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ORIGINAL ARTICLE

Exploring the complications of climate change funding in Sub-Saharan African countries

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Abstract
Globally, climate change funding has become a focal point and debate among international organisations, private agencies, governments, and civil societies mainly because of its significant threats to social, economic, and the environment and the significant funds needed to adapt and mitigate its impacts. While substantial amounts of funds have been secured and distributed to governments, private organisations and institutions in the continent to mitigate and cope with the threats of climate variabilities, the outcomes have failed to meet the desired outcomes due to limited access to funding, lack of transparency in allocations and the failure of the funds to reach local communities where the impacts are significantly felt. Using a conventional approach of data collection tools predominantly of quantitative and qualitative methods and extensive literature materials, this paper explored the complexities and constraints of sourcing climate change funding and the mechanisms of distribution funds across the continent. The findings unearthed that climate funding lacks transparency and equitable distribution; furthermore, there are substantial bureaucratic processes, capacity constraints and immense conflicting priorities among countries on the continent. Our findings uncovered that addressing these anomalies will require innovative funding structures that catalyse technical assistance programmes to support the creation of new avenues for climate finance as well as reforming global financial institutions, emphasising debt reductions, freeing up additional funding for climate change mitigation and adaptation, and channelling private finance to both climate and sustainable development, particularly in the more vulnerable countries.

Keywords Climate change · Risk assessment · Livelihoods · Global threats · Sustainability · Green energy

1 Introduction

Climate funding is often described as resources and instruments to support and promote climate change activities (Abbass et al. 2022). Similarly, Ngwenya et al. (2020) described climate change funding as local, national or transnational soliciting funds from public, private and alternative sources to support mitigation and adaptation actions that address

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climate change. Sub-Saharan Africa is the most vulnerable continent to climate change implications under all climate scenarios above 1.5 degrees Celsius (ADB 2022a). Despite having contributed the least to global warming and having the lowest emissions, the continent faces exponential increases in damages, posing systemic risks to its economies, infrastructure investments, water and food systems, public health, agriculture and livelihoods, threatening to undo its modest development gains and slip into higher levels of extreme poverty (Mavume et al. 2021; GCA 2022). Over the years, the continent has received a significant amount of climate change funding through different channels, including multinational agencies such as the Green Climate Fund (GCF), Global Environmental Facility (GEF), bilateral aid from the developed countries, private investments in the form of climate-resilient projects, participated in carbon markets from development banks such as African Development Bank, World Banks and International Monetary Fund to address the challenges of climate change (Belianska et al. 2022).

Similarly, other scholars and commentators, including Ijjasz-Vasqueuze et al. (2023), Wright et al. (2024) and Villaba et al. (2024), expressed that over the past three decades, Africa's share of global climate finance and funding has increased marginally from 23% between 2010 and 2015 to 26% between 2016 and 2019, representing a 3% increase. Convertibly, this denotes that the continent received approximately $73 billion in climate-related development finance between 2016 and 2019, an annual average of about $18 billion from divert sources. ADB (2018) report revealed that the Multilateral Development Financial Institutions (DFIs) and climate funds are the largest sources of public climate funding on the continent with 49%; this is followed by bilateral development partners including bilateral DFIs 22%, international governments 16% and climate funds 4%. The private sector, largely corporates and commercial financial institutions, also contributes 46% to mitigation and adaptation activities and 2% towards projects with dual benefits. Additionally, 50% of African private finance is generated from domestic sources, followed by international (39%) and unknown sources (11%). According to the World Bank (WB 2019) report, corporations and commercial and domestic financial institutions contribute a large share of climate funding to the continent. Many of these come in the form of institutional investors such as private equity, venture capital and infrastructure funding. Figure 2 summarises the funding sources for Africa.

While acknowledging these funding instruments and funding flow into the continent over the past three decades has increase nonetheless, global funding of climate change programmes in most countries on the continent is characterised as either insufficient, inefficient, or unfair (Midgler 2023). Mohieldin et al. (2023) expressed that strained national budgets, unsustainable debt levels entwined with uncooperative policy frameworks, lack of trust and accountability, unpredictable regulations and policies, and insufficient private sector investments hinder climate funding in almost all countries on the continent. Disappointingly, the most vulnerable such as the Central Africa Republic, Sudan, Somalia, Zimbabwe and Mozambique, faces significant shortfall of climate change funding (Azour et al. 2023). Similarly, Prasad et al. (2022) stated that poor governance manifesting in feeble regulatory frameworks, corruption and complex administrative processes, perceived and real foreign currency risks, complexities of international climate funding mechanisms and lack of data and information cumulatively increases the risk for potential climate funding on the continent. Numerous researchers and commentators, including Overland et al. (2021), Sibiya et al. (2023) and Savvidou et al. (2021), are of the view that Africa, as a continent with 54 nations that are particularly vulnerable to climate change receive far less share of climate funding. Maino et al. (2022) concurred that the current climate finance flows to Africa are woefully insufficient compared to what is needed to adapt to climate change.

These authors argue that between 2016 and 2020, Africa received only $19.5 billion in climate funding, although annual adaptation costs needed for the continent are estimated to be $30–50 billion by 2030. Lederer (2020) posited that the continent needs US$250 billion annually in conditional and unconditional financing between 2020 and 2030 to implement its nationally determined contributions (NDCs) under the Paris Climate Agreement. Weikmans (2023) further disclosed that at COP15 in Copenhagen in 2009, industrialised countries committed to collectively contributing $100 billion annually until 2020 to support developing countries in their climate change needs. Meanwhile, Feyen et al. (2020) stated that the projected increases in adaptation costs alone in Africa will reach $140 billion to US$300 billion by 2030. Ironically, the support and pledges for climate finance by the world's wealthiest economies and multilateral institutions were less than $100 billion, and even that has failed to materialise. Atteridge and Remling (2017) opined that in 2020, only $83 billion of the commitments were met, while an average of $75 billion was promised between 2016 and 2019, but $20 billion (27%) of this amount was actually received between 2016 and 2019 (van der Berg et al. 2019).

Similar arguments were expressed by Coulibaly et al. (2023) that there is a growing imbalance between Africa and the rest of the world regarding private sector investments in climate technological innovation, research and development. These authors expressed that tracking climate tech investments, Africa's share of global investments in the climate technology and innovation sector stands at just 0.2%. In contrast, the share of the US, China, and Europe stands over 93% of such investments for climate mitigation and adaptation solutions, with the US and Canada alone accounting for nearly 50% (approximately US$29 billion of VC investment) (Coulibaly et al. 2023). In light of these complications, this paper analyses the current funding frameworks for climate change on the continent and assesses the structural and institutional complications hindering the effective utilization and distribution of climate change funds and proposes recommendations to strengthen institutional capacities, enhance transparency, and foster regional cooperation to improve the efficiency and effectiveness of climate finance distribution in Africa.

2 Material and methodology

This paper comprehensively examined the multifaceted constraints hampering climate change funding in Africa. Through a methodical approach, this section outlines the strategies and framework applied to identify, analyse and interpret the complex challenges confronting the continent in accessing sufficient funding for climate-related initiatives using extensive field surveys and literature materials.

2.1 Research design

This paper utilised a concurrent and participatory mixed method approach of a quantitative and qualitative approach to obtain relevant data to exploit the complexities of securing funding from donor institutions into the continent. According to Thornton et al. (2018), a mixed-method approach integrates the accuracy and reliability of quantitative and qualitative data to exploit insights into a phenomenon. Furthermore, the approach is more appropriate to gain insights into phenomena than the conventional quantitative end-use method or stand-alone qualitative methodology. The integration of quantitative and qualitative methods provided the study with accurate data to investigate the evolution of climate

funding and investment on the continent, the public and private funding sources, the opportunities and challenges of sourcing funding and alternative strategies to improve climate change funding and investments on the continent. The integration approach also provided a multi-faceted understanding of the complexities surrounding climate change funding on the continent. This comprehensive approach assisted in identifying not only the measureable outcomes and impacts but also the underlying human and contextual factors influencing the success and challenges of funding initiatives. Additionally, the study extensively employed existing data from journals, academic book chapters, articles, and government publications to obtain information on the continent's climate change funding policies and regulations conducted between January and December 2023. The questionnaires, in the form of online emails, websites, online communities, and social media platforms, were used to obtain demographic information and to measure the levels of satisfaction and effectiveness of the current model of climate funding on the continent. The designed questions were meticulously carefully loaded and distributed into links to the intended audience. Telephonic interviews were conducted with carefully selected twenty respondents, mainly from funding institutions, policymakers, and academic and research institutions. The questions centred on the factors restricting the flow of climate funding on the continent and alternative strategies for enhancing funding and financing opportunities for climate change initiatives in Africa.

2.2 Sampling technique and sample population

This paper employed a purposive and simple random sampling technique to select a total of 600 respondents, mainly for online interviews and questionnaire surveys. Webb and Wang (2013) define purposive sampling as a technique in which units are intentionally selected from the population based on their expertise, qualifications, experience and job specifications. Considering the complexities associated with sourcing climate change funding in Africa, well-versed of 20 respondents were purposively selected to obtain in-depth knowledge and information in sourcing funding to the continent. Specifically, three directors were picked from the United Nations Environmental Programmes (UNEP), three managers from the African Development Bank (ADB), two directors from the Department of Environment, Forestry and Fisheries in Pretoria and two directors from South African Presidential Climate Commission. Others include five interviewees from academic and research institutions from Ghana and Nigeria as well as five representatives from multilateral and bilateral donors of climate change activities in Kenya, Ethiopia and Tanzania. Questions for this group of respondents centred around the complications to funding, funding criteria and requirements, capacity and infrastructure, success stories and best practices, stakeholder coordination, financial mechanisms and innovations, impact assessment and reporting, political and economic context, the balance between adaptation and mitigation funding and recommendations for improvement.

In relation to quantitative data, simple random online sampling techniques were used to solicit responses from 600 respondents from different countries on the continent. The choice of these respondents was informed due to the complication of sourcing climate funding on the continent; hence, soliciting views from diverse and relevant individuals and experts is critical to gaining in-depth insight and understanding of the funding activities on the continent. The selection criterial include 120 government officials (10% national levels from environmental and finance ministries, and 10% local level from regional and municipal representatives), 60 representatives from international organisations including

UN agencies, World Bank and AFDB, 120 from non-governmental organisations and civil society group (15% international NGOs focused on climate change sustainability) 90 private sector representatives (10% corporate sustainability managers and 5% impact investors) 60 from academic and research institutions (7% universities and research centres specialising in climate and environmental studies, and 3% think tanks focusing on climate policy) 60 respondents from multilateral and bilateral donors (7% development agencies with climate funding initiatives, and 3% international climate funding including GCF and GEF), 60 community leaders and indigenous groups (5% traditional leaders providing local insights and 5% indigenous representatives with unique practices and 30 from regional bodies (officials and representatives from African Union and Regional Economic Communities involved in climate policy). The summary breakdown is depicted as follows: Government officials (120); International organisations (60); NGOs and Civil Society (120); Private sector representatives (90); Academic and research institutions (60); Multilateral and Bilateral donors (60); Community and indigenous groups (60) and Regional bodies (30). This comprehensive and balanced approach ensures a thorough understanding of Africa's challenges and opportunities in sourcing climate change funding. Prior to ethical guidelines, they were rigorously adhered to throughout the data collection processes. Respondents' confidentiality was strictly maintained, informed consent was obtained from participants, and the research was conducted with full transparency and integrity. Our methodology was designed to respect the rights and dignity of all respondents, ensuring that their participation was voluntary and that they were fully informed about the purposes and use of the research outcomes.

2.3 Data analysis

Data obtained from the field survey was analysed simultaneously. For the purpose of this study, the Statistical Package for the Social Sciences (SPSS) version 22 software was utilised to analyse the questionnaire outcomes. The software enabled the data to be grouped into frequency tables, graphs and diagrams for easy and quick interpretation and comprehension. Thematic analysis was used to analyse the data obtained from the interviews. Kiger et al. (2020) defined thematic analysis as an approach for qualitative data analysis that involves probing across a data set to identify, analyse and report repeated patterns using an inductive approach. The thematic analysis for this study assisted the researchers in categorising respondents' views into themes of similarities and discourses to build arguments of constraints and strategies for improving climate change funding. The data obtained from the secondary sources were analysed using critical discourse analysis and a comparative analysis approach; these methods assisted data in being interrogated on "what, why and how" issues related to climate change governance at the local government level.

3 Empirical evidence

The data obtained were grouped and analysed under the three main objectives set up for the study, which include evaluating the levels of effectiveness of the current funding models, the restriction factors to funding and financing to funding climate change initiatives and alternative strategies to improve funding flow to the continent.

3.1 Demographic background of respondents

In order to appreciate the content of this paper, it's imperative to analyse the demographic profile of the study population, particularly those that are likely to be directly involved in the climate administration and governance on the continent. Therefore, this study ascertained the demographic profile of the 600 respondents engaged in the survey. The results are presented in the next section.

Table 1 depicts that 63% of the respondents were in their middle ages, ranging from 40 to 59 years of age. More than half, 55%, of the respondents were males compared to 45% females. Regarding educational levels, almost all the respondents engaged have a formal educational background, with more than 60% having bachelor's degrees and beyond. However, only 41% of the population had studied climate change as either a module or specialised in climate change activities.

3.2 Barriers and challenges to climate change funding in Africa

This study explored the interwoven and multifaceted restrictions to climate change funding initiatives on the continent. Figure 1 reflects the perspectives of respondents.

The findings underscore that the majority, 100 (17%) out of a total of 600 respondents, agreed that the lack of or limited access to finance is the significant hindrance to the funding of climate change activities on the continent. This was immediately followed by a lack of capacity and infrastructure by 98 respondents; 80 respondents mentioned political and socioeconomic instability as one of the barriers to funding activities. The high burden of debts, limited private sector engagements, inadequate data and information, and limited knowledge and climate risk assessments are other constraints mentioned by respondents. Online interviews with some key stakeholders in the field validated these statistical breakdowns. A Director at the African Development Bank in Kenya said this:

> "Limited access to capital markets, financial institutions, and investment resources have significantly hindered funding of climate-related activities on the continent. This interviewee further stated that, for instance, in 2019-2021, the entire continent received $11.4 billion on average in funding adaptation of initiatives, while the funding increased to a double-digit between 2021-2022, the funding was a shortfall of $52.7 billion or 2.5% of the continent's GDP. Furthermore, the majority of this funding was channelled through loans, making the debt situation on the continent onerous."

Another Director in the United Nations Environmental Programme country based in Ghana, along with other institutions and experts, stated this:

> "the unyielding constraints facing climate change funding on the continent are intricately linked to the region's insufficient infrastructure and capacity restrictions. The lack of adequate infrastructure, which includes energy, transportation, and water systems, together with capacity limitations within institutions and communities, hinders the implementation and sustainability of climate change projects. These deficits not only hamper the effective execution of climate change adaptation and mitigation strategies but also adversely impact the ability to attract essential funding flow on the continent."

Table 1 The demographic background of respondents. **Source:** Field survey by Research team

Gender	Male Respondents						Female Respondents				TOTAL	PER.%
	330	55%					270	45%			600	100%
Age of Respondents	20–29		30–39		40–49		50–59		60+			
	52	09%	77	13%	146	24%	235	39%	90	15%	600	100%
Experience of Respondents	0–5 yrs		6–10 yrs		11–15 yrs		16–20 yrs		20+ yrs			
	65	11%	75	13%	107	18%	220	37%	113	19%	600	100%
Qualifications of Respondents	Matric/GCE		Diploma		Bachelor		Honours		Master/PhD			
	10	2%	15	3%	150	25%	345	57%	60	10%	600	100%
Qualification in climate studies	No studies		Part of study		A module		Studies as course		Specialised			
	-	0.0%	77	13%	155	25%	202	34%	166	28%	600	100%

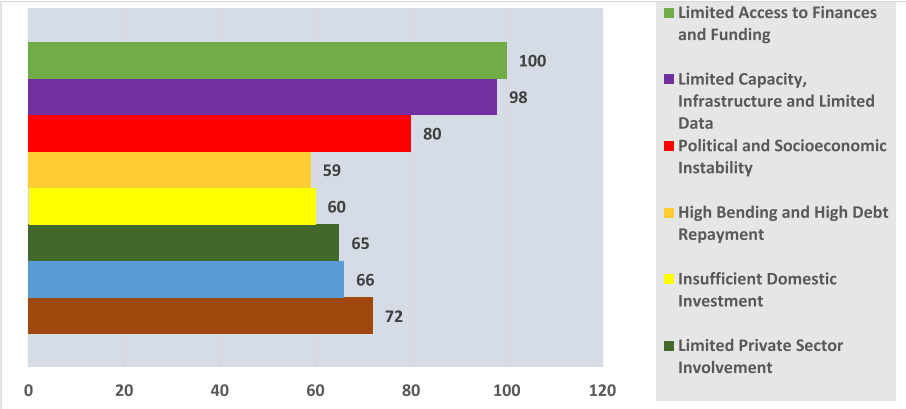

Fig. 1 Restrictions of climate change funding in Africa. **Source:** Field surveys by the Research team

Standard views emanating from some interviewees suggest that the non-fulfilment of pledges and commitments by donors and global institutions for funding climate change activities on the continent further undermines the ability of countries to address climate challenges effectively, obstructs progress towards sustainability, and heightens the vulnerability of communities already facing the severe impacts of climate change.

3.3 Alternative strategies to enhance climate change funding in Africa

Considering the enormous challenges in funding climate change activities on the continent, this paper appraised these challenges. Respondents were tasked to enumerate some of the challenges. The answers obtained are displayed in Fig. 2.

The results show that of the 600 responses obtained 87, translating to 15%, were of the view that promotion of global green climate change funds and aids on the continent will boast funding on the continent; this was followed by 85 or 14%, suggesting the continent should

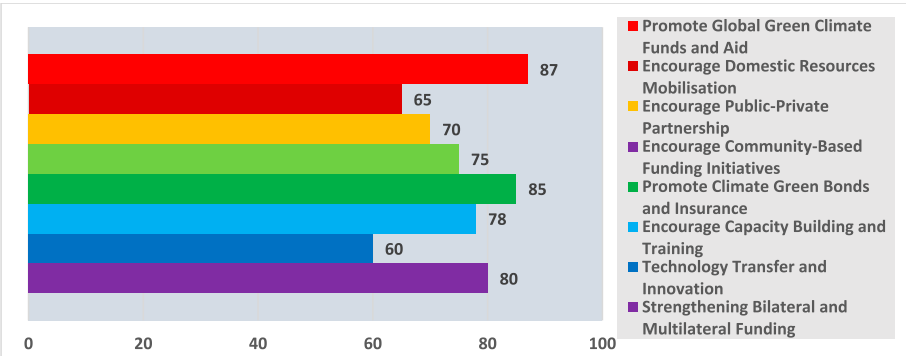

Fig. 2 Alternative strategies to improve climate change funding in Africa. **Source:** Field surveys by the Research team

encourage global green climate change and insurance funds. Furthermore, 80 respondents mentioned that the continent should strengthen current bilateral and multilateral programmes in funding climate change activities. Our online interviews with prominent stakeholders buttressed the statistical information. A Director and climate change expert at the African Development Bank representing Southern Africa disclosed this:

> "Converting or writing off climate change loans to grants and aid on the continent will boost funding for climate change initiatives, reduce the financial burden and encourage greater participation in sustainable projects. The interviewee further stressed that grants and aid are more flexible and do not impose payment obligations, making it easier for the continent to invest in long-term climate solutions without diverting resources for essential services; moreover, this shift will boast and foster international collaboration, as grants and aid will promote a sense of shared responsibility and commitment to address the global of the challenge of climate change."

Another interviewee from UNEP in Ethiopia representing East African countries shared this in our discussion:

> "To boost funding for climate change activities, the continent should promote green bonds and global green climate support funding initiatives. This interviewee posited further that such funding platforms will offer the continent the necessary resources to invest in renewable energy projects, enhance climate resilience and transition to low-carbon economies. Similarly, these funding opportunities will foster international collaboration and promote partnerships between African governments, international financial institutions, and private institutions".

A similar sentiment was shared by another Director from UNEP representative based in Mozambique, who stated this:

> "It is critically important to fortify public-private funding for climate change initiatives on the continent. The interviewee further stressed that collaboration between the government and private sector is imperative to mobilise resources efficiently to address funding gaps and execute sustainable solutions for climate resilience in Africa. Similarly, there should be pragmatic and innovative funding models to secure sufficient funding to drive impactful projects and long-term sustainability on the continent."

A common view from other experts interviewed suggests the significance of an integrated funding approach in addressing climate change issues on the continent. These respondents underscore the need for a collaborative strategy involving various stakeholders to ensure adequate resources and a holistic response to Africa's climate challenges. Furthermore, they stressed that an integrated approach that involves innovative financing mechanisms, capacity-building programs and a focus on creating an enabling environment for investment in climate projects are significant steps to address climate change challenges on the continent.

4 Discussion

The discussion of this paper is structured to bring a holistic overview and understanding of climate change funding in Africa under two main objectives: The existing funding framework, along with the structural and institutional barriers to climate change funding on the continent as well as the innovative and alternative strategies for improving funding for

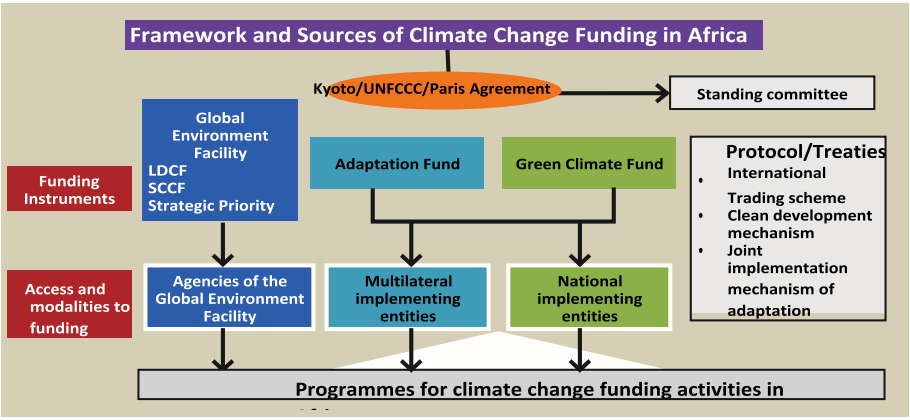

Fig. 3 The climate funding framework and framework in Africa: **Source:** Climatelinks

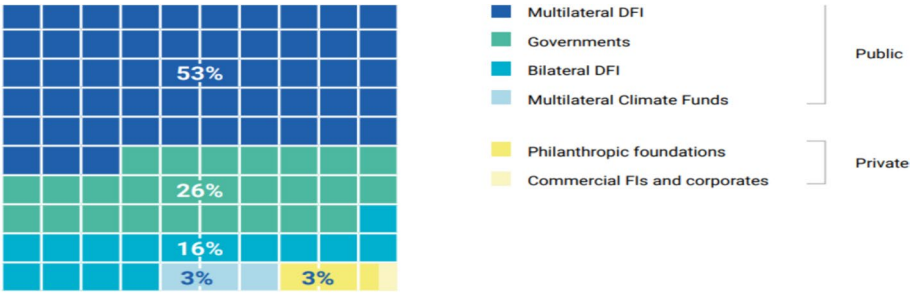

Fig. 4 Funding sources and allocations in Africa. 2021 **Source:** United Nations Framework Convention on Climate Change (UNFCCC)

climate-related initiatives. The underlying findings of this paper revealed a complex issue with the funding of climate activities portraying two contrast perspectives highlighting both gains and serious challenges. On hand, our findings established that Africa as a continent benefit from the existing frameworks for financing climate initiatives. See Fig. 3 and 4. We picked from with experts in this sector that as of 2023, the continent has received tens of billions of dollars in climate change funding from various sources, including $2.5 billion from the Green Climate Fund, $3.2 billion from the Global Environment Facility, a pledge of $25 billion from the African Development Bank between 2020 and 2025 and over 15 billion from bilateral and multilateral aid from countries like the United States, Germany, the United Kingdom, and France.

The underling findings of Fig. 3 augmented by ADB (2022a, b) revealed that current funding framework which include multilateral institutions such as the Green Climate Fund (GCF), the Global Environment Facility (GEF) and the Adaptation Fund provide structured and transparent processes for financing climate initiatives. Based on expert opinions in the sector many African countries particularly, South Africa, Rwanda, Kenya, Nigeria and Ethiopia have developed national climate change policies and strategies that outline detailed frameworks for accessing and utilising climate finance, defining priority

areas, promoting stakeholders' engagement and enhancing monitoring mechanisms. The regional initiatives such as Africa Adaptation Initiative (AAI) and the African Risk Capacity (ARC) further compliments the structured pooling of resources and coordination of climate finance across multiple countries. Similarly, it was established that partnerships with international financial institutions such as the World Bank and the African Development Bank (ADB) also offer supplementary funding mechanisms, technical assistance and capacity-building efforts on the continent. Other establishments such as National Designated Authorities (NDAs) and European Investment Bank supporting countries on the continent in funding proposals that align with national priorities and meet international requirements. These elements collectively form a structured and clear framework for funding and implementing climate activities in Africa, ensuring efficient and effective use of financial resources for climate resilience and adaptation projects. Another noteworthy finding of Figs. 3 and 4 revealed that public–private partnerships (PPPs) through the existing frameworks enhances the collaboration between governments, private sector entities and civil society organisations, mobilise and utilises climate finance. These elements collectively form a structured and clear framework for funding and implementing climate activities in Africa, ensuring efficient and effective use of financial resources for climate resilience and adaptation projects. Figure 4 simplifies the funding sources and proportion of funding on the continent.

Despite this glorious picture painted, findings from Fig. 1 and engagements with relevant players in the field uncovered that climate change funding in Africa is not smooth sailing, funding programmes are riddled with a plethora of interwoven challenges that include complex bureaucratic procedures, fragile national capacity, governance and institutional weaknesses such as corruption, lack of transparency and inadequate national policies and strategies that align with international funding. A striking findings of Fig. 1 showed that limited access to funding sources to tackle numerous and a significant hurdles of climate change initiative on in almost all the countries on the continent. Another remarkable findings of the Fig. 1, augmented by engagements with experts revealed that access to funding on the continent are constrained by tight national budgets, competing needs, high levels of debt and inflation, over dependence on aids and unreliability of foreign aid, grants and pledges, perceived financial risks in most countries particularly those in the Sub-Saharan regions, cumbersome and bureaucratic processes and unequal access to international capital markets and funding institutions. Our engagements and analysis from the financial statements of most countries on the continent, namely Zambia, Mozambique, Chad, Sudan, Ghana, and Kenya, revealed heavily indebted nations with debts nearly equal to or surpassing their GDP. These developments have severely limited their ability to allocate funds for fighting climate change and investing in adaptation mechanisms. Similarly, it was uncovered that the unsustainable debt levels intertwined with unsupportive policy frameworks, inconsistent regulation, and insufficient private sector engagement are significant constraints to climate change funding on the continent. Further findings of Fig. 1 underscored disparities and irregular accessibility of climate c funding on the continent. The outcomes revealed that unpredictable investment conditions across the continent influence the accessibility; for instance, we established that Nigeria's political instability and perceived corruption, the Democratic Republic of Congo's ongoing conflict and poor governance, Somalia's security concerns, South Sudan's economic instability, and Zimbabwe's economic mismanagement and political issues deterred climate investments and funding nationally and internationally. These outcomes.

Another significant finding of Fig. 1 together with views from experts suggest that climate change funding on the continent is also drawback by the amalgamation of factors,

including lack of capacity and infrastructure development. Our observation confirmed that the lack of capacity, limited access to finance and infrastructure development, insufficient domestic investments and fragmented policies not only impede any meaningful funding of climate activities on the continent but also hampers the ability of the continent to attract, utilise and manage climate finance effectively. Furthermore, scarcity of technical expertise, poor financial systems, limited government and private sector investments, and incoherent climate policies are the underlying drivers of the gaps in climate funding on the continent. Another noteworthy outcome from Fig. 1, established that lack of meaningful stakeholder involvement or education and awareness in climate activities has augmented the gaps in funding of climate activities on the continent. Other setbacks picked from Fig. 1, includes lack of transparency and accountability in fund use, efficient and effective of risk assessments as well as lack of prioritising community needs are some of the contributing factors to insufficient funding of climate activities on the continent. It was further established from the Fig. 1 constrained are further compounded by insufficient local engagements, marked by limited community involvement and awareness, further complicating issues are lack of climate data and information gaps coupled with weak monitoring and evaluation mechanisms, all factors impede the planning, implementation and assessment of effective climate actions. These outcomes are conceptualised and simplified Fig. 5.

We established that the lack of adequate funding and the challenges has exposed the continent to climate change implications. The underfunding has exacerbated the continent's vulnerability to extreme weather events, significantly threatening food security, increases health risks and considerably water scarcity. Additionally, it has contributed to substantial economic cost on the important economic sectors such as agriculture, fisheries and tourism and has heightened displacement and migration.

Considering the overwhelming challenges of sourcing funding for climate change activities on the continent, this paper explored into innovative and alternative strategies required to enhance funding on the continent. The underlying findings from Fig. 2, together with expert perspectives, established that improving or increasing funding climate activities on the continent will necessitate that the developed countries and financial institutions such as the World Bank, International Monetary Funds and European Bank nullify or convert the huge debts owed by the African countries particularly those

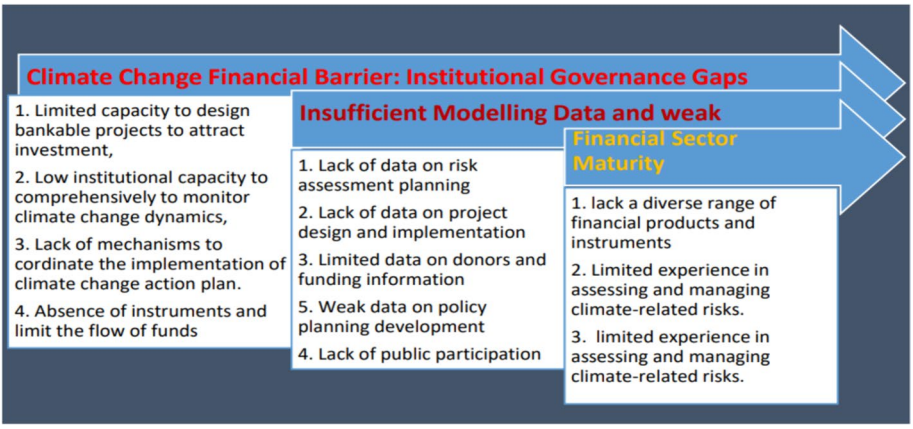

Fig. 5 Summarises the constraints to climate change funding on the continent. **Source:** The Research Team

accrued from climate-related activities into aids and grants. The underlying views from our engagements and the findings of Fig. 2, suggest that historical debts, climate injustice, heightened vulnerability and widespread poverty levels underpin Sub-Saharan Africa and have retarded any meaningful of addressing climate change challenges on the continent. In our view these challenges will require cancelling loans and debts and prioritising sustainable development, equitable resource allocation and climate resilience initiatives tailored on the continent's unique socio-economic and environmental contexts. Views from majority of experts and findings of Fig. 2 suggests that freeing up fiscal and financial debts on the continent will empower countries such as Mozambique, Ethiopia, Madagascar, Sudan, Zimbabwe, Zambia and Kenya, which are more prone to climate disasters, to prioritise adaptation and mitigation strategies, build resilience infrastructure and align with international commitments such as the Paris Agreement, COPS 27 and 28; Sharm El-Sheikh in Egypt and Dubai, the United Arab Emirates respectively.

Another remarkable finding from Fig. 2 uncovered that climate change funding on the continent could be enhanced through the global green climate change bond market and insurance policies. The underpinning outcomes of Fig. 2 and views from some respondents suggest that utilising green climate change bonds and insurance proficiently is the surest and effective strategy to attract investments for climate-sustainable projects and to contribute to more resilient and eco-conscious markets. Respondents particularly those from the African Development Bank and the multilateral and bilateral suggest that the green climate change bond will increase climate funding on the continent by providing direct financing for climate projects, accessing international capital markets, lowering borrowing and interest, building capacity and expertise in sustainable financing, increase private sector investment as well as aligning with international climate goals such as the Paris Agreement, COP 27 and 28. Furthermore, the outcomes from Fig. 2 established embracing these strategies, will put most countries on the continent in a better position to secure sufficient funds required to address its vulnerabilities and disasters adequately, attract private investment, mobilise domestic resources, and commit to sustainable development goals (SDGs) while at the same time fulfilling their international agreements and obligations.

Another remarkable finding from Fig. 2, call for a more consolidation of strategies ranging from capacity building, technology transfer, fostering global partnerships, establishing robust monitoring and evaluation frameworks, mobilising community-based funding sources, long-term planning and comprehensive policies that address the complexities and evolving trends of climate change funding on the continent. These perspectives are conceptualise and streamlines in Fig. 6

In this model, we advocate for an integrated structured approach focusing on four key drivers: fostering knowledge and awareness among private actors and investors, developing innovative R&D financing solutions supported by effective policies, reinforcing coordination platforms for better alignment at regional and local levels, and strengthening monitoring and evaluation mechanisms for improved data sharing and targeted interventions for climate funding. These efforts should be augmented across three levels of engagement: regional and sub-regional institution-building to co-create with the private sector, direct engagement with country-level institutions to support private intermediaries, and supporting private sector business with a focus on co-funding approaches. These must be grounded on cross-cutting themes, which include capacity building at regional and local institutions, de-risking efforts to encourage private sector and financial institution investments, scaling up and replicating successful green MSMEs investments, and enhancing monitoring and evaluation to assess the impact of investments and initiatives on meeting climate targets.

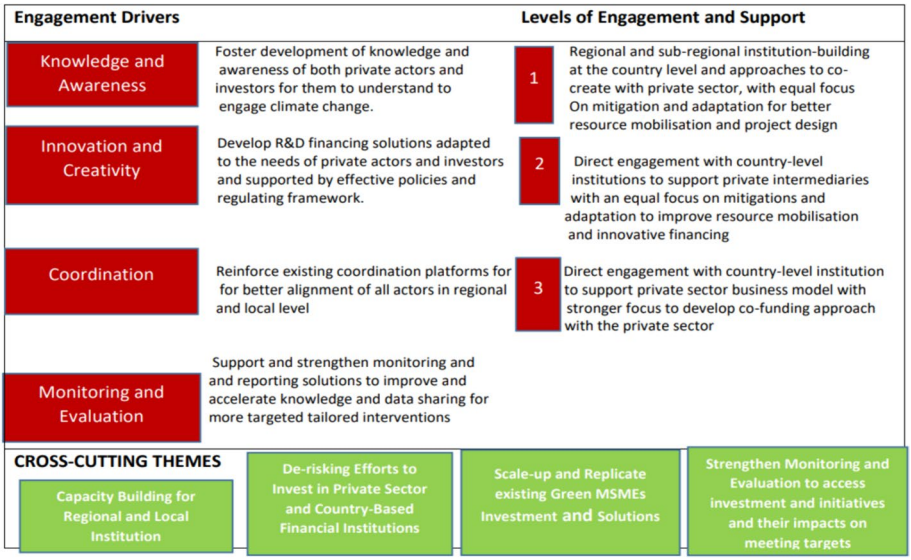

Fig. 6 Funding strategies for climate change activities in Africa. **Source:** Research Team

5 Conclusion

This paper established that while much progress has been made in igniting debates globally about the need and urgency to raise funds to support the Africa's programmes towards adaptations and mitigations, nonetheless, the urgency is not reflected in most of the countries on the continent. Numerous factors were considered hindrances to equitable, effective and sustainable funding climate activities on the continent. Among them are limited funding sources, bureaucracies in accessing funds, competing corporate and political interests, lack of human capital, sectoral planning, lack of technology and information, and a mismatch between available financing and specific regional needs. Addressing these challenges will require comprehensive and integrative strategies that amalgamate innovative funding mechanisms with a sustainable approach. Furthermore, governments should promote funding through issuing green bonds to encourage public–private partnerships while at the same time incentivising private sector investments such as subsidising and tax breaks on climate-related businesses. Furthermore, it is imperative to enhance institutional and technical capacity through building programs and knowledge transfer skills in climate funding management on the continent.

Additionally, there should be advancement and promotion of public–private partnerships, where skills and knowledge can be leveraged from different institutions, such as the African Development Bank, partnering with governments and other private organisations on the continent to utilise climate funds effectively and transparently. Beside these strategies, the continent must promote climate insurance, carbon pricing, and technology transfer from developed nations that generate revenue streams and reduce implementation costs. Similarly, developed countries and global financial institutions must fulfil climate funding commitments pledges and establish dedicated funds for the continent to meet the adaptation and mitigation programmes. This should also include greater transparency and accountability in allocating funds to combat financial leaks and sources of corruption.

Finally, it is recommended that local communities be involved in decision-making and be empowered with skills while governments on the continent implement robust monitoring and evaluation strategies that contribute to sustainable climate change projects.

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Data availability The data supporting the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions.

Declarations

Conflict of interest The authors of this paper declared that there is no conflict of interest in writing this manuscript.

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