. (2021). Impact of climate change on vulnerability of freshwater resources: A case study of Mauritius. Environment, Development, and Sustainability, 23, 195–223. 22. Bowen, A., Cochrane, S., and Fankhauser, S. (2012).
12. Climate change, adaptation and economic growth. Climatic Change, 113(2), 95–106. 23. Braun, J., Afsana, K., Fresco, L.O., and Hassan, M. (2021). Food systems: Seven priorities to end hunger and protect the planet. Nature, 597, 28–30. 24.
13. Brouwer R., and Spaninks F.A. (1999). The validity of environmental benefits transfer: Further empirical testing. Environment and Resource Economics, 14(1), 95–117. 25. Burke, M., Davis, W.M., and Diffenbaugh, N.S. (2018).
14.Large potential reduction in economic damages under the UN mitigation targets. Nature, 557, 549–553
15. Abbas, A., Ekowati, D., Suhariadi, F., and Fenitra, R.M. (2023). Health implications, leaders' societies, and climate change: A global review.
16. In U. Chatterjee, A.O. Akanwa, S. Kumar, S.K. Singh, and A. Dutta Roy (Eds.), Ecological footprints of climate change (pp. 653–657). Springer, Cham. https://doi.org/10.1007/978-3-031-15501-7_26 2. Abeysekara, W.C.S.M., Siriwardana, M., and Merg, S. (2023).
17. Economic consequences of climate change impacts on the agricultural sector of South Asia: A case study of Sri Lanka. Economic Analysis and Policy, 77, 435–450. 3.
18. Abidoye, B.O., Kurukulasuriya, P., Reed, B., and Mendelsohn, R. (2017). Structural Ricardian analysis of Southeast Asian agriculture. Climate Change Economics, 8(3), Article 1740005. https://doi.org/10.1142/S201000781740005X 4.
19. Abidoye, B.O., Mendelsohn, R., Ahmed, S., Amanullah, S., Chasidpon, C., Baker, L., Dobias, R., Ghosh, B., Gunaratne, L.H.P.,
20. Hedeyetullah, M.M., Mungatana, E., Ortiz, C., Simoes, M., Kurukulasuriya, P., Perera, C., Sooriyaarachchi, A., Supnithadnapor, A., and Truong, T. (2017).
21. South-East Asian Ricardian studies: Bangladesh, Sri Lanka, Thailand, and Vietnam. Climate Change Economics, 8(3), Article 1740002. https://doi.org/10.1142/S2010007817400048 5.
22. Aboubakri, O., Khanjani, N., Jahani, Y., Bakhtiari, B., and Mesgari, E. (2020). Projection of mortality attributed to heat and cold:
23. The impact of climate change in a dry region of Iran, Kerman. Science of the Total Environment, 728, Article 138700. 6. Adejuwon, J.O. (2006). Food crop production in Nigeria. II. Potential effects of climate change. Climate Research, 32: 229–245. 7.
24. Adom, P.K., and Amoani, S. (2021). Role of climate adaptation readiness in economic growth and climate change relationship:
25. An analysis of output/income and productivity/institution channels. Journal of Environmental Management, 293, Article 112923. 8. Agbor, M.E., Udo, S.O., Ewoma, I.O., Nwokolo, S.C., Ogbulezie, J.C., and Amadi, S.O. (2023).
26. Potential impacts of climate change on global solar radiation and PV output using the CMIP6 model in West Africa. Cleaner Engineering and Technology, 13, Article 100630. 9.
27. Gunther Fischer, Mahendra Shah, Francesco N. Tubiella and Harris Van Velhuizen (2005). Socio-economic and climate change impacts on agriculture: an integrated assessment, 1990-2080. https://doi:10.1098/rstb.2005.1744
28. Boned et al (2021). Agricultural seasonality, market access, and food security in Sierra Leone
https://doi.org/10.1007/s12571-021-01242-z.