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Funding Climate Action: A Systematic Review of Climate Finance Efficiency and Impact



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ABSTRACT: This study presents a systematic review of the efficiency and impact of climate finance, with a focus on the key funding sources, allocation patterns, and the effectiveness of current climate finance mechanisms in advancing climate mitigation goals. Climate finance has emerged as a critical component of global efforts to combat climate change, yet its efficiency and impact remain under scrutiny. The study synthesizes existing empirical literature on climate finance, examining the role of public, private, and blended finance in funding climate action. It highlights the major sources of climate finance, including bilateral and multilateral funds, as well as private sector investments, and evaluates how these funds are allocated across various regions and sectors. Additionally, the study explores the operational mechanisms of climate finance, assessing their effectiveness in mobilizing resources for climate change mitigation and adaptation. The findings reveal that while significant progress has been made in mobilizing climate finance, there are persistent challenges related to funding gaps, fragmentation, and inefficiencies in the allocation of resources. The impact of climate finance on achieving climate mitigation goals has been varied, with successes in some areas, particularly in renewable energy and forest conservation, but limited progress in others due to governance issues, lack of coordination, and weak institutional frameworks. The study calls for a more streamlined and transparent approach to climate finance, emphasizing the importance of effective governance and accountability mechanisms to enhance the efficiency of funding and maximize its impact on climate mitigation. Recommendations are provided to improve the alignment of climate finance with sustainable development objectives, address regional disparities, and overcome the barriers to large-scale private investment in climate action.

KEYWORDS: Climate Finance, Funding Sources, Efficiency, Impact, Mitigation.

1. INTRODUCTION

Climate change remains one of the most critical global challenges of the 21st century, with profound implications for ecosystems, economies, and human well-being. In response, climate finance has emerged as a pivotal mechanism to support mitigation and adaptation efforts, particularly in developing and vulnerable regions (UNFCCC, 2022). Defined broadly, climate finance refers to local, national, or transnational financing—drawn from public, private, and alternative sources—that seeks to support climate-resilient and low-carbon development pathways (OECD, 2021).

Over the past two decades, the volume of climate finance has increased significantly. According to the Climate Policy Initiative (CPI, 2021), annual global climate finance flows reached approximately USD 632 billion in 2019–2020, driven by both public and private sector contributions. However, despite these financial commitments, questions persist regarding the efficiency of climate finance—how effectively funds are mobilized, allocated, and utilized—and their actual impact on climate mitigation outcomes. Issues such as fragmentation of funding sources, lack of transparency in disbursements, and limited tracking mechanisms continue to hinder the effectiveness of global climate finance systems (Buchner et al., 2019; Watson & Roberts, 2020).

The escalating global crisis of climate change necessitates urgent, large-scale interventions to mitigate its effects and build resilience. A cornerstone of these interventions is climate finance, which serves as the lifeblood for efforts to limit global warming, reduce greenhouse gas emissions, and adapt to inevitable environmental changes. Despite an increasing global commitment to financing climate action, concerns about the efficiency of these financial flows, their effective allocation, and their measurable impact on climate change outcomes remain central in both academic and policy discussions (Pizer et al., 2019; Weikmans & Roberts, 2020). The efficiency of climate finance refers to how well resources are utilized in achieving climate goals, while the

impact pertains to tangible outcomes in terms of emissions reductions, adaptation strategies, and sustainable development (Cozzi et al., 2020).

Funding for climate action is mobilized through an intricate mix of mechanisms, involving public finance, private investment, and philanthropic contributions (Denton et al., 2021). Yet, despite the diversity of funding sources, significant challenges remain in optimizing the allocation of climate finance to ensure that it reaches the most vulnerable populations and the most effective mitigation and adaptation projects. Existing studies point to issues such as fragmentation of financial flows, inequities in access to finance, and poor tracking and accountability mechanisms (Schmidt et al., 2021). These issues underscore the need for a more granular understanding of how climate finance can be optimized, which this study seeks to address through a systematic review of the literature.

While global financial flows to combat climate change have grown, critics argue that current funding structures fail to maximize their potential impact. For instance, evidence suggests that much of the finance directed to climate change mitigation often bypasses low-income countries, where climate impacts are most acute (Brock et al., 2020). Additionally, private sector involvement, despite its potential to scale climate finance, has been slow to materialize due to risks associated with uncertain returns and a lack of regulatory clarity (Fankhauser et al., 2021). Therefore, an in-depth evaluation of both public and private contributions to climate finance is necessary to identify barriers and facilitate more effective investments in climate action.

While a growing body of empirical and theoretical research has explored climate finance mechanisms, there remains a need for a comprehensive synthesis of findings to assess the current state of knowledge, identify gaps, and inform policy and practice. This study addresses that gap by conducting a systematic review of global literature on climate finance, with a focus on the efficiency of financial flows and their impact on climate action, especially mitigation outcomes. The review seeks to answer the following core questions: (1) What are the key funding sources and allocation patterns in climate finance? (2) How efficient are current climate finance mechanisms? (3) What evidence exists on the impact of climate finance in advancing climate mitigation goals?

2. LITERATURE REVIEW

A growing body of research has examined the effectiveness of various funding mechanisms, ranging from public finance channels like the Green Climate Fund (GCF) and the Global Environment Facility (GEF) to private sector investments facilitated through blended finance models. Studies have focused on the efficiency of these mechanisms in mobilizing funds, their ability to meet climate goals, and their direct contributions to emissions reductions and resilience building. This literature highlights both the successes and limitations of current climate finance structures, offering critical perspectives on improving fund management, reducing administrative barriers, and enhancing accountability. In this systematic review, the study synthesizes these empirical findings to provide a comprehensive understanding of how climate finance has advanced global climate action and identify the key factors influencing its overall impact.

2.1 FUNDING SOURCES AND ALLOCATION PATTERNS IN CLIMATE FINANCE

Multilateral institutions like the Green Climate Fund (GCF) and private sector investments through green bonds and blended finance are central sources of climate finance. Research reveals allocation patterns that prioritize mitigation over adaptation, with certain regions and sectors receiving more attention.

2.1.1 Public Climate Finance Sources

Public climate finance remains the dominant source of funding for global climate action, particularly in developing countries. A significant portion of these funds comes from government contributions, channeled through international climate financing mechanisms such as the Green Climate Fund (GCF), Global Environment Facility (GEF), and Adaptation Fund (OECD, 2020). Public finance plays a crucial role in de-risking climate investments, enabling private sector participation in high-risk regions and sectors (Buchner et al., 2019).

Several studies emphasize that climate finance is heavily concentrated in mitigation efforts, with public funds flowing into largescale renewable energy projects, energy efficiency programs, and infrastructure development (Brock et al., 2020). However, there is a significant funding gap for adaptation initiatives, particularly in least developed and small island developing states (SIDS), where vulnerability to climate change is high (Cozzi et al., 2020). This disparity in allocation patterns reflects both the challenges in assessing and scaling up adaptation finance and the prioritization of mitigation in international agreements like the Paris Agreement (Siddiqui et al., 2021).

2.1.2 Private Sector and Blended Finance Models

In recent years, private sector involvement in climate finance has grown, though it still lags behind public sector contributions. The private sector includes institutional investors, private equity funds, banks, and multinational corporations that fund climate

projects either directly or through blended finance mechanisms. Blended finance combines public finance and private investment to reduce risks and attract greater private capital for climate initiatives (Obersteiner et al., 2021).

Studies show that private investments in climate finance are often concentrated in specific sectors such as renewable energy, sustainable infrastructure, and climate-smart agriculture, where the potential for financial returns is more predictable (Fankhauser et al., 2021). However, barriers such as regulatory uncertainty, market failures, and the perceived risk of long-term investments limit private sector engagement in less developed markets (Wegner et al., 2020). A key finding in the literature is that blended finance can help mitigate these challenges by leveraging public funds to de-risk investments and encourage private sector engagement (Schmidt et al., 2021).

2.1.3 Allocation Patterns: Regional Disparities

Climate finance allocation patterns are characterized by regional disparities, with funds disproportionately flowing to middleincome and emerging market economies rather than the most vulnerable countries. According to the Climate Policy Initiative (2021), about 40% of global climate finance flows to Asia, primarily due to large-scale projects in countries like China and India. However, funding for Africa and small island nations has remained insufficient to meet their urgent climate adaptation needs (Watson & Roberts, 2020). These allocation patterns reflect a combination of factors, including the size and economic importance of recipient countries, perceived investment risks, and geopolitical considerations (López et al., 2020).

Moreover, studies indicate that climate finance allocation is heavily influenced by donor priorities, with countries and international institutions often directing funds based on their political and economic interests rather than the actual needs of the recipient countries (Cozzi et al., 2020). North-South funding flows, where high-income countries contribute to low- and middle-income countries, remain central to the global climate finance landscape, but transparency and accountability in fund allocation remain areas of concern (Buchner et al., 2019).

2.1.4 Allocation to Mitigation vs. Adaptation

One of the central debates in climate finance is the balance between mitigation and adaptation finance. Mitigation projects, which aim to reduce greenhouse gas emissions, typically receive the largest share of climate finance, especially for projects related to renewable energy and low-carbon technologies (Cozzi et al., 2020). However, adaptation finance, which focuses on helping vulnerable countries and communities cope with the impacts of climate change, remains severely underfunded, despite its critical importance for countries most affected by climate change (Watson & Roberts, 2020). According to the OECD (2020), in 2019, only 22% of climate finance was allocated to adaptation, with the remaining 78% directed toward mitigation.

Several studies suggest that the lack of a clear and standardized framework for tracking adaptation finance contributes to this imbalance, leading to challenges in mobilizing and allocating sufficient resources for adaptation (Schmidt et al., 2021). Moreover, regional disparities also affect the allocation of adaptation finance, with some countries in the Global South receiving relatively higher shares of adaptation funds due to their increased vulnerability and the presence of donor-driven adaptation projects (Brock et al., 2020).

2.1.5 Challenges in Allocation Efficiency

Despite the substantial volume of climate finance mobilized globally, several studies highlight inefficiencies in the allocation process. Coordination failures, the fragmentation of financing mechanisms, and the absence of effective monitoring systems impede the efficient allocation and use of funds (Weikmans & Roberts, 2020). For example, the existence of multiple funds and initiatives with overlapping mandates can lead to inefficiencies in fund allocation, as resources may be duplicated or poorly targeted (Siddiqui et al., 2021). Furthermore, political interests and economic priorities often shape the allocation process, leading to a misalignment between the funds provided and the areas of most critical need, such as climate adaptation and resilience building (Buchner et al., 2019).

2.2 EFFICIENCY OF CURRENT CLIMATE FINANCE MECHANISMS

Various studies have assessed the performance of public and private financing channels, including multilateral funds like the Green Climate Fund (GCF) and private sector investments, in delivering impactful climate outcomes. Research highlights both successes in scaling up renewable energy and adaptation projects, as well as challenges such as administrative delays, fragmented governance, and insufficient monitoring frameworks.

2.2.1 Public Climate Finance Mechanisms and Efficiency

Public climate finance mechanisms such as the Green Climate Fund (GCF) and Global Environment Facility (GEF) play a pivotal role in funding climate action, particularly in developing countries. However, several studies have raised concerns regarding the efficiency of these mechanisms in mobilizing and allocating funds effectively. A significant challenge identified in the literature is

administrative inefficiency within these funds. According to Buchner et al. (2019), the GCF, despite being a major funding mechanism, faces delays in disbursing funds due to bureaucratic processes, regulatory barriers, and slow approval timelines, which reduce the overall efficiency of climate finance delivery.

Further analysis by Watson and Roberts (2020) suggests that although public funds are crucial in leveraging private investments, inefficiencies in fund management—due to inconsistent reporting and tracking—result in a misallocation of resources. These inefficiencies often lead to high transaction costs and suboptimal project outcomes, especially in fragile and vulnerable regions where climate change impacts are most severe. The lack of harmonized standards for fund management across different mechanisms further exacerbates inefficiencies in climate finance (López et al., 2020).

2.2.2 Role of Private Sector Participation in Improving Efficiency

Private sector participation in climate finance has been increasingly emphasized as a means of enhancing the efficiency of funding flows. Blended finance, which combines public funds with private investments, has been promoted as a strategy to de-risk climate projects and increase private sector involvement (Schmidt et al., 2021). Studies have shown that blending public and private finance can significantly improve the efficiency of climate finance by leveraging greater financial resources for large-scale mitigation and adaptation projects (Fankhauser et al., 2021).

However, private sector engagement in climate finance is still limited by several inefficiencies. For instance, barriers to investment, such as perceived risks, long payback periods, and inadequate regulatory frameworks, often prevent the private sector from fully engaging in climate finance (Obersteiner et al., 2021). While blended finance models can enhance project feasibility, they require substantial coordination between public and private actors, which can add to the transaction costs and create additional challenges in terms of efficiency (Fankhauser et al., 2021).

2.2.3 Efficiency of Climate Finance in Achieving Mitigation and Adaptation Goals

The efficiency of climate finance mechanisms is not only assessed based on the speed of fund mobilization but also on their effectiveness in achieving climate mitigation and adaptation outcomes. Several studies have found that climate finance mechanisms are often more efficient in mitigation projects, particularly in renewable energy and low-carbon technologies (Cozzi et al., 2020). These projects generally attract greater private sector investment due to their clear financial returns and scalability. Conversely, adaptation finance has been less efficient, as it faces challenges in terms of project scalability, long-term funding commitments, and measurement of outcomes (Brock et al., 2020).

Schmidt et al. (2021) note that adaptation finance, despite being a priority in many vulnerable countries, suffers from inefficiencies due to poor project design, lack of local ownership, and unclear outcome metrics. Many adaptation projects fail to demonstrate tangible and measurable impacts, making it difficult to evaluate their efficiency in enhancing resilience or reducing vulnerability to climate change (Weikmans & Roberts, 2020). The absence of standardized frameworks for monitoring and reporting on adaptation outcomes further compounds these inefficiencies (Siddiqui et al., 2021).

2.2.4 Efficiency Challenges in Multilateral Climate Finance Mechanisms

Multilateral climate finance mechanisms, such as the Adaptation Fund and Global Climate Fund (GCF), have been identified as both essential and inefficient in meeting global climate targets. Pizer et al. (2019) argue that these funds are critical in channeling resources to the most vulnerable countries, yet they are plagued by inefficiencies in fund allocation and tracking, which delay disbursements and increase project costs. The disbursement delays have been particularly evident in regions where political instability and limited technical capacity exacerbate the inefficiency of climate finance programs (López et al., 2020).

Moreover, Buchner et al. (2019) note that the effectiveness of multilateral funds is further hindered by the fragmentation of the climate finance landscape. Multiple overlapping institutions with competing mandates can lead to inefficiencies in fund allocation, duplication of efforts, and a lack of coordinated action. Efforts to streamline and improve the governance of these mechanisms have been proposed, but achieving systemic change in multilateral institutions has proven to be a complex and slow process (Watson & Roberts, 2020).

2.2.5 Monitoring and Evaluation Mechanisms for Efficiency

One of the core challenges in assessing the efficiency of climate finance mechanisms is the lack of robust monitoring and evaluation (M&E) frameworks. Several studies highlight that most climate finance mechanisms lack the comprehensive tracking systems necessary to assess fund usage and effectiveness (Siddiqui et al., 2021). Without effective M&E frameworks, it becomes difficult to evaluate the efficiency of climate finance in terms of actual climate outcomes, such as emissions reductions or improved climate resilience (Weikmans & Roberts, 2020).

The OECD (2021) suggests that developing a standardized global M&E framework would improve the transparency and accountability of climate finance, enabling more efficient allocation and reducing the risk of fund mismanagement. The importance

of transparency and accountability in improving the efficiency of climate finance mechanisms has been emphasized in recent reports (Pizer et al., 2019; Weikmans & Roberts, 2020).

2.3 CLIMATE FINANCE IN ADVANCING CLIMATE MITIGATION GOALS

Empirical literature on the impact of climate finance in advancing climate mitigation goals examines how financial resources contribute to reducing greenhouse gas emissions and promoting low-carbon development. Studies here highlight the outcomes of investments in renewable energy, energy efficiency, and sustainable infrastructure, particularly in developing countries.

2.3.1 Public Climate Finance and Mitigation Goals

Public climate finance plays a central role in supporting climate mitigation initiatives worldwide. As noted by Buchner et al. (2019), the majority of climate finance flows have been directed toward mitigation activities, including renewable energy development, energy efficiency improvements, and low-carbon infrastructure. These investments are critical for achieving global climate goals, particularly the targets set under the Paris Agreement to limit global warming to well below 2°C above pre-industrial levels. A study by Fankhauser et al. (2020) found that public climate finance has been effective in catalyzing large-scale mitigation projects in developing countries, particularly in regions like sub-Saharan Africa and Asia. These regions, which face significant energy deficits and infrastructure gaps, have benefitted from financing for solar energy, wind power, and energy access programs. For instance, the World Bank and Asian Development Bank have funded multiple renewable energy projects that not only reduce carbon emissions but also enhance energy security in these regions (Pizer et al., 2019). However, despite this progress, there are concerns about the efficiency and scale of these investments. Studies suggest that public finance alone is insufficient to meet the ambitious mitigation goals outlined in the Paris Agreement (Buchner et al., 2019).

2.3.2 Private Sector Finance and Its Role in Mitigation

Private sector finance, particularly through blended finance mechanisms, has emerged as a critical tool for scaling up climate mitigation efforts. The blended finance model, which combines public and private sector funding, has been instrumental in reducing the financial risks associated with climate mitigation projects and attracting larger volumes of private investment (Schmidt et al., 2021). The private sector has been actively involved in financing clean energy technologies such as solar, wind, and electric vehicles, as well as low-carbon technologies in industry and transport.

Several studies have demonstrated that private investments, when effectively leveraged, can significantly enhance the impact of climate finance on mitigation outcomes. According to Obersteiner et al. (2021), private investment has been particularly successful in scaling renewable energy technologies, with large multinational companies and financial institutions making significant contributions to funding green bonds and low-carbon infrastructure projects. Blended finance is seen as an effective strategy to channel funds into high-impact mitigation projects that otherwise might not attract private capital due to perceived risks (Fankhauser et al., 2021).

However, private sector engagement remains limited by barriers such as market imperfections, regulatory uncertainty, and the long payback periods of many mitigation projects. Obersteiner et al. (2021) argue that while the private sector plays a crucial role in climate finance, its contribution needs to be more systematic and well-integrated with public finance mechanisms to maximize its impact on climate mitigation.

2.3.3 Effectiveness of Multilateral Climate Funds in Mitigation

Multilateral climate funds, including the Green Climate Fund (GCF) and Global Environment Facility (GEF), have played a significant role in funding mitigation projects across various regions. These funds are particularly focused on reducing emissions in sectors such as energy, transport, forestry, and land use. A study by Schmidt et al. (2021) indicates that the GCF has contributed to several large-scale projects aimed at reducing emissions, including renewable energy investments and low-emission transport systems in emerging economies like India, South Africa, and Brazil. The GCF has also funded capacity-building projects in developing countries to enhance their ability to implement mitigation strategies and access additional financing (Buchner et al., 2019).

Despite these successes, there is evidence suggesting that the effectiveness of multilateral climate funds in advancing mitigation goals is sometimes hindered by administrative delays, fragmented funding flows, and insufficient monitoring and evaluation mechanisms (Pizer et al., 2019). The complex governance structures and bureaucratic processes within multilateral funds often slow down the disbursement of funds and impede the timely implementation of mitigation projects, reducing their overall impact (Weikmans & Roberts, 2020).

2.3.4 Impact of Climate Finance on Greenhouse Gas Emissions Reductions

One of the key measures of the impact of climate finance is its contribution to greenhouse gas (GHG) emissions reductions. Studies examining the direct impact of climate finance on emissions reduction have shown that it plays a significant role in sectors such as

energy, agriculture, and forestry. For example, Fankhauser et al. (2020) evaluated the impact of climate finance in Latin America and found that investments in renewable energy and energy efficiency have contributed to notable reductions in GHG emissions. These projects not only decrease emissions but also enhance local economies through the creation of green jobs and the development of sustainable industries.

However, Cozzi et al. (2020) highlight the challenge of quantifying the long-term impact of climate finance on emissions reductions, as many projects are still in their early stages of implementation. Emissions reductions from these investments are expected to become more apparent in the medium-to-long term. The lack of robust monitoring and reporting frameworks for climate finance projects makes it difficult to assess the full extent of their impact on global emissions reduction targets (Schmidt et al., 2021).

2.3.5 Challenges in Achieving Climate Mitigation Goals through Finance

Despite the significant mobilization of climate finance, several challenges remain in achieving climate mitigation goals. Cozzi et al. (2020) argue that climate finance has often been insufficient, with a significant funding gap remaining to meet the ambitious targets set by the Paris Agreement. Furthermore, the uneven distribution of climate finance, with a heavy focus on mitigation projects in middle-income countries, has led to challenges in scaling mitigation efforts in the least developed countries (LDCs) and small island developing states (SIDS), which are most vulnerable to climate change impacts.

Another challenge highlighted in the literature is the lack of coordination among climate finance institutions and the fragmentation of funding sources, which can undermine the overall impact of climate finance on mitigation efforts (Weikmans & Roberts, 2020). The inefficiencies in fund allocation and the siloed approach to funding across different sectors and regions further exacerbate these challenges.

3. METHODOLOGY

The methodology for this systematic review on "Funding Climate Action: A Systematic Review of Climate Finance Efficiency and Impact" follows a structured and transparent process to ensure comprehensive and unbiased synthesis of existing empirical evidence. The review begins with a clear research question: How effective and impactful are current climate finance mechanisms in advancing climate mitigation and adaptation goals? To address this, the review includes studies that examine the efficiency, funding sources, allocation patterns, and overall impacts of climate finance mechanisms. A comprehensive search strategy is employed to identify relevant literature from multiple databases, including Google Scholar, Scopus, Web of Science, and specialized environmental finance journals. Keywords such as "climate finance," "efficiency," "impact," "funding sources," and "climate mitigation" are used to capture a wide range of articles, reports, and working papers published between 2010 and 2025.

The inclusion criteria for studies focuses on empirical research that assesses climate finance mechanisms, including both public and private sources, and their effects on climate change mitigation and adaptation. Only peer-reviewed articles, official reports from climate finance institutions (e.g., Green Climate Fund, World Bank), and reputable think tanks are considered. The review specifically excludes opinion pieces, non-empirical studies, and works that are not directly related to climate finance efficiency and impact.

In terms of data extraction, each study is evaluated based on key characteristics: funding sources, allocation patterns, efficiency of finance mechanisms, and measurable outcomes related to climate mitigation and adaptation. Relevant data such as the geographical scope, sector focus (e.g., renewable energy, energy efficiency), and the scale of financing is extracted. A critical appraisal of each study's methodological quality is conducted to assess the reliability and validity of their findings. The data synthesis employed both qualitative and quantitative approaches, organizing the results into thematic areas such as "funding sources," "efficiency of mechanisms," and "impact on mitigation goals." The final synthesis presented a cohesive summary of the evidence, identify gaps in the literature, and suggest directions for future research.

Additionally, a quality assessment using established criteria, such as the Critical Appraisal Skills Programme (CASP) checklist, were performed to evaluate the robustness of the studies included in the review. To ensure reproducibility and transparency, the entire review process followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, providing clear documentation of the search strategy, selection process, and data analysis procedures. By synthesizing a broad range of empirical evidence, this systematic review aimed to provide actionable insights for policymakers, financial institutions, and researchers on optimizing climate finance mechanisms to meet global climate goals effectively.

4. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary of Findings

The summary of findings in this study provides a comprehensive overview of the key insights derived from the empirical literature on climate finance. This section addresses the primary funding sources and allocation patterns, evaluates the

efficiency of current climate finance mechanisms, and examines the impact of climate finance in advancing climate mitigation goals.

4.1.1 Funding Sources and Allocation Patterns in Climate Finance

The literature identifies public and private sector sources as the primary drivers of climate finance, with the former predominantly channeling funds through multilateral climate funds (such as the Green Climate Fund and Global Environment Facility) and national governments. Public funding has been critical in addressing the funding gap for climate mitigation and adaptation projects in developing countries, especially in regions like sub-Saharan Africa, South Asia, and Latin America. Buchner et al. (2019) emphasize the vital role of multilateral institutions in distributing climate finance, although there are concerns about the efficiency of fund allocation due to complex bureaucratic processes.

On the other hand, private sector finance has gained significant momentum, primarily through blended finance models that combine public and private investments. Private investments in green bonds, climate-friendly infrastructure, and renewable energy projects are increasingly becoming crucial in scaling up climate action, with Obersteiner et al. (2021) suggesting that these private capital flows are essential to bridge the financing gap. However, private sector contributions are often hindered by the long payback periods and perceived risks of investing in climate-related projects.

Allocation patterns are observed to heavily favor mitigation projects, especially in renewable energy and energy efficiency, with some regions—especially middle-income countries—receiving a disproportionate share of funding. Research by Schmidt et al. (2021) highlights a geographical and sectoral imbalance in funding allocation, with energy and infrastructure receiving the largest shares, while adaptation measures—particularly those targeting vulnerable populations—are often underfunded. This imbalance raises concerns about the long-term sustainability and inclusivity of climate finance.

4.1.2 Efficiency of Current Climate Finance Mechanisms

The efficiency of climate finance mechanisms has been a critical area of research, with studies consistently pointing to both strengths and weaknesses in current funding structures. Buchner et al. (2019) argue that while there has been a marked increase in funding flows, the administrative burden and complex governance structures of multilateral funds often delay the disbursement of funds, hindering timely implementation of climate projects. The Green Climate Fund (GCF), for instance, has been praised for its ambition but criticized for slow fund allocation and burdensome application processes (Pizer et al., 2019).

On the other hand, blended finance models, which involve the combination of public and private funds, have been noted for their ability to overcome barriers to private investment in climate action, by reducing risks and enhancing financial viability (Schmidt et al., 2021). However, Cozzi et al. (2020) highlight that these mechanisms are still relatively new and that their effectiveness remains limited by the lack of transparency in fund allocation and the difficulty of measuring impact. While some studies argue that blended finance has succeeded in scaling up renewable energy projects, it is also noted that the complexity of blending private and public funds can sometimes lead to inefficiencies, such as administrative fragmentation and increased transaction costs (Weikmans & Roberts, 2020).

Overall, the literature suggests that while current mechanisms are making significant strides in mobilizing funds, there is a need for greater efficiency in fund distribution and a streamlined governance framework to enhance the impact of climate finance. Improving monitoring systems and coordination among funding institutions is also crucial to ensure that financial resources are allocated where they are needed most.

4.1.3 Climate Finance in Advancing Climate Mitigation Goals

The impact of climate finance on advancing climate mitigation goals is generally seen as positive but uneven. Numerous studies highlight that investments in renewable energy, energy efficiency, and sustainable infrastructure have led to significant emissions reductions in some regions, particularly in middle-income countries. Fankhauser et al. (2020) found that projects funded by the GCF in countries like India and South Africa have been instrumental in scaling renewable energy solutions, contributing to substantial reductions in carbon emissions. Similarly, research by Obersteiner et al. (2021) shows that private investments in green bonds and low-carbon technologies have contributed significantly to emissions reductions in high-growth sectors such as transport and industry.

However, the quantification of impact is challenging. While short-term outcomes are often measurable in terms of project implementation and funding disbursement, the long-term impact on emissions reductions is less clear. Cozzi et al. (2020) point out that many climate finance projects are still in their early stages, and it will take years before their full environmental impact is realized. Moreover, Pizer et al. (2019) emphasize that the effectiveness of climate finance mechanisms in achieving global mitigation targets is constrained by issues such as the fragmentation of funding, insufficient integration of adaptation and

mitigation goals, and misaligned priorities in the allocation of funds. These factors lead to concerns that climate finance alone will not be sufficient to meet the ambitious targets set by the Paris Agreement.

In conclusion, while climate finance has proven impactful in advancing mitigation goals, its long-term effectiveness remains uncertain due to challenges in monitoring, funding gaps, and geographic imbalances. More comprehensive frameworks for evaluating impact and aligning finance with mitigation priorities are essential to maximize the benefits of climate finance in addressing global climate change.

4.2 Conclusions

4.2.1 Funding Sources and Allocation Patterns in Climate Finance

In conclusion, the empirical literature on key funding sources and allocation patterns in climate finance reveals that both public and private sources are essential for scaling up climate action. Multilateral funds, such as the Green Climate Fund (GCF), along with private sector investments in green bonds and blended finance, have emerged as critical mechanisms. However, the allocation patterns show a clear prioritization of mitigation over adaptation projects, and certain regions, especially middle-income countries, receive a disproportionate share of funding, while vulnerable areas often face underfunding.

4.2.2 Current Climate Finance Mechanisms' Efficiency

Regarding current climate finance mechanisms' efficiency, the literature underscores the effectiveness of multilateral funds in mobilizing resources but highlights significant inefficiencies due to bureaucratic delays, complex administrative structures, and fragmented governance. These factors hinder the timely disbursement of funds and the successful implementation of climate projects. Blended finance models have shown potential in overcoming barriers to private investment, yet challenges such as high transaction costs and lack of transparency persist, reducing overall efficiency.

4.2.3 Climate Finance in Advancing Climate Mitigation Goals

Finally, on the impact of climate finance in advancing climate mitigation goals, the literature suggests that investments in renewable energy, energy efficiency, and sustainable infrastructure have contributed positively to emissions reductions, particularly in developing countries. However, the long-term impact remains difficult to measure due to the early stages of many projects and challenges in tracking emissions reductions. While climate finance has made significant strides in mitigating climate change, its full potential has yet to be realized, and its contribution to global mitigation goals will depend on improving the alignment of finance with mitigation priorities, enhancing monitoring systems, and addressing funding gaps.

4.3 Recommendations

Based on the findings of the study on "Funding Climate Action: A Systematic Review of Climate Finance Efficiency and Impact", the following four key recommendations are made to enhance the effectiveness and impact of climate finance:

4.3.1 Improved Allocation to Adaptation and Vulnerable Regions

There is a pressing need to rebalance the allocation of climate finance by prioritizing adaptation projects and directing more funds to the most vulnerable regions, particularly low-income and least-developed countries. This ensures that the most affected populations receive adequate support to build resilience to climate impacts.

4.3.2 Streamlining Governance and Administrative Processes

To improve the efficiency of climate finance, it is critical to simplify bureaucratic procedures and reduce delays in fund disbursement. Multilateral institutions, such as the Green Climate Fund (GCF), should expedite access to resources, ensuring faster implementation of climate projects.

4.3.3 Enhancing Monitoring and Evaluation Systems

Robust monitoring, reporting, and verification (MRV) systems are essential to assess the impact of climate finance accurately. Improved tracking of emissions reductions and long-term outcomes will ensure transparency, accountability, and better measurement of progress toward climate mitigation and adaptation goals.

4.3.4 Encouraging Private Sector Investment

To scale up climate finance, governments and multilateral institutions must create more favorable conditions for private sector investment in climate projects. This can be achieved through innovative financial instruments, risk mitigation strategies, and incentives that attract private capital to support sustainable development and climate action.

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