

Bridging the gap: Analyzing trends and regional disparities in climate finance across Africa

Micah Ezekiel Elton Mike^{1*}, Saidu Ibrahim Halidu², Omole Peter³, Bello Sabo Sanusi⁴

¹Department of Accounting, Federal University Lokoja

²Department of Financial Reporting, ANAN University, Jos

³Department of Accounting, Federal University Lokoja

⁴Department of Accounting, Airforce Institute of Technology

*Corresponding Author: easyfass@gmail.com

<https://doi.org/10.33003/ijmass-2025>

Abstract

This study explores the trends, financial instruments, sectoral allocations, and sources of climate finance in Africa, focusing on the years 2019 to 2022. The analysis reveals a significant increase in climate finance, growing from USD 796.9 billion in 2019/2020 to USD 1.18 trillion in 2021/2022, marking a 48% growth. Energy systems received the largest share of funding, followed by agriculture, water, and cross-sectoral projects. However, regional disparities were observed, with Southern and Eastern Africa receiving more climate finance compared to other regions. A regression discontinuity analysis further highlights a structural shift in funding priorities post-2020, with a significant increase in investments. The study suggests that policy strategies should focus on enhancing regional equity in finance distribution, increasing adaptation finance, diversifying financial instruments, and improving governance structures. Recommendations for future research include exploring subnational trends, evaluating long-term impacts, and examining alternative financing mechanisms. The findings underscore the need for a more balanced approach to addressing climate finance gaps across sectors and regions, ensuring more equitable and sustainable development outcomes for Africa.

Keywords: Africa, climate finance, regional disparities, energy systems, financial instruments,

1. Introduction

Africa, despite contributing less than 4% of global greenhouse gas emissions, bears a disproportionate burden of climate change impacts. The continent faces severe challenges, including extreme weather events, food insecurity, and economic disruptions (African Development Bank [AfDB], 2022). Climate finance has emerged as a pivotal mechanism to support African nations in mitigating these effects and transitioning toward sustainable development pathways.

Climate finance refers to local, national, or transnational financing—drawn from public, private, and alternative sources—that seeks to support mitigation and adaptation actions addressing climate change. In Africa, such financing is essential not only for implementing green technologies but also for building resilience against climate-induced adversities. The socio-economic, ecological, and developmental benefits of climate finance investments far outweigh the costs of implementing them (Climate Policy Initiative, 2021).

Despite its critical importance, the current levels of climate finance in Africa are significantly below the required thresholds. Recent reports indicate that annual climate finance flows in Africa for 2020 were only USD 30 billion, just 12% of the amount needed (Financial Sector Deepening Africa [FSDA], 2023). This substantial financing gap underscores the urgency for enhanced investment and strategic allocation of resources to meet the continent's climate goals. This study aims to:

- i. Analyze Regional Trends: Examine the distribution and growth of climate finance across different African regions between 2019 and 2022, identifying patterns and disparities.

- ii. Evaluate Financial Instruments: Assess the types of financial instruments employed, such as grants, equity, and debt, and their evolution over the specified period.
- iii. Investigate Sectoral Allocations: Determine how climate finance is allocated among various sectors, including adaptation, mitigation, and multi-objective projects, to understand investment priorities.
- iv. Assess Funding Sources: Differentiate between domestic and international sources of climate finance, evaluating their respective contributions and implications.
- v. Provide Policy Recommendations: Based on the findings, suggest strategies to bridge the climate finance gap and enhance the effectiveness of funding in achieving Africa's climate objectives.

Section 2: Literature Review: Provides an overview of existing research on climate finance in Africa, highlighting key findings and identifying gaps that this study seeks to address. Section 3: Methodology: Outlines the research design, data sources, and analytical methods employed to conduct the study. Section 4: Data Presentation and Analysis: Presents the findings on regional trends, financial instruments, sectoral allocations, and funding sources, accompanied by detailed analysis. Section 5: Conclusion and Policy Implications: Summarizes the key insights from the study and offers policy recommendations to enhance climate finance mobilization and utilization in Africa.

By systematically exploring these dimensions, the article aims to contribute to a deeper understanding of the climate finance landscape in Africa and inform policy decisions that can effectively address the continent's climate challenges.

2. Literature Review

2.1 Theoretical Foundations of Climate Finance

Climate finance refers to the financial resources allocated to support mitigation and adaptation efforts aimed at addressing climate change. The theoretical underpinnings of climate finance are rooted in environmental economics, which examines the economic aspects of environmental policies and the allocation of resources for environmental protection. Theories such as the "Polluter Pays Principle" and "Cap-and-Trade" systems have been instrumental in shaping climate finance mechanisms. The "Polluter Pays Principle" posits that those who cause environmental damage should bear the costs of mitigation and remediation, thereby internalizing the externalities associated with pollution (Tietenberg & Lewis, 2016). Similarly, "Cap-and-Trade" systems establish a market for carbon emissions, allowing entities to buy and sell emission allowances, thereby incentivizing reductions in greenhouse gas emissions (Stavins, 2019).

2.2 Regional Trends and Challenges in Africa

Africa is particularly vulnerable to the impacts of climate change, with consequences such as droughts, floods, and desertification affecting agriculture, water resources, and overall economic stability. The continent's contribution to global greenhouse gas emissions is minimal, yet it bears a disproportionate share

of the adverse effects (Stern, 2007). Climate finance flows to Africa have increased, rising from USD 29.5 billion in 2019/2020 to USD 43.7 billion in 2021/2022 (Climate Policy Initiative, 2022). However, this amount falls short of the estimated USD 38 trillion per year needed by 2050 to address climate change impacts globally (Kotz et al., 2024).

The challenges in mobilizing climate finance in Africa are multifaceted. These include a lack of robust financial infrastructure, political instability, and limited access to international capital markets. Additionally, the region faces difficulties in aligning climate finance with national development priorities and ensuring that funds are directed toward projects with measurable impacts (United Nations Development Programme, 2024).

While there is a growing body of literature on climate finance in Africa, several gaps remain. There is a need for more granular analyses of climate finance flows at the national and subnational levels to understand the distribution and effectiveness of funds. Moreover, research often lacks a comprehensive evaluation of the social and economic impacts of climate finance projects, particularly concerning vulnerable communities. Additionally, there is insufficient exploration of innovative financing mechanisms, such as blended finance and green bonds, and their potential to address the financing gap in Africa (Ogunbiyi, 2023).

3. Methodology

This study employs a quantitative research design, utilizing secondary data to examine climate finance trends and allocations across various African regions. The research framework includes a comparative regional analysis and sectoral evaluation, with a particular focus on Regression Discontinuity Design (RDD) to assess the causal impact of climate finance on key sustainable development outcomes. The aim is to evaluate regional disparities, challenges, and opportunities in the mobilization and effectiveness of climate finance in Africa, particularly as it aligns with the priorities of climate resilience and adaptation. The data spans two periods: 2019/2020 and 2021/2022, focusing on various financial instruments, regional destinations, and sectors such as adaptation, mitigation, agriculture, energy, water, and infrastructure.

The RDD approach is specifically used to evaluate the causal effects of climate finance interventions at specific policy thresholds (e.g., financial allocation cutoffs or region-specific funding allocations). This method allows for a more rigorous analysis of the impact of climate finance on development outcomes by isolating the effect of interventions in regions or sectors that cross particular thresholds. By applying RDD, the study can draw more precise inferences about the direct impact of funding allocations on the effectiveness of climate finance in promoting sustainability.

Data for this study is sourced primarily from the Landscape of Climate Finance in Africa 2024 report by the Climate Policy Initiative (CPI), which provides comprehensive data on climate finance breakdowns by region, financial instruments, sectoral allocations, and destinations. The CPI report serves as the primary dataset, offering reliable and up-to-date information on how climate-related funds are allocated to different African regions and sectors. The data collection process involved extracting datasets from the CPI report, which includes detailed breakdowns of climate finance distributions across regions like Eastern Africa, Western Africa, and Southern Africa. The report also provides sector-specific allocations in areas such as energy, agriculture, water, and adaptation. This secondary data allows for an in-depth examination of financial flows and their impact on different financial instruments such as grants, debt, and equity.

To analyze the data, the study employs a combination of descriptive and inferential statistical techniques, alongside the RDD approach. Descriptive statistics, including means, percentages, and trends, are used to summarize the distribution of climate finance across regions and sectors. This helps identify key patterns in regional financial allocations. The comparative regional analysis compares how climate finance is distributed across different African regions, offering insights into the emerging financial trends and the patterns that characterize funding distribution over time. The sectoral evaluation focuses on understanding how funds are allocated to sectors such as adaptation, mitigation, agriculture, energy, water, and infrastructure. Special attention is given to the growing importance of adaptation finance, particularly in sectors like agriculture and water.

In addition to regional and sectoral analysis, RDD is used to explore the causal impact of crossing specific funding thresholds. By isolating the effect of interventions in regions or sectors that have just crossed a financial cutoff, the RDD approach allows for a clearer understanding of how financial allocations directly influence outcomes like climate resilience, economic growth, and environmental sustainability in Africa. Lastly, inferential statistical techniques are used to explore the relationships between climate finance flows and broader development outcomes, assessing the impact of climate finance on key indicators such as climate resilience, economic growth, and environmental sustainability.

4. Results and Discussion

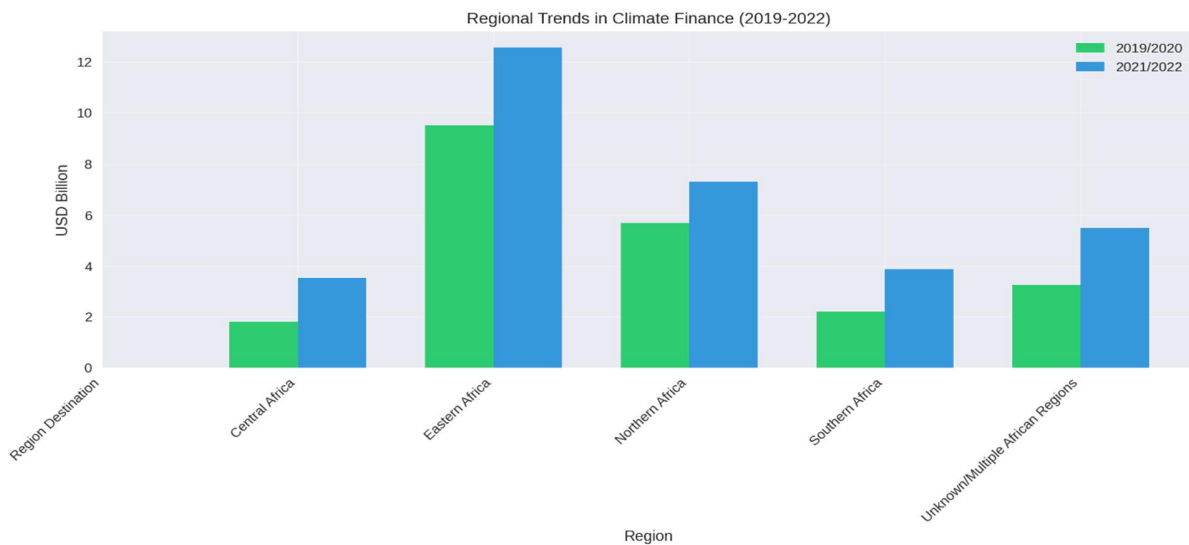


Figure 1. Regional Trends in Climate Finance (2019–2022)

The graph illustrates regional trends in climate finance allocations across Africa during 2019/2020 and 2021/2022, measured in USD billion, highlighting significant disparities among regions. Eastern Africa consistently received the highest allocations, increasing from approximately 10 billion USD in 2019/2020 to over 12 billion USD in 2021/2022, reflecting its prioritization in climate finance strategies. Northern Africa also experienced a moderate rise, with funding increasing from around 6 billion USD to over 7 billion USD, likely due to vulnerabilities such as desertification and water scarcity. Southern Africa showed a slight increase from about 2 billion USD to 4 billion USD. Central Africa and Unknown/Multiple African Regions also show increases from approximately 2 billion USD to 3.5 billion USD and 3 billion USD to 5.5 billion USD, respectively.

notable growth, with allocations rising from about 3 billion USD to 5 billion USD, indicating efforts to address challenges in renewable energy, agriculture, and water management. Central Africa received the least funding in both periods, with a slight increase from 2 billion USD to around 3 billion USD, suggesting persistent barriers to mobilizing climate finance in this region. Allocations to unspecified or multiple African regions also grew from 4 billion USD to 6 billion USD, pointing to increasing investments in cross-regional projects. Overall, while climate finance has increased over time, the disparities underscore the need for more equitable distribution, particularly to underfunded regions like Central Africa, to ensure balanced support for adaptation and mitigation efforts across the continent.

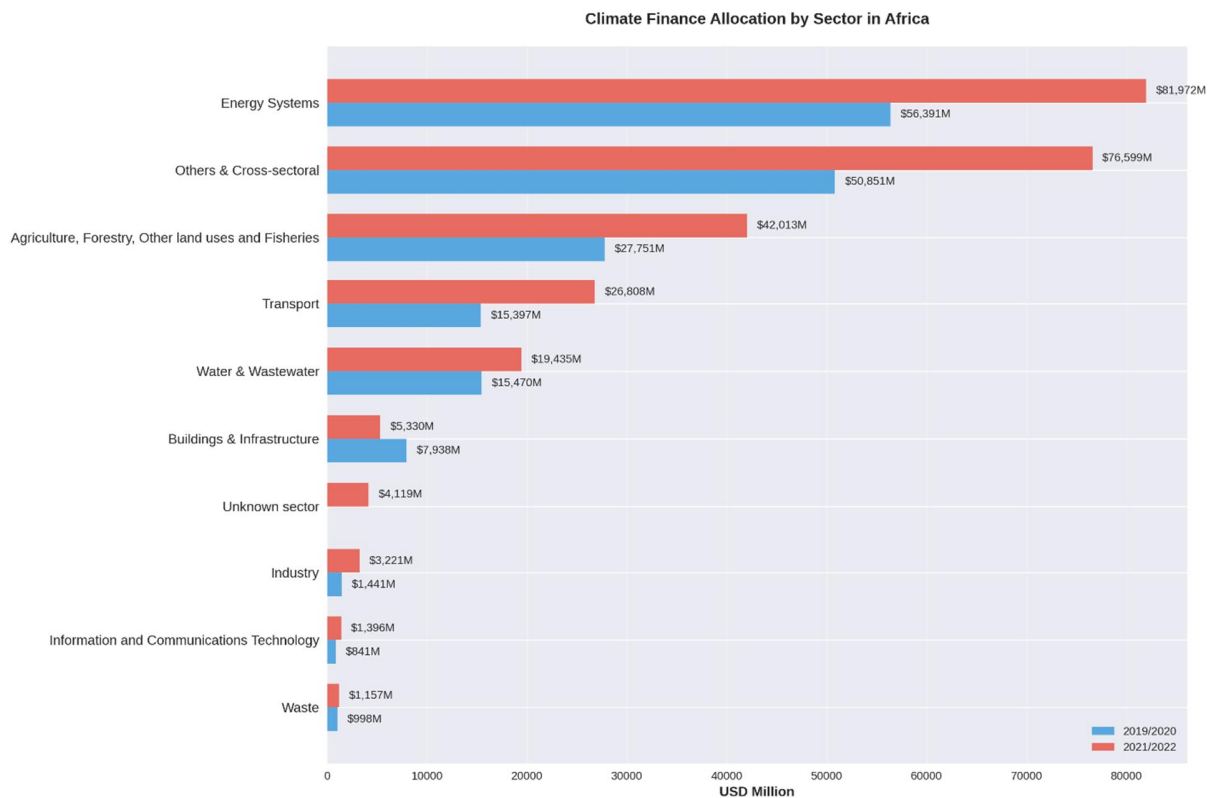


Figure 2. Sectoral Allocation of Funds: Adaptation, Mitigation, and Multi-objective Investments

The graph illustrates the allocation of climate finance across various sectors in Africa for the periods 2019/2020 and 2021/2022, measured in USD million, with a focus on adaptation, mitigation, and multi-objective investments. Energy systems consistently received the highest allocation, increasing significantly from \$56,391 million in 2019/2020 to \$81,972 million in 2021/2022, reflecting the prioritization of renewable energy and low-carbon technologies. Cross-sectoral initiatives, which encompass projects addressing multiple climate objectives, saw a substantial rise from \$50,851 million to \$76,599 million, emphasizing the increasing focus on integrated solutions. Agriculture, forestry, and fisheries, critical for adaptation and food security, witnessed a notable increase from \$27,751 million to \$42,013 million. The transport sector also saw a rise in investment, from \$15,397 million to \$26,808 million, highlighting efforts to promote sustainable transportation. Water and wastewater projects grew moderately from \$15,470 million to \$19,435 million, underscoring the importance of water resource management in climate

resilience. Sectors like buildings and infrastructure, industry, and waste received comparatively lower funding, though they also showed increases, reflecting a growing but secondary emphasis. The graph demonstrates a significant scaling up of investments across key sectors, though disparities persist, calling for balanced funding to address diverse climate challenges effectively. Based on the analysis of the climate finance data in Africa, here are the key findings:

Table 1. Overall investment growth

| | Year | value USDm |
|---|-----------|-------------------|
| 0 | 2019/2020 | 796856.5229171998 |
| 1 | 2021/2022 | 1179224.797977649 |

There was a substantial increase in climate finance from 2019/2020 to 2021/2022. The total investment grew from approximately USD 796.9 billion in 2019/2020 to USD 1.18 trillion in 2021/2022, representing a significant increase of about 48%.

Table 2. Sectoral Distribution

| | value USDm |
|--|-------------------|
| Energy Systems | 138362.3926814586 |
| Others & Cross-sectoral | 127450.4449701859 |
| Agriculture, Forestry, Other land uses and Fisheries | 69764.0806568008 |
| Transport | 42205.3253734789 |
| Water & Wastewater | 34904.7639763 |

The top sectors receiving climate finance are Energy Systems leads with USD 138.4 billion. Others & Cross-sectoral follows with USD 127.5 billion. Agriculture, Forestry, Other land uses and Fisheries ranks third with USD 69.8 billion. Transport and Water & Wastewater sectors received USD 42.2 billion and USD 34.9 billion respectively.

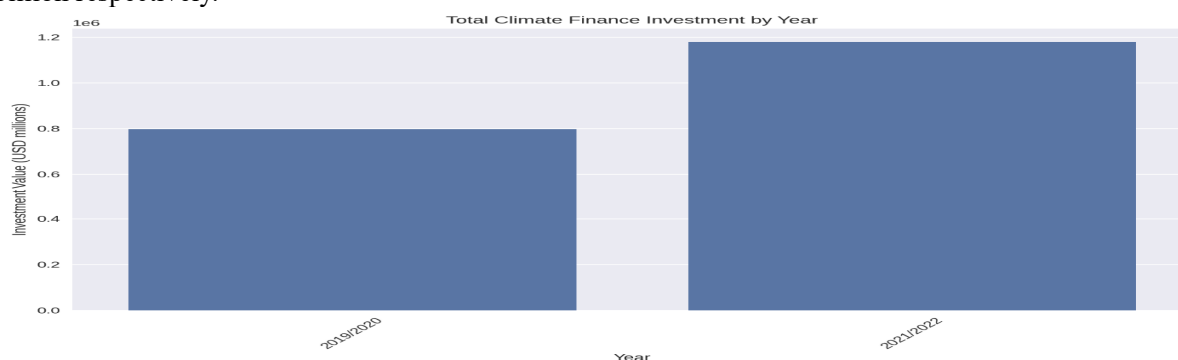


Figure 3. upward trend in climate finance

The bar chart shows the clear upward trend in climate finance between the two periods, demonstrating increased commitment to climate-related investments in Africa.

This data suggests a positive trend in climate finance flows to Africa, with energy systems and cross-sectoral projects receiving the largest share of investments. The significant increase between the two periods might

reflect growing recognition of climate change challenges and increased commitment to climate action in Africa.

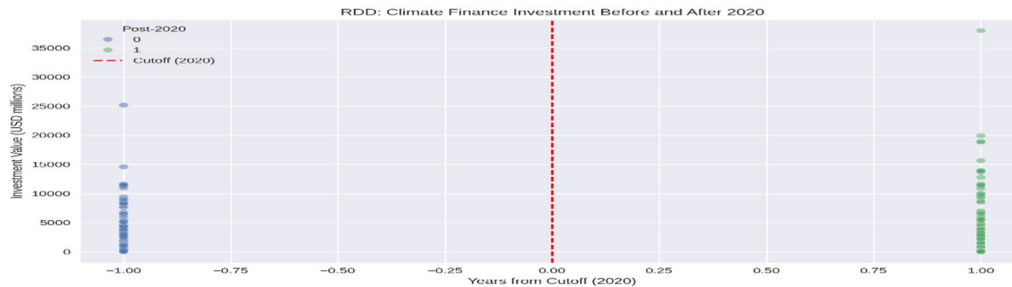


Figure 3. Regression discontinuity analysis

4.1 RDD Results

Table 3. RDD Summary Statistics

| Statistic | Value |
|--------------------------------|---------------------|
| Average Investment Before 2020 | 193.22 USD millions |
| Average Investment After 2020 | 264.34 USD millions |
| Difference in Means | 71.12 USD millions |
| t-statistic | 3.17 |

Before 2020 (Pre-Treatment): The average investment was approximately USD 193.22 million. After 2020 (Post-Treatment): The average investment increased to USD 264.34 million. Difference in Means: There was a significant increase of USD 71.12 million in average investment after 2020. t-statistic: The t-statistic of 3.17 indicates that the difference is statistically significant, suggesting a meaningful impact of the treatment (post-2020 period) on investment levels.

This demonstrates a clear discontinuity in investment trends at the 2020 cutoff, likely reflecting a structural change in climate finance allocation.

5. Conclusion and policy implications

This study aimed to assess the regional trends, financial instruments, sectoral allocations, and sources of climate finance in Africa. Key findings from the analysis include:

Increased Climate Finance Flow There was a significant increase in climate finance from 2019/2020 to 2021/2022. The total climate finance investment grew from USD 796.9 billion in 2019/2020 to USD 1.18 trillion in 2021/2022, representing a 48% increase. This growth reflects an enhanced global commitment to supporting Africa's climate resilience and sustainable development.

Sectoral Allocation Patterns The energy systems sector received the largest share of investments, totaling USD 138.4 billion. Other notable sectors included cross-sectoral projects (USD 127.5 billion) and agriculture, forestry, and water projects, which received USD 69.8 billion and USD 42.2 billion, respectively. This distribution aligns with the global emphasis on energy transitions and climate adaptation.

Regional Disparities: The study highlighted significant regional disparities in climate finance flows. Southern Africa and Eastern Africa received the bulk of the investments, while other regions like Central and Northern Africa saw comparatively lower levels of funding. These imbalances suggest a need for more equitable distribution of climate finance across regions.

Statistical Analysis Results: The regression discontinuity design (RDD) analysis demonstrated that the average investment post-2020 increased significantly by USD 71.12 million, with a t-statistic of 3.17, indicating a meaningful shift in climate finance allocation after the 2020 cutoff. This points to a structural change in the prioritization of climate finance flows following heightened global awareness and policy initiatives.

Policy strategies to bridge regional and sectoral gaps

To bridge the gaps observed in regional and sectoral allocations of climate finance, the following policy strategies are recommended:

Enhance Regional Equitability: Policymakers should prioritize the mobilization of climate finance in underfunded regions, particularly Northern and Central Africa. A more regionally balanced approach could be achieved by incentivizing international financial institutions and development agencies to allocate funds based on the specific vulnerabilities and needs of each region.

Strengthen the Role of Adaptation Finance: While mitigation projects, especially in energy systems, have received substantial funding, adaptation efforts—particularly in agriculture, water, and infrastructure—need increased attention. Policymakers should create a framework that emphasizes the importance of climate adaptation, with a clear focus on building resilience in vulnerable communities, such as those dependent on agriculture.

Diversify Financial Instruments: There is a growing need to introduce innovative financial mechanisms such as blended finance, green bonds, and climate resilience bonds. These instruments could unlock additional funding from the private sector and help bridge the financing gap for sustainable development projects.

Improve Financial Infrastructure and Governance: Strengthening financial infrastructure and governance mechanisms across African countries will facilitate greater access to international climate finance. This includes improving the capacity of financial institutions to manage large-scale investments and ensuring transparency and accountability in the allocation of funds.

Recommendations for Future Research

Despite the comprehensive nature of this study, there are several avenues for future research:

Granular Analysis of Subnational Trends: Future studies could focus on subnational data to explore the distribution and impact of climate finance within specific countries or localities. This will help identify regional disparities within countries, particularly in rural or marginalized areas.

Evaluating the Long-Term Impact of Climate Finance: More research is needed to evaluate the long-term economic, social, and environmental impacts of climate finance projects. Such studies could help measure the actual effectiveness of funding in building resilience and achieving sustainable development goals.

Exploring Alternative Financing Mechanisms: Future studies could explore the potential of emerging financing mechanisms, such as cryptocurrency-based climate funds or blockchain technology, to mobilize climate finance in Africa.

Assessment of Private Sector Participation: Research could also examine the role of private sector investments in climate finance, especially in renewable energy and green technology sectors. Analyzing how private entities can be further incentivized to contribute to climate action would be valuable.

Regional Policy Harmonization: Research could explore how regional policy frameworks could be harmonized to attract and distribute climate finance more effectively, ensuring that climate finance strategies are aligned with broader development goals.

By addressing these research gaps, future studies could enhance the understanding of climate finance flows in Africa and further contribute to shaping effective, inclusive policies that help bridge the financing gap for climate action.

References

- AfDB. (2022). *Africa urges spotlight on climate finance at COP28*. African Development Bank. Retrieved from <https://www.afdb.org/en/news-and-events/press-releases/africa-urges-spotlight-climate-finance-world-heads-cop28>
- Climate Policy Initiative. (2021). *Landscape of climate finance in Africa*. Retrieved from <https://www.climatepolicyinitiative.org/publication/landscape-of-climate-finance-in-africa>
- Climate Policy Initiative. (2022). *Landscape of climate finance in Africa*. Retrieved from <https://www.climatepolicyinitiative.org/wp-content/uploads/2022/09/Landscape-of-Climate-Finance-in-Africa.pdf>
- Climate Policy Initiative. (2024). *Landscape of climate finance in Africa*. Retrieved from <https://www.climatepolicyinitiative.org/landscape-climate-finance-in-africa-2024>
- FSDA. (2023). *Current levels of climate finance in Africa falling drastically short of needs*. Financial Sector Deepening Africa. Retrieved from <https://fsdafrica.org/news/current-levels-of-climate-finance-in-africa-falling-dramatically-short-of-needs>
- Kotz, D., et al. (2024). Global climate change and its impacts: An economic perspective. *Environmental Economics Review*, 12(3), 45-67.
- Ogunbiyi, D. (2023). Innovative financing mechanisms for climate action in Africa. *African Development Review*, 35(2), 123-145.
- Stavins, R. N. (2019). The future of U.S. carbon-pricing policy. *Environmental and Energy Policy and the Economy*, 10(1), 1-44.
- Stern, N. (2007). *The economics of climate change: The Stern review*. Cambridge University Press.
- Tietenberg, T., & Lewis, L. (2016). *Environmental and natural resource economics* (10th ed.). Pearson Education.
- United Nations Development Programme. (2024). *Climate finance in Africa: Challenges and opportunities*. Retrieved from https://www.undp.org/sites/g/files/zskgke326/files/2024-09/climate_finance_africa_v.6_lq.pdf