Review Paper

Conceptualization and management of disasters and climate change events in Africa: a review

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Abstract
The concepts of disasters, hazards and climatic events are well established, showing disciplinary-based perspectives. Globally, efforts have been made to come to a common understanding of these concepts; however, there remains a gap in the conceptualizations of these concepts in Africa, the hub of climate change impacts. This paper identified and characterized the understanding, management practices and limitations of disasters/climate change studies in Africa. This study employed a multi-level review process that resulted in the selection of 170 peer-reviewed articles for study. Findings revealed that the majority of the studies were tied to case studies both in the southern region of Africa and the country of South Africa. Findings also revealed that the 'natural disaster' narrative, which excludes the influence of humans in triggering these events, dominated the studies. This was complemented by the dominance of single-hazard narrative and disaster/hazard management measures that promote the prediction and modeling of nature and disasters. Further, it identified limitations in disaster and hazard studies in Africa such as the lack of synthesis of case studies, lack of adaptive planning, lack of state capacities, research-policy gaps among others. It was recommended that research on climate hazards should explore multi-hazards/disasters, demand driven, give more attention to underrepresented disciplines and capture future dynamics in the employed methodologies.

Keywords Disaster · Hazard · Climate change · Flood · Drought · Africa

1 Introduction

With the establishment of the Green Climate Fund and other funding mechanisms for extreme climate events, donors are dedicating billions of dollars into projects aimed at addressing these disasters [18, 27] which are co-produced by climate variability and human actions [16]. The Hyogo and Sendai Frameworks, which are global calls for disaster reduction, emphasized the significance of making disaster risk reduction a national and a local priority and understanding disaster risk, respectively [41]. Disasters, one of the main challenges facing nations of the developing world, do not only cause high mortality and suffering but also impedes the stabilization of local economies and thwart development achievements. According to [17], the economic costs from disasters and climate extreme events have been on the increase, especially in least developed countries where remediation funds are either lacking or limited. This escalating cost of disasters and climate change events reflects the need to encourage disaster risk reduction, which according to [13, 16, 46] lies in the strength of effective disaster management and adaptation planning. Disaster risk management is the application of disaster risk reduction policies and

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strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses [16]. Hence, it is evident that managing disaster risk lies on the strength of disaster management policies that address current and future risks as well as climate dynamics.

Literature that shows that climate is not necessarily a major driver of disasters is long-standing. While [15] challenged the dominant view of 'natural hazards' by emphasizing the social, economic, political and cultural aspects of hazards, [32] were of the view that disaster marks the interface between extreme physical events (in this case, hazards) and a vulnerable human population. To them, being affected by a disaster or hazard is a function of being exposed (vulnerable) to the disaster. Also, [16] in their definition of climatic risks highlighted it to be a combined effect of vulnerability, exposure and hazards (natural and/or anthropogenic), and [5] went further to include coping, adaptation and resilience. Recent studies like [34] also advance this debate. They opined that human vulnerability to climate change was not a result of multiple stressors including climatic and nonclimatic variables. Also, [37] in their assessment of food insecurity in parts of Africa challenged its sole attribution to climate change (that is, drought). They argued that food system failure can be understood from a sufficient consideration of multiple factors and that climate change is only likely to worsen the current vulnerability in agricultural production. It is thus necessary to see whether these speculations are captured in disaster and climate studies in Africa.

Several articles exist in related areas. For instance, [12] examine the state of discontents in the past, present and future of climate change vulnerability research based on a review of 587 peer-reviewed articles which, contrary to this article, focused on the understanding of disaster management and climate extremes both in conceptualization (in research articles) and practice (in policy documents). [6] reviewed the social vulnerability to climate impacts and identified the common approaches, strengths and limitations embedded in climate vulnerability mapping. [31] evaluated the progress of the Sendai Framework in Africa since its adoption in 2015 and highlighted that more decisive actions are needed to achieve the 2030 targets of the framework. [3] analyzed the drivers for coping with flood hazards using case studies from Cameroon and discovered that flood management decisions were greatly influenced by the social and human capitals of affected areas as against priorities of the Sendai Framework. [36] examined the relationship between integrated coastal management and climate change preparedness of developing nations and highlighted the great mismatch between coastal and disaster management and climate adaptation frameworks. One argument arising from the reviewed literature is that climate impacts (including disasters) are more profound in least developed countries, especially Africa, due to financial constraint and limited management capacities. Also, there remains an emphasis on African case studies in allied global studies (for example, [6, 48]) encompassing disaster management and climate change for its high vulnerability to climate change, hence the choice of Africa for the context of this study. While all of these allied studies emphasized the global context of climate change vulnerability, drivers of disaster coping and management mechanisms, relative high vulnerability of Africa to climate change impacts and disaster losses, there remains a need for a systematic and critical evaluation of the understanding and management practices of disaster risk/hazards and climate change events in Africa.

To address this knowledge gap, this paper systematically assessed peer-reviewed articles from African countries on the subject area to achieve these objectives: (a) identify the current understanding of disaster and disaster risk management (including climate events), (b) characterize the current practice in the management of disaster risk and climate change, (c) identify best practices and limitations and (d) suggest recommendations that should guide future research and practice in this area. This paper is organized as follows. The next section highlights the methods employed in this study. This is followed by the presentation of the results of this study. Following the result are the highlights of recommendations and prospects of this study. The last section suggests relevant areas for further research as well as concludes this paper.

2 Materials and methods

This paper is based on a systematic review and critical evaluation of 'disaster risk research' in Africa. Disaster risk research used here refers to the studies that seek to understand and ameliorate hazards, disasters and extreme climate events in Africa. This study employed a multi-stage review process as applied by various authors [4, 6, 12, 46]. This method was applied because it helps to identify empirical evidence that fits the predefined inclusion criteria of research [38]. While this review method has been faulted for requiring access to a wide range of databases and its biased nature in terms of authors' self-proclaimed research design, it has also received credits for its capacity to increase a study's breath, dependence on empirical evidence and its transparent nature and replicability [22]. This study applied the following stages of analysis:

1. Definition of the scope of the study: This review was based on the objectives of this study mentioned above. The thematic scope was limited to the domain

of disaster risk and extreme climate events, especially on the current understanding and management practices of these events. The geographic coverage of this study is the African continent. For the scope of this study, only papers that addressed flood, drought and climate change events (in general) were selected for the study. This is because floods and droughts (also as climate change impacts) are the most occurring disaster events in Africa, ranked immediately after epidemics [9].

2. Documents search and selection for detailed review: The literature search was done using the search terms 'drought,' 'flood,' 'climate change' and 'Africa' on February 15, 2021, on the Web of Knowledge (WOK) to identify relevant peer-reviewed articles. This resulted in 864 publications. The titles and abstracts of these 864 results were then screened to select the final papers for analysis. Conditions for selection were (a) the geographic coverage of Africa, (b) topics addressing drought, flood and climate change and (c) papers addressing management practices for the topics in (b) above. Papers that did not meet these three conditions were excluded, while those that met these conditions were retained for further analysis. This process resulted in 170 relevant articles for detailed analysis.
3. Detailed Analysis of selected articles: In this stage, the full text of the 170 articles was reviewed. Here, details relating to the study objectives were extracted from the selected articles under the following headings: (i) study characteristics (geographic and regional coverage, article type, year of publication, etc.), (ii) disaster risk and climate change understanding (and management practices) and (iii) relevant concerns for future research. These aspects were chosen to give a general overview of the selected articles and specifically to answer the study objectives (a) and (b) stated above. For objective (b), the authors' conceptualization/understanding of disaster and climatic events were assessed from the sampled papers based on three criteria: the authors' climate change understanding (both explicit and implied), methodological approach of the authors and authors understanding of disaster/hazard occurrence. To address the study objective (b), the management practices and policy approaches were extracted based on the best practices that were appraised, suggested or recommended by the authors of the sample papers.
4. Raising relevant concerns and prospects for future research and practice: Here, the gaps in disaster and climate change research/management were identified from the sampled articles and suggestions were made following recommended global practices. The future prospects of disaster and climate change research and policy formulation were also charted here. These aspects were chosen to answer the study objectives (c) and (d) stated above.

3 Results

3.1 Characteristics of the studies

3.1.1 Geographic coverage

The selected papers covered a wide range of geographic regions (Fig. 1). Of the 170 sampled papers, 28 were global in scope (they compared two or more countries across the globe. For example, [6, 48]) and eight were situated in two or more African countries (that cut across different African regions). Of the nonglobal studies, 39% were situated in South Africa, 30% in East Africa, 27% in West Africa and 4% in North Africa. In terms of country coverage, numerous studies (54) were situated in at least two African countries. This was followed by South Africa (22), Ethiopia (12), Kenya and Ghana (11 each), Nigeria (10), Zimbabwe (6), Botswana and Malawi (5 each). Other countries had less than five papers. Figures 1 and 2 show the distribution of the sampled papers by African regions and countries, respectively.

3.1.2 Journals and year coverage

The top publication destinations for the sampled papers were Physics and Chemistry of the Earth (6), Jàmbá—Journal of Disaster Risk Studies (6), Water (5), Climate Change (4), Sustainability (4), Hydrology and Earth System Sciences (3), International Journal of Climate Change Strategies and Management (3) and Natural Hazards (3). Other journals had less than 3 representations. These studies covered a total of 123 journals, with a strong representation of geography, earth and environmental science and natural hazards. In terms of year

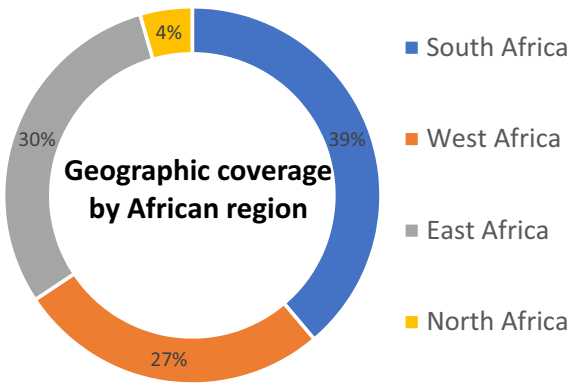


Fig. 1 Geographic coverage of studies by African region

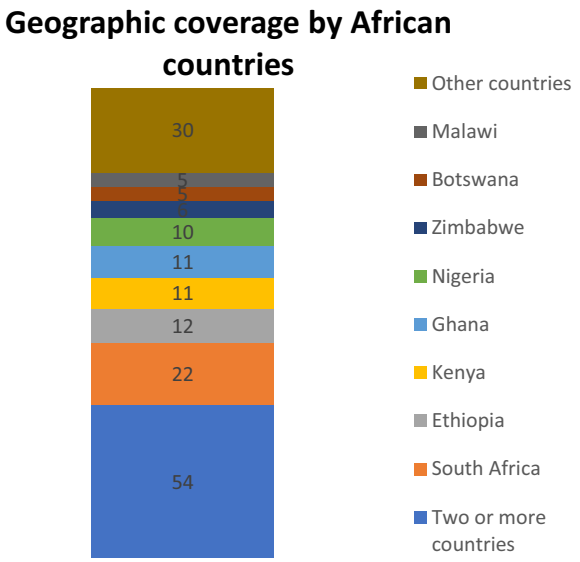


Fig. 2 Geographic coverage of studies by countries

coverage, the top five published years were 2020 (28), 2018 (23), 2019 (22), 2013 (15) and 2016 (13). Figure 3 shows the year coverage for the sampled papers.

3.1.3 Scale of analysis

The sampled papers showed a varied scale of analysis. Most of the sampled papers were focused on local areas (for example, municipalities, districts or communities) (43). The others focused their analysis on Global (11), continental (13), regional (35), national (36) and sub-national (32) scales. Irrespective of the scale of analysis, all studies had a defined boundary (administrative or natural). In terms of paper type, the majority of the studies (161) were tied to a study area (i.e., papers with specific case study), while few (9) were review papers (had no case study). Figure 4 summarizes the studies based on their scale of analysis.

3.1.4 Disciplines

In terms of author disciplines, the sampled papers varied widely. However, the majority were in the disciplines of geography (31), climatology (30), environmental science and management (21), hydrology (20), agricultural science (18), disaster risk management (9), economics (7) and urban planning (5). Authors from other disciplines were less than five. Figure 5 shows the distribution of the studies by disciplines. This show how represented or under-represented some disciplines are in the African context.

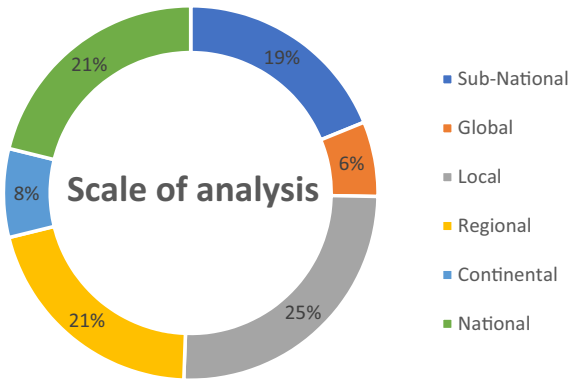
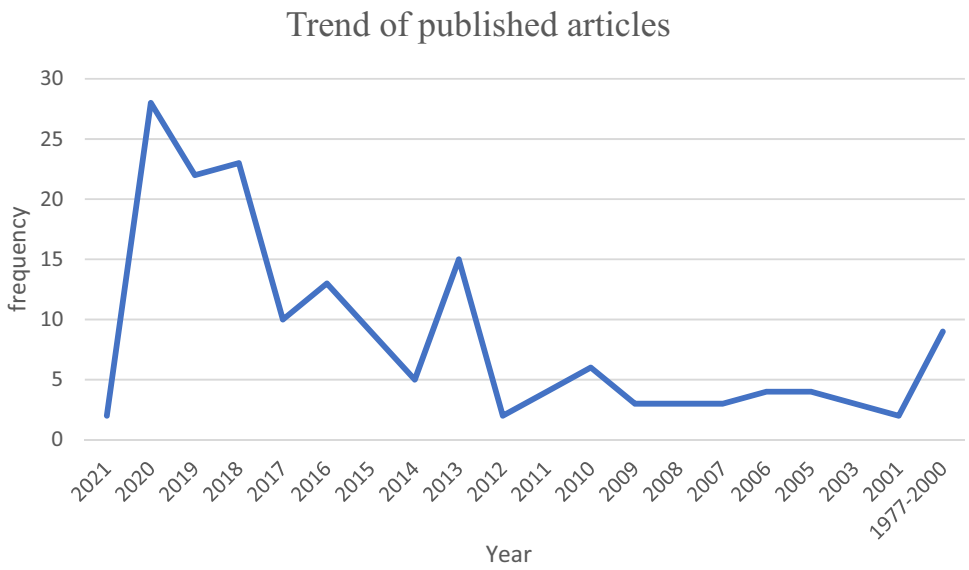


Fig. 4 Studies by scale of analysis

Fig. 3 Summary of studies by publication years



3.2 Disaster and climate change understanding and management practices

In this section, the disaster and climate change understanding of the sampled papers were assessed.

3.2.1 Conceptualization of disasters and climate events

In this section, the authors' conceptualization/understanding of disaster and climatic events was assessed. This was based on three criteria: (a) the authors' climate change understanding (both explicit and implied), (b) methodological approach of the authors and (c) authors understanding of disaster/hazard occurrence. Based on the aforementioned criteria, four distinct perspectives or understanding of disasters and climatic events emerged: (a) *physical* (these authors attributed disasters and/or climatic events to natural processes and/or did not consider human impacts in their analysis of climatic/hazard events), (b) *anthropogenic* (rooted in the social sciences and thinks that human systems/structures cause vulnerability to disasters/climatic events and that assessing of such should be humanly focused), (c) *socio-natural* (attributes hazards/climatic events to both natural processes and human actions) and (d) *other perspectives* (authors that were indifferent or attributed hazards/climatic events to multiple factors).

Of the total sampled papers, 73 (43%) attributed hazards/climatic events to natural processes and/or did not consider human impacts (for example, in assessing climate change in the MENA region, [45] employed physics-based General Circulation Models (GCMs) using atmospheric temperatures and precipitation. Here, no reference to socio-ecological systems was made). Also, 33 papers (20%) exhibited the anthropogenic perspective. For example, [2], in their assessment of climate change, vulnerabilities and risks in the coastal zones of Gambia, employed focus group discussions, stakeholders' consultations and community participatory mapping to detect climate causes and impacts locally. Here, the human-focused approach was emphasized). Furthermore, 60 papers (35%) exhibited the socio-natural perspective. For example, [25] in exploring the connections between flood and drought hazards and food security, recognized the role played by natural processes in triggering floods and droughts. However, they argued from their results that the propensity to be affected by hazards lies in the structural vulnerabilities and unsustainable development paths in places. Only four studies (2%) were indifferent or attributed hazards/climate events to multiple factors. Figure 6 shows the sampled studies conceptualized disasters and climate change.

3.2.2 Management practices and policy approaches to disasters and climate change events

Here, the characterization of management practices and policy approaches was based on the best practices that were appraised, suggested or recommended by the sample papers. Based on the aforementioned, six management practices were identified, namely: (a) technocratic (measures that anchored on modeling and prediction of climatic/hazard events), (b) structural/physical (measures that anchored on using engineering structures to buffer hazards/climatic events), (c) ecosystem-based (measures that focuses on the sustainable management and conservation of ecosystems to reduce and mitigate disaster risk and climatic events), (d) social (practices that suggest changes in people's lifestyle, for example, livelihood and social network changes), (e) institutional (measures that involve changing existing policies, laws, including measures that governmental interventions) and (f) others (a combination of two or more of the aforementioned measures).

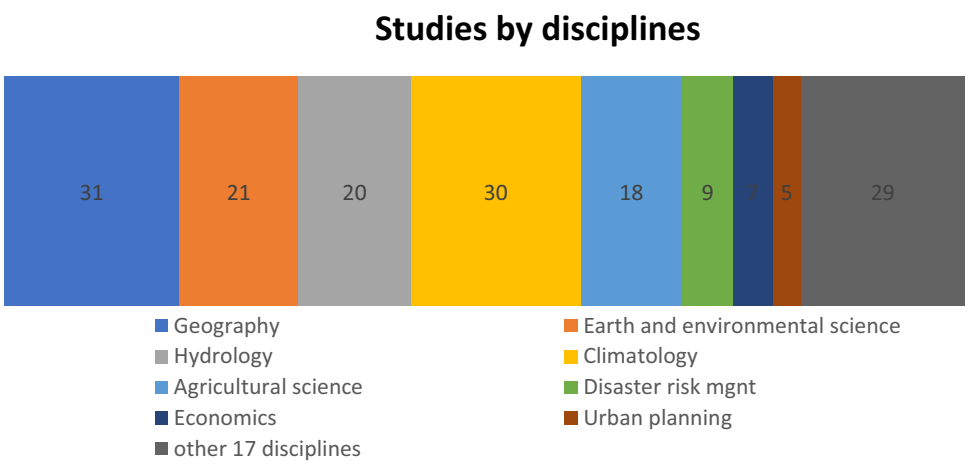


Fig. 5 Studies by disciplines

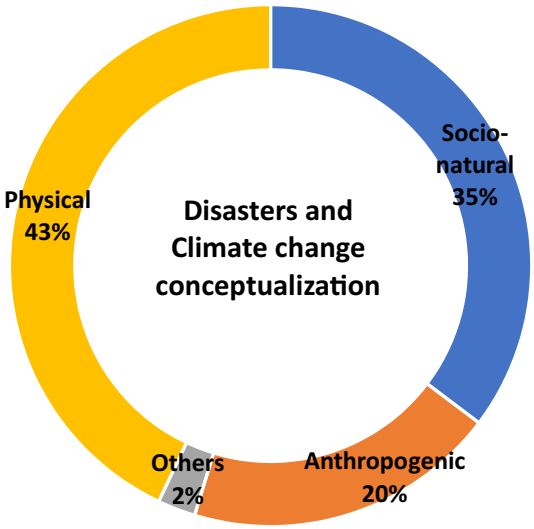


Fig. 6 Studies conceptualization of disasters and climate change

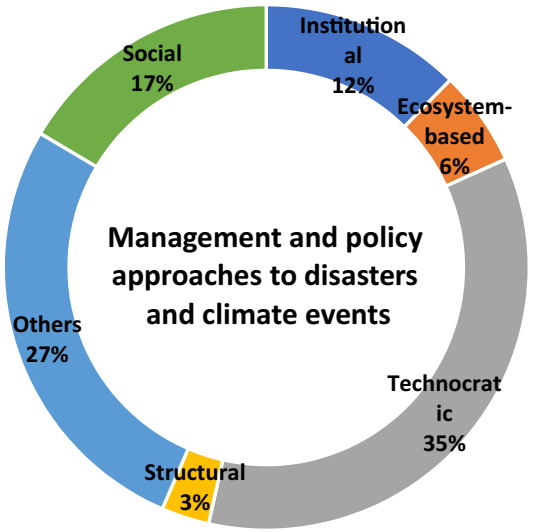


Fig. 7 Studies recommendations of best practices for managing disasters and climate change events

Of the total sample, 60 papers (35%) exhibited/suggested technocratic measures. For instance, in exploring the nexus between climate change and famine, [42] suggested that increased African capacity for rainfall observation, forecasting and modeling application would increase the coping capacity of African communities to famine. In the same connection, 10 studies (6%) recommended ecosystem-based approaches to mitigating hazards/climatic events. For example, [24] highlighted various ecosystem options and their respective services in strengthening climate resilience in Sub-Saharan Africa. Also, 28 studies (17%) suggested social measures to mitigate hazard and climate events. [30], who advocated for human capacity building and livelihood diversification as the best method to enhance community adaptation to droughts and floods in Kenya, is an example to note. A total of 21 papers (12%) recommended institutional measures. For instance, [10] advocated that the government actively embraces longer-term cross-sectoral planning to foster climate change adaptation and adaptation planning in southern Africa. Furthermore, 46 studies (27%) put forward other (multiple) measures. [51], who recommended sustainable land-use systems, proper utilization of rivers and flood forecasting for managing flood in the lower Baro–Akobo River basin, is an example of such as it encompasses technocratic and social approaches. Only five papers (3%) gave structural recommendations. An example to note is [21], who thought that the establishment of service infrastructures was necessary for flood disaster risk reduction in Khartoum. Figure 7 summarizes the studies best practices for managing disasters and climate events.

3.3 Relevant concerns

3.3.1 Lack of synthesis of various case study

Case studies of different scenarios lack synthesis. The majority of the case studies treated the designated study areas as disconnected from other case studies. Also, a comparison between different case study scenarios is lacking. It is important that different case studies/scenarios are aggregated for common concerns and hazard triggers. This is especially relevant for areas with similar geographic characteristics. It is noteworthy that regions differ in terms of meteorological, climatological, hydrological aspects; hence, case studies may be disconnected. However, in such a case, reliable methodologies that can be replicated elsewhere should be applied. Also, the majority of the sampled studies did not engage with stakeholders and policymakers in framing their research questions or in the assessment of hazards and/or climatic events. This is an issue of concern because incorporating stakeholders is important in addressing the science-policy gaps in research. Most of the studies claimed to be policy-relevant and emphasized the importance of their study; however, only a few gave specific policy recommendations. It is necessary to address this concern because the success of adaptation options is also strongly tied to the active involvement of relevant stakeholders [46].

3.3.2 Vulnerability, resilience, adaptation and transformation not adequately captured

The key risk/disaster concepts of vulnerability, resilience, adaptation and transformation were not adequately captured. This might be because a majority of the studies had a physical perspective of hazards. The majority of studies that explored flood and drought risks (for example, [20, 23, 35] focused on the hazard component and did not captured the two other components of risk as specified by [16]: vulnerability and exposure). Few studies mentioned these concepts but did not show how they relate and interact. The vulnerability understanding of root causes [5] was not evident in the papers. The socio-ecological conceptualization of hazard by [11, 40] was not adequately captured by the sampled studies. It is worthy of note that resilience goes beyond providing engineering or ecosystem-based solutions, but also include adaptability and transformability [44]. It is also worthy of note that transformation is adaptation outcomes that change a system's attribute [16]. The limits to adaptation or possibility of maladaptation [16] were not captured in the sampled studies.

3.3.3 Adaptive planning not incorporated into policy recommendations

The majority of the sampled papers did not incorporate flexibility in their policy recommendations in light of future climate dynamics. The recommendations were captured in a static manner though climate and hazard events were static. Thus, flexibility must be incorporated in decision making with regard to hazard and climate events mitigation to account for uncertainties of climate change. Adaptive planning is series of measures that incorporates flexibility and accounts for future dynamics in decision making, and this is often done through active stakeholder involvement [49]. This according to [46, 49] would help to avoid lock-in situations and maladaptive consequences.

3.3.4 Authors specific concerns

Here, relevant concerns specified by the sampled papers as hampering hazard mitigation or research are highlighted. Some of the issues hampering hazard/climate change adaptation, mitigation and research in Africa include the lack of state capacity [26, 43], gaps between research and policy implementations [33], lack of technical capacities for modeling and prediction [39, 42], limited investment on research and innovation [2, 8], lack of longer-term adaptation policies [10], limited research into the potential of ecosystem services in buffering hazards [24], limited collaboration between disciplines [25], the unpredictability of weather and unreliability of climate projections [19, 29], the low human capacity to undertake climate change planning and lack of climate and hazard insurance [28] among other issues.

4 Discussion

This paper has explored the understanding and management practices of disasters and climate change events in Africa. Key findings revealed the dominance of the natural hazard narrative (for example, [45]), which was complemented by the management practices (such as [1, 39, 42]) anchored on modeling hazards. This may probably be a result of the dominance of physical scientists in the sampled articles, and this thinking is synonymous with that of [15]. Major disciplines evident in the sampled papers are geography, climatology, environmental sciences, hydrology, agricultural sciences, while ecological sciences, food security, social work, ecotourism aspects remain under-represented.

Following from the results in this paper is the dominance of a single-hazard lens perspective to disasters and climate change events. For instance, [14] focused on drought and [26] focused on flood and did not consider related climatic risks. While this perspective is somewhat relevant in generating detailed and intersectional studies, it is noteworthy that these so-called single-hazard lens is not ideal in the real world. Recent trends of disaster/hazard occurrence have shown that different hazards occur simultaneously, thereby generating multiple risks/disasters. In such cases, a single-hazard lens would not be adequate in addressing these multi-hazards [16]. The dominance of the single-hazard narrative might be due to the lack of capacities to conduct multi-hazard assessments as revealed in this study (for example, [39, 42]). Apart from the fact that multi-hazard assessments help to address disasters and climate change events more holistically, they are very useful in exploring possible cascading impacts that may be generated from the interaction of multi-hazards, and this would help inform future hazards adaptation and reduction.

In the same line of thought, a disaster/risk assessment cannot be complete if it does not consider all the relevant components of risks [16]. Hence, resulting aspects of climate change events/hazards, vulnerability of people and societies, exposure of people and infrastructures, robustness of systems/societies are very relevant in such assessments [5]. As revealed from the sampled papers, the hazard component is already well represented. However, other components are still either under-represented or not well communicated. Recent development in the field of hazard and disaster assessment has incorporated the ideas of livelihood assets and hazard vulnerability [7], root

causes of vulnerability embedded in the political system [49], risk governance [40], socio-ecological systems [40], adaptation pathways [49], resilience thinking [11]. Of important interest here is the high negligence of a system's robustness to hazards/disasters. This is very critical because a system's robustness is an important determinant of how well a society or other affected element would cope and/or recover from hazards/disasters. Robustness of a system here refers to the coping capacities or elements in a system that would enable it to withstand, cope with or easily recover from hazards/disasters [49]. The exclusion of this critical aspect as evident in the sampled studies is therefore a redundancy to disaster studies in Africa.

A deeper reflection on the reviewed articles points to the resolution: disaster and climate change studies in Africa are more arbitrary and author defined than demand/problem based. A possible reason for this might be the lack of research funds as evident from the sampled papers. Irrespective of the reasons, it is pertinent to acknowledge that demand-based researches yield better and problem-solving policy outcomes than arbitrary ones.

A major limitation of this study is the selection of only articles written in English language and the negligence of the French and Portuguese ones. Another limitation is the lack of comparison of the perspectives from scientific articles and policy documents (for example, national disaster and climate change strategic documents) of countries to see how the understanding and practice of disaster management vary. Stakeholder's interview was also not incorporated in this study as it is entirely review-based and this is thus a limitation.

5 Recommendations and future prospects

Based on the analysis of the sampled papers and the concerns discussed above, the following recommendations are made:

(a) Research on climatic hazards such as drought and floods, although interdisciplinary, shows more representation of geography, climatology, environmental sciences, hydrology and agricultural science. For a more interdisciplinary approach, less-represented disciplines like environmental governance, ecological science, food security, psychology, ecotourism, social work should be more represented. Case studies, although, may differ in climatology, meteorology, population, should not be treated as disconnected from each other but as part of the larger earth. This may be done by employing reliable methodologies that can easily be replicated. Also, future studies in this area should not be undertaken from the perspective of a single-stand-alone lens. Rather, they should be done by building-on and complementing existing studies. Here, mixed research methodology (incorporating quantitative and qualitative approaches) should be embraced. It is important that future research on climatic/hazard events in Africa incorporates key stakeholders and policymakers (for example, government agencies, ministries, local communities) in all the research steps. This would not only help to bridge the science-policy gaps but also, in formulating policy-relevant measures.

(b) Hazard/climate events assessments should be done in line with recent trends. This calls for a shift from the single-hazard/disaster narrative (as evident from the sampled papers) to the multi-risks/hazard assessments. This would mean considering all relevant aspects of hazards including socio-ecological systems [11, 40], vulnerability and exposure components [16], adaptation [16] and resilience outcomes [44]. Taking these aspects into consideration would promote a more nuanced approach to hazard assessments, and this would foster the generation of policy-relevant mitigative measures.

(c) Climate dynamics and uncertainties should be captured in future research. Because future climate is uncertain, hazards assessments should incorporate these dynamics, especially in the methodologies employed. As evident from the sampled articles, the majority of the papers did not incorporate this uncertainty in their assessments. Hence, adaptive planning becomes very crucial in addressing this gap. The potential of adaptive planning to switch between alternative depending on future situations makes it indispensable in adaptation planning [47]. Adaptive planning is series of measures that incorporates flexibility and accounts for future dynamics in decision making, and this is often done through active stakeholder involvement [46, 49].

(d) The broad issues hampering climate and hazards mitigation and research in African countries should be holistically addressed. A first step to addressing this would be the establishment of a common African funding body that would fund research on disasters and climate change studies based on predefined interests. This would encourage and promote demand-driven research as against the arbitrary ones as evident in this paper. Government agencies responsible for formulating disaster-related policies should collaborate with hazard/disaster researchers through project-based researches to address science-policy gaps. Ecosystem-based adaptation to disasters/hazards should be increasingly encouraged

in African countries. Also, there is a need for African countries to embraced climate insurance.

6 Conclusion

Hazard and disaster assessment is a growing field and more importantly likely to be given more importance given the projected increases in hazard events [16, 50]. In line with the above, this paper assessed the conceptualization and management of disaster in Africa. Results revealed that the majority of the studies had the 'natural disaster' narrative, neglecting human impacts. Results also showed that the majority of the studies anchored technocratic solutions: measures that intend to predict and control nature. Relevant concerns identified from the sampled papers include: the lack of synthesis of case studies, vulnerability and socio-ecological system ignored, the nonincorporation of adaptive planning and management, research-policy gaps, lack of state capacity and the like. It is pertinent that the issues raised by authors in the study area are adequately addressed to improve the state of art of hazard and disaster assessment. The focus of this study on articles published only in the English language is a major limitation. Hence, future studies in this area should explore articles published in French and Portuguese. Future research in this area should also explore the nexus between climate events and health implications which was lacking in the reviewed articles. Also, researchers in this area should collaborate with policymakers to develop reliable methodologies for assessing multi-hazards and disasters. It is, however, important that these methodologies incorporate the flexibility to accommodate local circumstances.

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Declarations

Conflict of interest The authors declare that they have no competing interests.

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