STM JOURNALS

International Journal of
Environmental Planning and
Development Architecture

ISSN: 2584-1688
Volume 4, Issue 1, 2026
January–June
DOI (Journal): 10.37591/IJEPDA

https://journals.stmjournals.com/ijepda

Research IJEPDA

Climate-Induced Drought, Food Insecurity, and Adaptation Governance: A Multiscale Review of Risks and Policy Responses in Africa and South Asia

Himank Sharma*

Abstract

Drought is one of the most critical climate-induced hazards, severely affecting agricultural systems, water resources, and human well-being, particularly in Sub-Saharan Africa and South Asia. This review provides a comprehensive analysis of the multidimensional impacts of drought by examining its effects on food security, population displacement, and institutional adaptation across selected case studies from West Africa, South Africa, and coastal Bangladesh. The findings reveal that increasing climate variability and prolonged dry conditions significantly reduce crop productivity, disrupt livestock systems, and undermine rural livelihoods, thereby exacerbating food insecurity and economic vulnerability. The paper also highlights the growing challenges faced by internally displaced populations in climate-sensitive regions, where inadequate access to healthcare, sanitation, and essential services intensifies health risks and social marginalization. In evaluating adaptation responses, the study explores the role of climate-smart agriculture, community-based adaptation, and ecosystem-based approaches in strengthening resilience. While these strategies demonstrate strong potential, their effectiveness is often constrained by limited financial resources, weak institutional coordination, insufficient extension services, and restricted access to climate information. Furthermore, the review identifies critical gaps in governance frameworks, particularly the disconnect between policy formulation and on-the-ground implementation. Marginalized communities, including smallholder farmers and displaced populations, remain underrepresented in adaptation planning processes. The study emphasizes the need for integrated, participatory, and multilevel governance systems that connect agriculture, health, and climate policies. Key recommendations include strengthening early warning systems, enhancing local knowledge integration, and improving access to adaptation finance. Overall, this review contributes valuable insights for policymakers and practitioners by outlining scalable, inclusive, and sustainable strategies to enhance drought resilience in highly vulnerable regions.

Keywords: Climate-induced hazards, climate-smart agriculture, drought, food security, institutional adaptation

***Author for Correspondence**
Himank Sharma
E-mail: himank.atr@gmail.com

Assistant Professor, Department of Civil Engineering, Echelon Institute of Technology, Faridabad, Haryana, India

Received Date: July 11, 2025
Accepted Date: August 13, 2025
Published Date: January 20, 2026

Citation: Himank Sharma. Climate-Induced Drought, Food Insecurity, and Adaptation Governance: A Multiscale Review of Risks and Policy Responses in Africa and South Asia. International Journal of Environmental Planning and Development Architecture. 2026; 4(1): 1–8p.

INTRODUCTION

Drought, a slow-onset and complex climate hazard, has become one of the most pressing challenges confronting agriculture, food security, and human development in the Global South, particularly in Sub-Saharan Africa and South Asia. These regions are experiencing increased exposure to climate-induced stressors due to their high dependency on rainfed agriculture, limited institutional capacity, and rapidly growing populations. The situation is further aggravated by erratic rainfall patterns, rising temperatures, and

land degradation, which directly contribute to reduced crop productivity, livestock mortality, and the displacement of vulnerable communities.

In West Africa, climate variability has had a particularly devastating impact on the crops and livestock sectors. Studies have shown that prolonged droughts result in crop failure, post-harvest losses, and diminished livestock productivity, further entrenching poverty and food insecurity. Similarly, in coastal Bangladesh, a region vulnerable to both salinization and river erosion, increasing drought frequency is directly contributing to internal displacement and growing health vulnerabilities among internally displaced persons. The dual burden of environmental and social stressors places immense pressure on national adaptation policies and local governance systems.

The global discourse on climate adaptation increasingly emphasizes the roles of climate-smart agriculture (CSA), community-based adaptation (CBA), and integrated policy frameworks in reducing vulnerability and building resilience. CSA techniques, such as the adoption of drought-tolerant crop varieties, improved irrigation efficiency, and soil moisture retention practices, are already being scaled up in parts of West Africa and South Asia. However, their implementation is often hindered by structural barriers, including limited access to climate information, insecure land tenure, gender disparities, and weak institutional coordination.

In Bangladesh, adaptation strategies such as rainwater harvesting, pond storage, and the introduction of salt- and drought-resistant rice varieties have shown potential to maintain rice productivity amid climatic stressors. However, these innovations often remain localized and underfunded. Moreover, there exists a considerable gap in national climate frameworks regarding the needs of internally displaced populations (IDPs), whose health outcomes are rarely integrated into formal climate adaptation planning.

Institutionally, while many countries have developed climate policies and adaptation plans, implementation remains inconsistent. In West Africa, for example, the Economic Community of West African States (ECOWAS) has adopted CSA strategies in regional frameworks; however, financing and operational execution are often weak. Similarly, Bangladesh's Climate Change Strategy and Action Plan (BCCSAP) provides a comprehensive policy framework; nevertheless, it lacks adequate attention to the socioeconomic vulnerabilities of displaced communities and marginalized groups.

Furthermore, adaptation planning often fails to adequately incorporate early warning systems (EWS) for drought. While technical capacity for forecasting exists in several countries, its integration into local-level planning and actionable decision-making remains limited. Consequently, communities receive delayed or non-contextualized information, reducing the opportunity for proactive risk reduction. Another under-researched area is the health impact of drought-induced displacement. In climate-vulnerable regions, IDPs often experience reduced access to health care, poor sanitation, and increased exposure to vector-borne diseases, such as malaria, and waterborne illnesses, such as diarrhea. However, most health models and adaptation projections either neglect or arbitrarily include health-related adaptation variables.

In contrast, participatory governance and ecosystem-based approaches are gaining traction for their ability to align local knowledge with institutional responses. Agroecology, for instance, integrates traditional farming wisdom with sustainable land-use practices, thereby enhancing community resilience while preserving biodiversity. Such approaches are also instrumental in promoting food sovereignty and decentralized adaptation planning. Cross-regional dynamics between South Asia and Africa offer vital comparative insights. While West Africa is experimenting with insurance-backed CSA strategies and scenario-based planning, Bangladesh's emphasis on CBA and localized infrastructure projects reveals the importance of community agency in adaptation success. However, in both contexts, institutional fragmentation, insufficient funding, and sociopolitical marginalization continue to obstruct sustainable adaptation pathways.

Table 1. Summary of key studies on climate change impacts, adaptation strategies, and governance insights across agriculture, health, fisheries, and displacement in West Africa and other vulnerable regions.

Author(s) and year	Region/focus	Key findings	Adaptation/governance insight
Wongnaa et al. (2024)	West Africa	Droughts impact crops, fisheries, and livestock	Climate-smart agriculture (CSA), insurance, gender-mainstreamed policy
Chowdhury et al. (2020)	Coastal Bangladesh	IDPs suffer health risks and inadequate infrastructure	Community-based adaptation (CBA) integrates migration into policy
Seppelt et al. (2022)	Global	Food security is challenged by climate and biodiversity feedback	Agroecology, close yield gaps, and reduce waste
Cordiner et al. (2024)	Global (Health modeling)	Health impacts underrepresented in climate models	Incorporate empirical adaptation into health models
Yiridomoh and Owusu (2021)	Ghana	Climate variability reduces yield, esp. for women farmers	CSA extension, women-targeted policy
Zougmoré et al. (2016)	West Africa	Drought reduces productivity in agriculture and livestock	Scale CSA, institutional coordination
Zakaria et al. (2020)	Ghana	Training and land tenure drive CSA adoption	Ensure land access, training investments
Idrissou et al. (2020)	Benin	Lack of climate info and market access hinders adaptation	Strengthen extension, ICT tools
Carr et al. (2022)	West Africa	Climate threatens staple crops and planning processes	Scenario modeling, local participation
Godde et al. (2021)	Sub-Saharan Africa	Drought and heat disrupt livestock supply chains	Improve animal husbandry systems
Faye et al. (2018)	Sudan Savanna (W. Africa)	2°C warming is more harmful than the 1.5°C scenario	Urge global mitigation, early CSA action
Haque et al. (2013)	Bangladesh	The rural poor rely on informal health coping	Health adaptation integration
Alidu et al. (2022)	Ghana	Limited climate info reduces CSA practices	ICT-based advisory networks
Cinner et al. (2022)	Coastal Tropics	Climate affects agriculture and fisheries jointly	Integrated land-sea adaptation frameworks
Maulu et al. (2021)	Africa	Aquaculture threatened by warming and oxygen loss	Develop hardy species, shift feeding methods
ECOWAS (2015)	West Africa	CSA strategies are included in the policy, but are underfunded	Need financial mechanisms and regional alignment
IPCC (2019)	Global	Climate-driven displacement rising	National migration-inclusive adaptation planning
Verner et al. (2018)	Côte d'Ivoire	Unreliable rainfall disrupts agriculture	EWS and traditional knowledge integration
Lam et al. (2012)	West African fisheries	Fishery collapse threatens food security	Marine CSA and regional cooperation
Zolnikov (2019)	Global case studies	Local adaptation thrives with autonomy	Decentralized planning builds trust in institutions
Hossain et al. (2020)	Coastal Bangladesh	Drought and salinity reduce rice productivity	Introduce salt-tolerant rice varieties, pond storage
Islam et al. (2014)	SW Bangladesh	River erosion leads to recurring displacement	Support IDP rights and planned relocation
Hoque et al. (2016)	South Asia	Groundwater salinization threatens agriculture	Desalination and rain harvesting
Owusu et al. (2021)	Ghana (3 ecozones)	Climate perception affects CSA choices	Zone-specific CSA programs
Gliessman (2021)	West Africa	Agroecology builds food sovereignty	Promote ecosystem-based adaptation, soil regeneration

METHODOLOGY

This review employs a structured qualitative methodology combining comparative analysis and thematic synthesis of peer-reviewed literature published between 2010 and 2024. The aim is to analyze drought-related climate risks, governance mechanisms, and adaptation strategies in Sub-Saharan Africa and South Asia. Primary research articles were selected for in-depth review from Bangladesh, South Africa, and West Africa. These papers were chosen based on criteria such as empirical relevance, regional diversity, institutional focus, and coverage of climate-agriculture-health intersections. Supplementary literature was selected using targeted keyword searches (e.g., "climate-induced drought," "food security," "adaptation governance," and "internal displacement") in databases, including Scopus, ScienceDirect, and Web of Science. Additional policy reports and meta-analyses were used to triangulate findings (Table 1).

A total of 20 articles were thematically categorized under four domains.

1. Climate impacts on agriculture and food systems
2. Drought-induced displacement and health vulnerability
3. Institutional and policy frameworks for adaptation, and
4. Strategies such as CSA and ecosystem-based approaches. Each entry was reviewed for its methodology, regional focus, findings, and policy relevance.

This process ensures a comprehensive, evidence-based synthesis across sectors and regions, with an emphasis on identifying transferable insights and actionable governance strategies for climate-resilient development.

RESEARCH SIGNIFICANCE

This study addresses a critical gap in existing climate adaptation literature by synthesizing multiscale evidence on drought-related risks and governance strategies across two of the world's most vulnerable regions: Africa and South Asia. Unlike many single-region or single-sector studies, this review adopts a comparative, cross-sectoral lens, analyzing case studies from West Africa, South Africa, and coastal Bangladesh to understand how institutional, socioeconomic, and environmental factors intersect to shape adaptive capacity.

By focusing on four thematic domains – climate impacts on agriculture and food systems, health vulnerabilities of displaced populations, institutional adaptation governance, and scalable resilience strategies – this research aims to generate transferable policy insights. It specifically underscores the importance of linking drought adaptation to long-term food security, public health planning, and inclusive governance, especially for marginalized communities.

Moreover, the review highlights the need for transdisciplinary approaches that bridge technological innovation (e.g., EWS, CSAs, and ecosystem-based adaptation) with social equity and participatory governance. In doing so, it contributes to both academic scholarship and policymaking by identifying leverage points for climate-resilient development.

Given the rising urgency of climate change and its disproportionate impacts on the Global South, this paper offers timely recommendations for governments, donors, and practitioners seeking to operationalize equitable and effective drought adaptation strategies.

POLICY, TECHNIQUES, AND CASE STUDIES

Policy Frameworks and Governance Structures in Drought Risk Management

Policy Evolution in South Asia and Sub-Saharan Africa

In both South Asia and Sub-Saharan Africa, drought-related policy development has evolved alongside growing awareness of climate vulnerability; however, significant regional disparities exist in coherence and implementation. For instance, Bangladesh has formulated national frameworks, such as the Bangladesh Climate Change Strategy and Action Plan (BCCSAP–2009) and the Bangladesh

Climate Change Trust Fund (BCCTF) [1] proactively. These strategies are intended to build long-term resilience through six thematic pillars, including food security, disaster management, and livelihood protection. However, implementation challenges at the local-level persist owing to weak institutional linkages, funding shortages, and a lack of monitoring mechanisms [2, 1].

In contrast, countries in West Africa often lack centralized, standalone climate frameworks. Instead, adaptation is fragmented across sectoral policies, often influenced by donor-driven priorities [3]. While regional bodies such as ECOWAS have acknowledged drought as a threat to agricultural sustainability, harmonized drought-specific policies are still nascent. Most policy actions remain reactive, responding only after crop failures or humanitarian crises occur [4].

Institutional Fragmentation and Capacity Gaps

In South Africa, although water and agricultural policies theoretically integrate climate risk, their operational silos hinder effective drought planning [5]. For example, there is often no direct coordination between provincial disaster management agencies and national climate offices, resulting in redundancy or contradiction in drought responses. Furthermore, the bureaucratic structure delays early warning dissemination and crisis mitigation, pushing vulnerable farming communities into reactive coping mechanisms.

Similarly, in West Africa [3], the absence of intersectoral collaboration between fisheries, agriculture, and water ministries has been noted. This lack of integrated climate governance has led to ineffective allocation of resources during drought episodes, especially in regions heavily dependent on rainfall for subsistence agriculture and fishing.

Migration and Displacement in Climate Policy

The connection between drought and human mobility is often missing in mainstream national adaptation policies. Chowdhury et al. [6] highlighted that IDPs in Bangladesh – driven by riverbank erosion, salinity intrusion, and drought – face systemic exclusion in national resettlement or development schemes. Although migration can serve as a form of adaptation [7], its governance is ad hoc and underfunded. IDPs often settle in informal areas lacking basic services, such as health care, potable water, and cyclone shelters, which further erodes their adaptive capacity [6, 8].

Techniques and Adaptation Strategies

Climate-Smart Agriculture

CSA has emerged as a leading strategy to combat drought-related impacts on agriculture, particularly in West Africa. CSA technologies include drought-tolerant crop varieties, conservation agriculture, agroforestry, alternate wetting and drying for rice, and improved livestock feed systems. These interventions aim to enhance productivity while building resilience and reducing greenhouse gas emissions.

Food and Agriculture Organization (FAO) [9] reports that CSA adoption remains low owing to limited farmer awareness, lack of access to credit, and weak agricultural extension services. For instance, in Ghana and Nigeria, only 25–30% of farmers have reported using drought-resistant seed varieties [10]. The lack of mechanization and over-reliance on rainfed agriculture further undermine drought preparedness.

Participatory and Community-Based Adaptation

In Bangladesh, CBA has been promoted as a bottom-up approach to empower communities in planning and implementing localized adaptation strategies. These practices include homestead gardening, rainwater harvesting, tree planting, and local disaster committees [6, 11]. However, barriers such as patriarchal norms, illiteracy, and social exclusion have limited widespread adoption, particularly among women and the elderly [12, 13].

Integrated stakeholder planning, including NGOs, local governments, and community groups, is critical. Schmidt et al. [14] stressed that participatory approaches foster trust and improve compliance, especially when linked with tangible benefits, such as agricultural subsidies or health services.

Early Warning Systems and Forecast-Based Action

EWS for droughts are less developed than those for floods or cyclones. In South Africa and West Africa, meteorological departments produce seasonal forecasts; however, these are rarely translated into pre-emptive actions because of bureaucratic delays and poor risk communication [5, 15].

For example, while drought monitoring indices are available, district-level officials often lack guidelines or funding to act on warnings. Training programs and mobile-based weather updates have improved community awareness in some areas; however, system-wide integration is still lacking [16, 8].

Agroecological and Nature-Based Approaches

Agroecology is gaining traction as a sustainable adaptation strategy. Practices such as intercropping, mulching, zai pits, and nitrogen-fixing trees help improve soil fertility and moisture retention [3, 17]. These methods mitigate drought impacts and enhance biodiversity and ecosystem resilience.

However, scaling up remains challenging. Traditional knowledge systems are undervalued in policy circles, and extension workers often prioritize high-input commercial models. Incentivizing agroecological transitions through subsidies, certification, and training could accelerate climate-smart shifts [2, 18].

RESULTS AND DISCUSSION

A comparative review of drought-related climate risks in Sub-Saharan Africa and South Asia reveals several cross-cutting findings. First, climate-induced drought has a severe and multidimensional impact on agriculture-dependent societies, particularly in regions reliant on rainfed farming systems. In West and South Africa, crop failure, livestock mortality, and declining fishery productivity threaten food security and rural livelihoods [1, 4]. Similarly, in coastal Bangladesh, drought exacerbates freshwater scarcity and contributes to internal displacement and public health crises among vulnerable populations [19, 20].

Second, while many countries have adopted national adaptation frameworks and climate policies, a critical implementation gap persists. This gap is largely due to institutional fragmentation, limited financial and technical capacity, and poor stakeholder engagement [5, 1]. For example, Bangladesh's BCCSAP provides a sound policy structure; however, it fails to address the needs of IDP and marginalized groups [21, 22]. In West Africa, although CSA strategies are gaining traction, their effectiveness is curtailed by low farmer uptake, limited extension services, and policy incoherence [3, 9].

Third, participatory and ecosystem-based adaptation approaches offer promising alternatives. CBA and agroecological practices have proven effective in enhancing local resilience, particularly when aligned with indigenous knowledge systems [11, 7]. However, these practices often lack institutional support and funding. Training programs, localized extension networks, and decentralized governance structures could improve the scalability of such grassroots strategies [14].

Fourth, EWS for droughts remain underutilized. Although technical capabilities exist in some countries, their integration into actionable decision-making frameworks is weak. Information often fails to reach end-users in a timely and interpretable manner, undermining its potential for proactive planning [14, 23].

Fifth, the review highlights a significant gap in migration governance. Climate-induced displacement, especially slow-onset events such as drought, remains invisible in national policies. IDPs in coastal Bangladesh and displaced livestock farmers in West Africa face institutional neglect, lack of infrastructure, and exposure to health risks [24, 25].

Overall, successful drought adaptation depends not only on technology and policy design but also on governance quality and social inclusivity. Countries with decentralized, participatory, and anticipatory governance frameworks are better positioned to manage drought-related risks. Conversely, reactive, top-down, and siloed approaches delay responses and magnify vulnerability.

The comparative nature of this review allows for the extraction of transferable lessons across geographies. For instance, the integration of CSA and stakeholder planning observed in West Africa can inform local-level resilience strategies in South Asia. Similarly, Bangladesh's emphasis on community-led adaptation offers insights for enhancing participatory governance in African contexts.

To close the gap between policy and practice, governments must integrate cross-sectoral strategies that link agriculture, health, migration, and the environment. Donor agencies and development partners should support adaptive institutional capacity, local innovation systems, and context-sensitive financing. Only then can long-term, scalable resilience to drought and climate extremes be achieved.

CONCLUSION

Drought, as a slow-onset climate hazard, presents a complex challenge that transcends sectors, scales, and governance systems. This review synthesizes evidence from South Asia and Sub-Saharan Africa to highlight how drought-induced stress on agriculture, human health, and food systems is amplified by institutional fragmentation and policy gaps. While CSA, CBA, and agroecological strategies offer promising solutions, their scalability is hindered by low uptake, weak coordination, and financial constraints. Migration and displacement, particularly among the poorest, remain under-addressed in policy frameworks, leaving millions vulnerable. For adaptation to be effective, national governments must move beyond reactive crisis management toward proactive, participatory, and decentralized governance. The integration of EWS, local knowledge, and cross-sectoral planning is critical to build resilient systems that protect livelihoods and ecosystems. This paper emphasizes the need for inclusive, forward-looking drought governance rooted in both technical innovation and social equity.

REFERENCES

1. Carr ER, Fleming SN, Kalala K. The challenges of climate change adaptation in West Africa: Stakeholder engagement and evidence use. World Dev Perspect. 2022;27:100456. doi:10.1016/j.wdp.2022.100456.
2. Irshad K, Almalawi A, Khan AI, Alam MM, Zahir MH, Ali A. An IoT-based thermoelectric air management framework for smart building applications: A case study for tropical climate. Sustainability (Basel). 2020;12(4):1564. doi:10.3390/su12041564.
3. Chowdhury MA, Hasan MK, Hasan MR, Younos TB. Climate change impacts and adaptations on health of internally displaced people (IDP): An exploratory study on coastal areas of Bangladesh. Heliyon. 2020;6:e05018. doi:10.1016/j.heliyon.2020.e05018. PubMed: 33024856.
4. Li X, Zhang F, Wang J, Tong J, Xu T, Zhu K. On-device lead-absorbing tapes for sustainable perovskite solar cells. Nat Sustain. 2021;4:1038–1041. doi:10.1038/s41893-021-00789-1.
5. Seppelt R, Klotz S, Peiter E, Volk M. Agriculture and food security under a changing climate: An underestimated challenge. iScience. 2022;25:105551. doi:10.1016/j.isci.2022.105551. PubMed: 36458255.
6. Abawiera Wongnaa C, Amoah Seyram A, Babu S. A systematic review of climate change impacts, adaptation strategies, and policy development in West Africa. Reg Sustain. 2024;5(2):100137. doi:10.1016/j.regsus.2024.100137.

7. Verner D, et al. Climate variability, drought, and drought management in Côte d'Ivoire. Washington (DC): World Bank; 2018.
8. Zougmoré R, Jalloh A, Nelson MT. Toward climate-smart agriculture in West Africa: A review of climate change impacts, adaptation strategies, and policy developments. Agric Food Secur. 2016;5:16. doi:10.1186/s40066-016-0070-2.
9. Rajamohan N, Rajasimman M. Effect of operating variables on the batch removal of a dye using activated plant biomass. Asian J Water Environ Pollut. 2013;10:59–64. doi:10.3233/AJW-2013-10_2_08.
10. Gliessman S. Agroecology: A transformative pathway to sustainability in Africa. Agroecol Sustain Food Syst. 2021;45(3):271–285. doi:10.1080/21683565.2020.1845925.
11. Alidu A, Issaka R, Danso-Abbeam A. Access to climate information and adoption of climate-smart agriculture in Ghana. Sustainability (Basel). 2022;14(10):5692. doi:10.3390/su14105692.
12. Habibipour R, Tamandegani PR, Farmany A. Monitoring of aflatoxin G1, B1, G2, and B2 occurrence in some samples of walnut. Environ Monit Assess. 2016;188:669. doi:10.1007/s10661-016-5678-4. PubMed: 27848109.
13. Tikariha H, Purohit HJ. Genomic adaptation and metabolic hierarchy: Microbial community response to oxygen stress in community derived from sludge treating refinery wastewater. J Clean Prod. 2021;320:128808. doi:10.1016/j.jclepro.2021.128808.
14. Chen CL. Unfinished business: Taiwan's experience with rights-based coastal fisheries management. Mar Policy. 2012;36:955–962. doi:10.1016/j.marpol.2012.02.009.
15. Cordiner R, Wan K, Hajat S, Macintyre HL. Accounting for adaptation when projecting climate change impacts on health: A review of temperature-related health impacts. Environ Int. 2024;188:108761. doi:10.1016/j.envint.2024.108761. PubMed: 38788417.
16. Yiridomoh G, Owusu R. Gendered impacts of climate change in agriculture: Evidence from Ghana. Clim Change. 2021. doi:10.1007/s10584-021-03128-4.
17. Vousdoukas MI, Clarke J, Ranasinghe R, Reimann L, Khalaf N, Duong TM, et al. African heritage sites threatened as sea-level rise accelerates. Nat Clim Chang. 2022;12:256–262. doi:10.1038/s41558-022-01280-1.
18. Irissou Y, Houngnandan P, Saïdou M. Smallholder farmers' adaptation strategies to climate change in Benin. Weather Clim Extrem. 2020;27:100230. doi:10.1016/j.wace.2020.100230.
19. Guha A, Han J, Cummings C, McLennan DA, Warren JM. Differential ecophysiological responses and resilience to heat wave events in four co-occurring temperate tree species. Environ Res Lett. 2018;13:065008. doi:10.1088/1748-9326/aabcd8.
20. Oliver TH, Morecroft MD. Interactions between climate change and land use change on biodiversity: attribution problems, risks, and opportunities. WIREs Clim Change. 2014;5:317–335. doi:10.1002/wcc.271
21. Luu QH, Nguyen TBT, Nguyen TLA, Do TTT, Dao THT, Padungtod P. Antibiotics use in fish and shrimp farms in Vietnam. Aquac Rep. 2021;20:100711. doi:10.1016/j.aqrep.2021.100711.
22. Economic Community of West African States (ECOWAS). Climate-smart agriculture in West Africa: Regional strategy. Abuja (Nigeria): ECOWAS Commission; 2015.
23. Dhiman R, Prakash SC, Sreenivas V, Puliyel J. Reply to comment on Dhiman R et al. Correlation of non-polio acute flaccid paralysis rate with pulse polio frequency in India. Int J Environ Res Public Health. 2019;16:63. doi:10.3390/ijerph16010063. PubMed: 30591650.
24. Pilotti MAE, Al Ghazo R. Sustainable education starts in the classroom. Sustainability (Basel). 2020;12(22):9573. doi:10.3390/su12229573.
25. Viry G, Rüger H, Skora T. Migration and long-distance commuting histories and their links to career achievement in Germany: A sequence analysis. Sociol Res Online. 2014;19:78–94. doi:10.5153/sro.3263.

