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Climate finance in South Asia: Evolution, challenges, and future prospects

Imran Uddin[1], Dr. Joyeeta Deb[2]
[1] Research Scholar, Department of Business Administration, Assam University, Silchar, Assam, India
[2] Professor, Department of Business Administration, Assam University Silchar, Assam, India
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Abstract
Climate finance has become a fundamental pillar of global efforts to address climate change by supporting mitigation, adaptation, resilience-building, and sustainable development. Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, the global climate finance architecture has evolved through successive international agreements, including the Kyoto Protocol, the Paris Agreement, the Glasgow Climate Pact, and the establishment of the Loss and Damage Fund. Despite these developments, significant disparities persist in the mobilisation, allocation, accessibility, and effectiveness of climate finance, particularly in developing and climate-vulnerable regions such as South Asia. The region faces increasing climate-related risks, including floods, cyclones, droughts, and glacier retreat, sea-level rise, and biodiversity loss, while facing substantial financial constraints in implementing climate mitigation and adaptation measures. This review paper examines the evolution, current landscape, major challenges, future prospects, and policy implications of climate finance in South Asia. Adopting a systematic narrative review approach, the study synthesises evidence from peer-reviewed journal articles, books, institutional reports, policy documents, and publications from international organisations, including the UNFCCC, IPCC, ADB, World Bank, OECD, CPI, GCF, and UNEP. The review analyses the principal sources, financial instruments, sectoral priorities, country-specific patterns, governance mechanisms, and institutional arrangements shaping climate finance across South Asia.
The findings indicate that although climate finance to South Asia has increased over the past decade, available financial resources remain well below the region's investment requirements. Major challenges include inadequate funding, unequal distribution across countries and sectors, complex access procedures, weak institutional capacity, governance deficiencies, limited private-sector participation, debt sustainability concerns, and fragmented monitoring and reporting systems. The effectiveness of climate finance will depend on stronger international cooperation, enhanced domestic resource mobilisation, institutional reforms, improved governance, integration of climate finance into national development planning, and expanded regional collaboration. The paper concludes with policy recommendations to strengthen the mobilisation, allocation, governance, and utilisation of climate finance. By integrating global developments with regional perspectives, this review contributes to the growing climate finance literature and provides a useful reference for researchers, policymakers, development partners, and financial institutions working towards climate-resilient and sustainable development in South Asia.

Keywords: Climate finance, South Asia, climate change, adaptation finance, mitigation finance, sustainable development, climate policy

Introduction

Climate change has emerged as one of the most pressing global challenges of the twenty-first century, posing significant environmental, economic, and social risks worldwide. Rising temperatures, changing precipitation patterns, more frequent extreme weather events, glacier retreat, sea-level rise, biodiversity loss, and ecosystem degradation are increasingly threatening livelihoods, infrastructure, food security, water resources, and economic development (IPCC, 2023; UNEP, 2023 [1]; World Meteorological Organization [WMO], 2024) [56]. According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2023) [34], human-induced greenhouse gas emissions have unequivocally altered the Earth's climate system, with disproportionately severe consequences for developing countries owing to their high dependence on climate-sensitive sectors, limited adaptive capacity, and institutional constraints.

Addressing these challenges requires substantial financial resources to support both mitigation, which reduces greenhouse gas emissions, and adaptation, which strengthens resilience to unavoidable climate impacts. Consequently, climate finance has become a central pillar of global climate governance and sustainable development. It encompasses financial resources mobilised from public, private, bilateral, multilateral, and innovative sources to support climate-related investments, technological innovation, institutional capacity building, and policy implementation (UNFCCC, 2023; OECD, 2023; CPI, 2023; Buchner *et al*., 2023) [9]. Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992[64], successive international agreements—including the Kyoto Protocol, Paris Agreement, and recent Conference of the Parties (COP) decisions—have progressively expanded climate finance commitments and strengthened institutional mechanisms such as the Global Environment Facility (GEF), Adaptation Fund, Green Climate Fund (GCF), and multilateral development banks (MDBs) (UNFCCC, 2023; GCF, 2024; ADB, 2024) [1, 3]. Despite these institutional advances, global climate finance remains substantially below estimated investment requirements. Although climate finance has grown considerably over the past decade, current financial flows remain insufficient to achieve the

objectives of the Paris Agreement, particularly in developing countries where adaptation financing gaps continue to widen (CPI, 2023; UNEP, 2023; OECD, 2023) [4]. This imbalance is particularly evident in South Asia, a region comprising Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, which accommodates nearly one-fourth of the world's population while facing some of the highest levels of climate vulnerability (IPCC, 2023; ADB, 2024) [2, 34]. Increasing frequencies of floods, cyclones, droughts, heatwaves, glacial lake outburst floods, sea-level rise, and changing monsoon patterns threaten agriculture, public health, water security, biodiversity, infrastructure, and long-term economic growth across the region (World Bank, 2023; UNEP, 2023; IPCC, 2023) [80].

The region's vulnerability is further intensified by rapid urbanisation, persistent poverty, dependence on climate-sensitive sectors, inadequate infrastructure, and uneven institutional capacity. Although international organisations, including the Asian Development Bank (ADB), World Bank, Green Climate Fund (GCF), Global Environment Facility (GEF), and bilateral development partners, have significantly expanded climate-related investments in renewable energy, climate-smart agriculture, disaster risk reduction, sustainable transport, coastal protection, and resilient infrastructure, important concerns remain regarding the adequacy, accessibility, equity, and effectiveness of these financial flows (ADB, 2024; World Bank, 2023; GCF, 2024; OECD, 2023) [56, 80, 83]. Access to climate finance continues to be constrained by complex institutional procedures, limited project preparation capacity, governance challenges, and insufficient private-sector participation (Halimanjaya, 2015; Betzold & Weiler, 2017; Doku *et al*., 2021; Roberts *et al*., 2021) [7, 13, 25, 52]. Furthermore, global climate finance remains disproportionately concentrated in mitigation activities, whereas South Asia's urgent adaptation needs—including climate-resilient agriculture, water management, disaster preparedness, and coastal resilience—remain significantly underfunded (Buchner *et al*., 2023; CPI, 2023; Pauw *et al*., 2020) [9, 51].

The growing importance of climate finance has generated extensive scholarly attention. Existing research has examined climate finance allocation (Clist, 2011; Halimanjaya, 2015; Betzold & Weiler, 2017) [7, 25, 43], governance and institutional quality (Michaelowa & Michaelowa, 2011; Doku *et al*., 2021) [13], adaptation finance (Pauw *et al*., 2020) [51], climate finance tracking (Buchner *et al*., 2023) [75], and the role of multilateral development banks and international climate funds (ADB, 2024; World Bank, 2023) [37, 56]. However, much of the literature remains fragmented, focusing on individual countries, financing mechanisms, or sector-specific issues. Limited attention has been given to developing an integrated understanding of the evolution, institutional architecture, regional challenges, emerging opportunities, and policy directions of climate finance in South Asia, particularly in light of recent developments such as the Glasgow Climate Pact, the Loss and Damage Fund, and negotiations on the New Collective Quantified Goal (NCQG) (UNFCCC, 2023; OECD, 2024) [6, 76]. Against this backdrop, the present study provides a comprehensive conceptual review of climate finance in South Asia by integrating evidence from academic literature, international reports, and policy documents. It examines the evolution of climate finance, analyses its institutional architecture, synthesises key regional challenges and emerging opportunities, and proposes strategic policy directions for strengthening climate finance systems in South Asia. By linking global climate finance developments with regional realities, the study contributes to the growing body of climate finance literature and provides an updated conceptual framework to support evidence-based policymaking, institutional reform, and climate-resilient and sustainable development across the region.

Review of Literature

1. Evolution of Climate Finance Literature

The evolution of climate finance has attracted extensive scholarly attention over the past three decades, reflecting its transformation from a relatively narrow environmental funding mechanism into a comprehensive global financial architecture supporting climate mitigation, adaptation, resilience, and sustainable development. Early studies distinguished climate finance from traditional development assistance by emphasising its role in addressing the additional costs of climate action while promoting the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) under the United Nations Framework Convention on Climate Change (UNFCCC) (Bird & Brown, 2010; Gupta *et al*., 2007; UNFCCC, 1992) [64, 67, 69]. Subsequent research further recognised climate finance as a key instrument for mobilising international financial resources, facilitating technology transfer, strengthening institutional capacity, and supporting low-carbon and climate-resilient development pathways (Falconer & Stadelmann, 2014; Buchner *et al*., 2015; OECD, 2015) [17, 27].

A substantial body of literature identifies successive international climate agreements as major milestones shaping the evolution of climate finance. The Kyoto Protocol introduced legally binding emission reduction commitments and market-based mechanisms, while the Bali Action Plan, Copenhagen Accord, Cancun Agreements, Paris Agreement, Glasgow Climate Pact, and subsequent Conference of the Parties (COP) decisions progressively expanded financial commitments, institutional arrangements, and accountability frameworks for supporting developing countries (Roberts & Weikmans, 2017[77]; Weikmans & Roberts, 2019; Bodansky, 2016; IPCC, 2022; OECD, 2024). Collectively, these developments transformed climate finance from a voluntary funding mechanism into a central component of global climate governance. Scholars have also examined the institutional evolution of climate finance through the establishment and expansion of specialised financing mechanisms, including the Global Environment Facility (GEF), Adaptation Fund (AF), Climate Investment Funds (CIFs), and Green Climate Fund (GCF). These institutions have strengthened the international climate finance architecture by improving resource mobilisation, project financing, institutional coordination, and support for adaptation and mitigation initiatives in developing countries (Porter *et al*., 2008; Schalatek *et al*., 2012; Nakhooda *et al*., 2013[44]; GCF, 2023; ADB, 2024).

Recent literature demonstrates that climate finance has become increasingly diversified beyond traditional public funding. Alongside bilateral and multilateral assistance, growing attention has been devoted to private investment,

blended finance, green bonds, sustainability-linked finance, carbon markets, climate insurance, and other innovative financial instruments as essential mechanisms for narrowing the global climate investment gap (Buchner *et al*., 2019; OECD, 2022; CPI, 2023; CPI, 2024) [2, 9, 45, 48]. At the same time, researchers have increasingly focused on issues of finance mobilisation, accessibility, transparency, effectiveness, accountability, and equitable allocation, particularly for climate-vulnerable developing countries facing widening adaptation financing gaps (UNEP, 2023; OECD, 2024; IPCC, 2022) [34, 61]. Although the existing literature provides valuable insights into the historical evolution, institutional development, financing mechanisms, governance arrangements, and mobilisation of climate finance, most studies examine these dimensions independently rather than through an integrated analytical framework (Bird & Brown, 2010; Nakhooda *et al*., 2013; Halimanjaya, 2015; Betzold & Weiler, 2017[7, 8, 27, 44]; Buchner *et al*., 2019; Doku *et al*., 2021) [13]. Comparatively limited attention has been devoted to synthesising the evolution of climate finance with its institutional architecture, regional financing dynamics, implementation challenges, emerging opportunities, and policy responses, particularly within the South Asian context (ADB, 2024; OECD, 2024; UNEP, 2023; CPI, 2024) [1, 3]. This fragmentation highlights the need for a comprehensive conceptual review that integrates these complementary dimensions to provide a holistic understanding of climate finance and establish a stronger foundation for future research and policy formulation in South Asia. The following subsection therefore examines the principal theoretical and conceptual perspectives that underpin the climate finance literature.

2. Theoretical and Conceptual Perspectives

The conceptual foundations of climate finance have evolved alongside international climate governance, sustainable development, and environmental economics. The literature broadly defines climate finance as financial resources mobilised from public, private, domestic, and international sources to support climate change mitigation, adaptation, resilience building, and low-carbon development (UNFCCC, 1992[64]; Gupta *et al*., 2007; IPCC, 2022; OECD, 2024) [3]. However, scholars differ in their interpretations regarding its objectives, governance, financing principles, allocation mechanisms, and developmental outcomes, resulting in several complementary theoretical perspectives. The Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) principle remains the cornerstone of international climate finance. It recognises that developed countries bear greater historical responsibility for greenhouse gas emissions and therefore have a greater obligation to provide financial and technological support to developing countries (UNFCCC, 1992; Gupta *et al*., 2007; Bodansky, 2016; Rajamani, 2016). This principle has guided successive climate negotiations and continues to shape debates on financial commitments, burden sharing, accountability, and equity under the Paris Agreement and subsequent COP decisions (Roberts & Weikmans, 2017[77]; Weikmans & Roberts, 2019; UNFCCC, 2023).

Another influential perspective is Climate Justice Theory, which extends climate finance beyond environmental protection by emphasising historical responsibility, distributive justice, and social equity. Scholars argue that countries contributing least to global emissions often experience the greatest climate impacts and therefore require greater financial support for adaptation and resilience building (Caney, 2010[69]; Ciplet *et al*., 2015; Roberts & Weikmans, 2017[77]; IPCC, 2022). Consequently, climate finance is increasingly viewed as an instrument for promoting equitable and inclusive development rather than merely financing environmental projects.

The literature also draws extensively on Sustainable Development Theory, which positions climate finance as a catalyst for achieving the Sustainable Development Goals (SDGs) through investments in renewable energy, resilient infrastructure, climate-smart agriculture, biodiversity conservation, disaster risk reduction, and green economic transformation (Sachs, 2015; IPCC, 2022; UNEP, 2023; OECD, 2024) [19, 22, 23, 83]. Closely related to this perspective are Public Goods Theory and Market Failure Theory, which consider climate change a global public goods problem requiring coordinated international financing, policy intervention, and collaboration among governments, multilateral institutions, and private investors to correct market failures and mobilise long-term climate investment (Stern, 2007; Stiglitz, 2015; Buchner *et al*., 2019; CPI, 2024) [2, 19, 48, 54]. Although these theoretical perspectives have substantially enriched the climate finance literature, they are generally applied in isolation. Comparatively few studies integrate climate justice, sustainable development, institutional governance, financing effectiveness, and market-based approaches into a unified conceptual framework, particularly within the South Asian context (Halimanjaya, 2015; Betzold & Weiler, 2017; Doku *et al*., 2021; OECD, 2024[3, 7, 13, 27]; ADB, 2024). This study addresses this gap by synthesising these complementary perspectives to develop an integrated conceptual understanding of climate finance that informs the subsequent discussion of regional challenges, opportunities, and policy directions.

3. Empirical Climate Finance Literature

Global climate finance research has expanded substantially over the past two decades, with increasing emphasis on the determinants, allocation patterns, governance, effectiveness, financing instruments, and developmental impacts of climate finance. Collectively, the literature demonstrates that climate finance allocation is influenced by a complex interaction of economic, institutional, environmental, and political factors rather than by a single determinant (Halimanjaya, 2015; Betzold & Weiler, 2017[7, 27]; Weikmans & Roberts, 2019; Doku *et al*., 2021; Buchner *et al*., 2023) [9, 52]. Recent studies also indicate that climate finance has evolved beyond public-sector assistance to incorporate private investment, blended finance, green bonds, carbon markets, climate insurance, and sustainability-linked financial instruments, thereby broadening the global climate finance architecture (OECD, 2022; CPI, 2023; OECD, 2024; CPI, 2024) [2, 5, 75]. One major stream of research examines the determinants of climate finance allocation. Existing evidence consistently shows that climate vulnerability, adaptive capacity, institutional quality, governance effectiveness, policy credibility, and project implementation capacity significantly influence access to international climate finance (Halimanjaya, 2015; Betzold & Weiler, 2017; Doku

et al., 2021; Roberts & Weikmans, 2017) [7, 13, 25, 77]. However, findings regarding the influence of macroeconomic variables such as GDP, population, carbon emissions, and income levels remain mixed, suggesting that climate finance allocation is shaped by multiple political, institutional, and developmental considerations rather than purely economic criteria (Clist, 2011[43]; Michaelowa & Michaelowa, 2011; Weikmans & Roberts, 2019) [48].

Another prominent area of research focuses on the distribution of adaptation and mitigation finance. Numerous studies reveal that mitigation activities—including renewable energy, energy efficiency, and sustainable transport—continue to receive a substantially larger share of climate finance because of their stronger investment potential and greater private-sector participation (Buchner *et al*., 2019; CPI, 2023[9]; OECD, 2024). In contrast, adaptation finance remains insufficient despite growing climate vulnerability and escalating adaptation needs in developing countries, leading to persistent financing gaps that threaten long-term climate resilience (IPCC, 2022; UNEP, 2023; OECD, 2024) [2, 32, 34].

The literature has also devoted considerable attention to the effectiveness of climate finance. Studies generally conclude that climate finance contributes positively to renewable energy deployment, resilient infrastructure, climate-smart agriculture, disaster risk reduction, institutional strengthening, and sustainable development when supported by effective governance, transparent financial management, sound project preparation, and strong monitoring systems (Bird & Brown, 2010; Nakhooda *et al*., 2013[8, 44]; Falzon & O'Sullivan, 2020; OECD, 2022; World Bank, 2023) [80]. Nevertheless, weak institutions, fragmented governance, limited technical capacity, and inadequate accountability continue to reduce the effectiveness of climate finance in many developing countries (Halimanjaya, 2015; Doku *et al*., 2021; ADB, 2024) [2, 13, 25]. More recent research highlights the growing importance of innovative financing mechanisms in addressing the widening global climate investment gap. Green bonds, blended finance, sustainability-linked finance, debt-for-climate swaps, climate insurance, and private-sector investment are increasingly recognised as complementary instruments capable of mobilising additional financial resources beyond conventional public funding (Stiglitz, 2015[19]; Buchner *et al*., 2019; CPI, 2024; OECD, 2024) [24]. However, scholars consistently argue that scaling up these instruments requires supportive regulatory frameworks, mature financial markets, transparent governance, effective risk-sharing mechanisms, and stronger institutional capacity (OECD, 2022; CPI, 2024; World Bank, 2023) [80].

Although global climate finance research has significantly advanced understanding of financing mechanisms, allocation patterns, governance, and investment effectiveness, the literature remains fragmented across individual themes, sectors, and geographical regions (Halimanjaya, 2015; Betzold & Weiler, 2017; Doku *et al*., 2021; Buchner *et al*., 2023) [7, 9, 13, 27]. Comparatively limited attention has been devoted to integrating these diverse dimensions into a comprehensive regional framework, particularly for South Asia, where financing needs, institutional capacities, and climate vulnerabilities differ considerably across countries (ADB, 2024; OECD, 2024; UNEP, 2023) [2, 34]. The following subsection therefore reviews the existing climate finance literature specific to South Asia.

4. South Asian Climate Finance Literature

South Asia has increasingly become a focal region in climate finance research because of its high climate vulnerability, rapid economic transformation, and substantial adaptation and mitigation financing needs (ADB, 2021; World Bank, 2022; IPCC, 2022; UNEP, 2023) [60, 61, 80]. Existing studies consistently identify inadequate financial resources, institutional constraints, weak governance, limited private-sector participation, and restricted access to international climate funds as major barriers to climate finance mobilisation across the region (ADB, 2024; CPI, 2024; OECD, 2024; ESCAP, 2023) [24, 75, 83]. However, the literature remains uneven both geographically and thematically. Country-specific research is dominated by India and Bangladesh. Studies on India primarily examine renewable energy finance, green bonds, carbon markets, blended finance, and public-private partnerships supporting low-carbon development (Bhattacharya *et al*., 2016; CPI, 2023; IEA, 2023) [1], whereas research on Bangladesh focuses largely on adaptation finance, disaster risk reduction, coastal resilience, and national climate trust funds (Huq & Ayers, 2008; Rai *et al*., 2015; World Bank, 2022) [19, 22]. By comparison, literature relating to Pakistan, Nepal, Bhutan, Sri Lanka, Maldives, and Afghanistan remains relatively limited and generally concentrates on climate vulnerability, disaster resilience, renewable energy, or policy implementation rather than comprehensive climate finance systems (ADB, 2021; ESCAP, 2023; UNEP, 2023) [31, 75].

Regional assessments further indicate that although international climate finance to South Asia has increased in recent years, investment remains substantially below estimated requirements. Reports published by the Asian Development Bank, Climate Policy Initiative, OECD, UNEP, World Bank, and UN agencies consistently highlight widening adaptation financing gaps, inadequate domestic resource mobilisation, fragmented institutional arrangements, weak project preparation capacity, and limited mobilisation of private investment as persistent challenges constraining climate finance effectiveness in the region (ADB, 2024; CPI, 2024; OECD, 2024; UNEP, 2023; World Bank, 2023) [75, 80, 83]. Overall, existing South Asian literature provides valuable insights into country-specific financing experiences; however, comprehensive regional syntheses remain scarce. Most studies examine individual countries, sectors, financing instruments, or policy issues independently, with relatively little attention given to integrating the historical evolution, institutional architecture, financing landscape, governance, implementation challenges, emerging opportunities, and policy responses within a single conceptual framework. This gap provides the principal rationale for the present review.

Table 1.2. Summary of Major Studies on Climate Finance

Author(s) (Year)	Study Area	Research Focus	Methodology	Major Findings	Identified Limitation
Bird & Brown (2010)	Global	Concept and evolution of climate finance	Conceptual review	• Distinguished climate finance from traditional development assistance. • Highlighted key financing principles.	• Limited discussion of regional implementation and governance.
Gupta et al. (2007)	Global	Climate justice and CBDR-RC	Policy analysis	• Emphasised differentiated responsibilities in international climate finance obligations.	• Limited assessment of financing mechanisms.
Nakhooda et al. (2013)	Global	Climate finance architecture	Institutional review	• Explained evolution of multilateral climate funds and financing institutions.	• Did not evaluate regional financing effectiveness.
Halimanjaya (2015)	Developing countries	Determinants of climate finance	Quantitative analysis	• Governance quality and institutional capacity significantly influence climate finance allocation.	• South Asia not analysed separately.
Betzold & Weiler (2017)	Global	Allocation of adaptation finance	Econometric analysis	• Climate vulnerability positively influences adaptation finance allocation.	• Limited assessment of mitigation finance.
Roberts & Weikmans (2017)	Global	International climate finance commitments	Policy review	• Identified persistent gaps between financial commitments and actual disbursements.	• Limited regional comparison.
Buchner et al. (2019)	Global	Global climate finance flows	Climate Policy Initiative assessment	• Private finance has become increasingly important source of climate investment.	• Does not focus on South Asian countries.
Doku, Ncwadi & Phiri (2021)	Africa	Determinants of climate finance	Panel regression	• Institutional quality and macroeconomic factors significantly affect climate finance mobilisation.	• Findings limited to African economies.
IPCC (2022)	Global	Climate finance and adaptation	Assessment Report	• Current climate finance remains insufficient to meet adaptation and mitigation requirements.	• Broad global assessment with limited regional detail.
ADB (2024)	South Asia	Climate finance in Asia	Regional policy assessment	• South Asia requires substantial scaling-up of climate finance and stronger institutional capacity.	• Focuses mainly on policy recommendations rather than integrated conceptual analysis.

Source: Author's compilation based on UNFCCC (2024); OECD (2023); ADB (2023); GCF (2023); World Bank (2023) and other relevant sources.

5. Critical Synthesis of the Literature

The reviewed literature demonstrates that climate finance has evolved into a multidisciplinary field encompassing international climate governance, institutional architecture, financing mechanisms, adaptation and mitigation finance, climate justice, sustainable development, and innovative financial instruments (Bird & Brown, 2010; Nakhooda *et al*., 2013; Halimanjaya, 2015; Betzold & Weiler, 2017[7, 8, 27, 44]; Buchner *et al*., 2019; Doku *et al*., 2021; IPCC, 2022[13, 45]; CPI, 2024). Collectively, these studies have significantly improved understanding of climate finance mobilisation, allocation, governance, and implementation across developed and developing economies. Despite these contributions, several important limitations remain. First, much of the existing literature examines climate finance through isolated perspectives—such as financing mechanisms, governance, adaptation, mitigation, or institutional arrangements—rather than adopting an integrated analytical framework (Halimanjaya, 2015; Betzold & Weiler, 2017[7, 27]; Weikmans & Roberts, 2019). Second, most empirical studies focus either on global trends or individual countries, while comprehensive regional syntheses for South Asia remain relatively scarce (ADB, 2024; OECD, 2024; UNEP, 2023) [1, 81]. Third, although recent institutional reports provide updated evidence on climate finance flows, financing gaps, and emerging instruments, relatively few studies integrate these developments with the historical evolution, institutional architecture, regional financing landscape, implementation challenges, future opportunities, and policy responses within a single conceptual framework (CPI, 2024; OECD, 2024; World Bank, 2023; GCF, 2024) [56, 76, 80].

These limitations reveal a clear need for a comprehensive and up-to-date conceptual review that synthesises academic research with recent policy and institutional developments. Responding to this need, the present study develops an integrated understanding of climate finance in South Asia by examining its evolution, institutional architecture, financing landscape, key challenges, emerging opportunities, and policy implications. The specific research gaps addressed by the study are presented in the following section.

Figure 1 Literature Review Framework illustrating the progression from existing knowledge on climate finance to the identification of the research gap and the conceptual contribution of the present study.

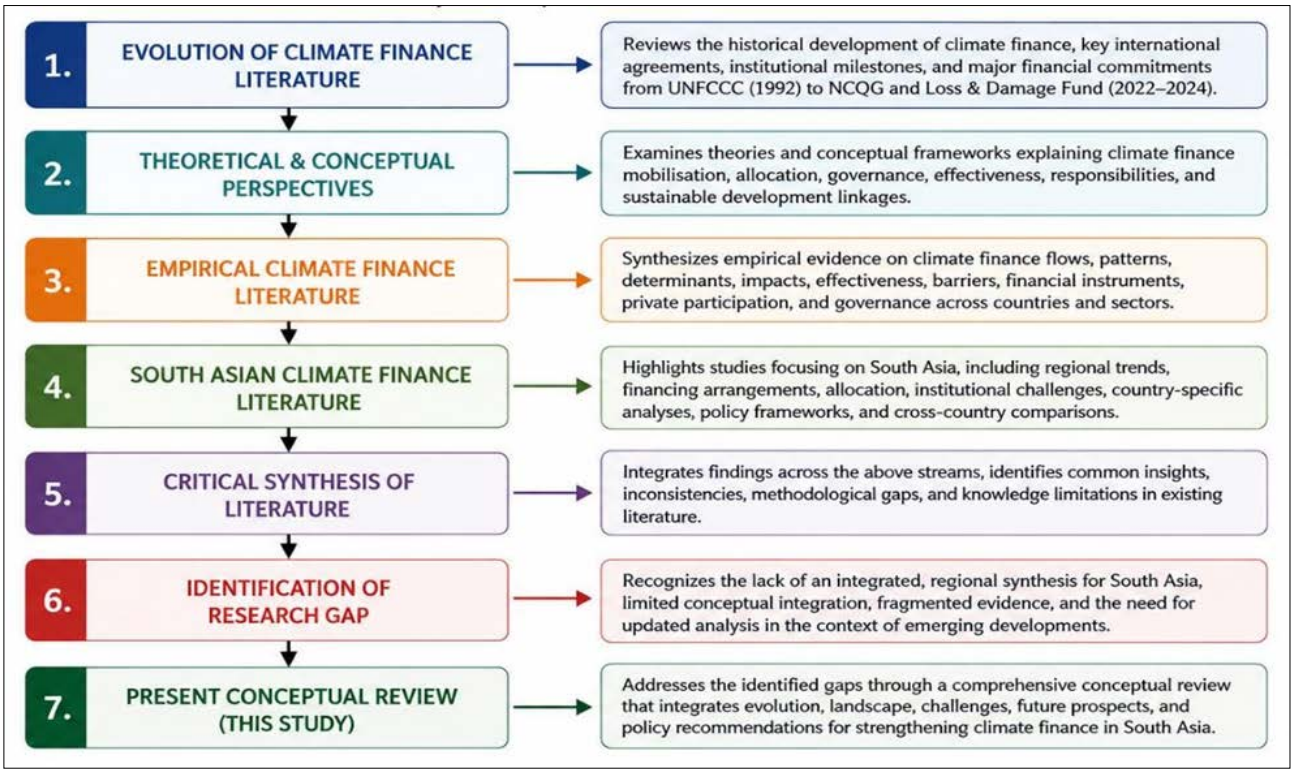

Fig 1: Conceptual Framework of the Literature Review

Figure 1 illustrates the thematic organization of the literature reviewed in this study. The framework shows that previous research has primarily focused on the evolution of climate finance, financing mechanisms, institutional arrangements, regional experiences, implementation challenges, and policy responses. This structure provides the conceptual foundation for identifying existing knowledge and guiding the subsequent analysis of climate finance in South Asia.

Research Gap

The existing literature has substantially advanced the understanding of climate finance by examining its conceptual evolution, institutional architecture, financing mechanisms, governance arrangements, adaptation and mitigation financing, and the role of international climate funds. Previous studies have also investigated the determinants of climate finance allocation, financing gaps, climate vulnerability, institutional quality, and the effectiveness of climate finance in both developed and developing economies. Furthermore, reports published by international organisations such as the UNFCCC, IPCC, OECD, CPI, ADB, UNEP, and the World Bank provide valuable insights into global climate finance trends, investment requirements, and policy developments.

Despite these contributions, several important research gaps remain. First, the existing literature is largely fragmented, with most studies focusing on individual aspects of climate finance, such as adaptation finance, mitigation finance, governance, financing mechanisms, or institutional arrangements, rather than integrating these dimensions into a comprehensive conceptual framework. Second, while numerous studies analyse global climate finance or individual countries, relatively few provide an integrated regional synthesis specifically focusing on South Asia. Third, existing review studies seldom combine the historical evolution of climate finance with the contemporary financing landscape, institutional architecture, implementation challenges, emerging financing mechanisms, and policy responses within a single analytical framework. Finally, the rapidly evolving international climate finance architecture, including recent developments under the Paris Agreement, Loss and Damage Fund, and the New Collective Quantified Goal (NCQG), has created a need for updated conceptual reviews that incorporate these emerging developments.

Accordingly, this study addresses these gaps by providing a comprehensive conceptual review of climate finance in South Asia. It integrates the historical evolution of climate finance, regional financing architecture, funding sources, financial instruments, institutional arrangements, implementation challenges, future financing opportunities, and policy recommendations within a unified analytical framework. By synthesising evidence from academic literature and major international institutions, the study aims to provide a holistic understanding of climate finance while identifying strategic priorities for strengthening climate finance mobilisation and effectiveness in South Asia.

Although climate finance has received increasing academic attention, existing studies remain fragmented in terms of geographical focus, thematic coverage, and policy integration. Figure 2 summarizes the major research gaps that provide the rationale for the present study.

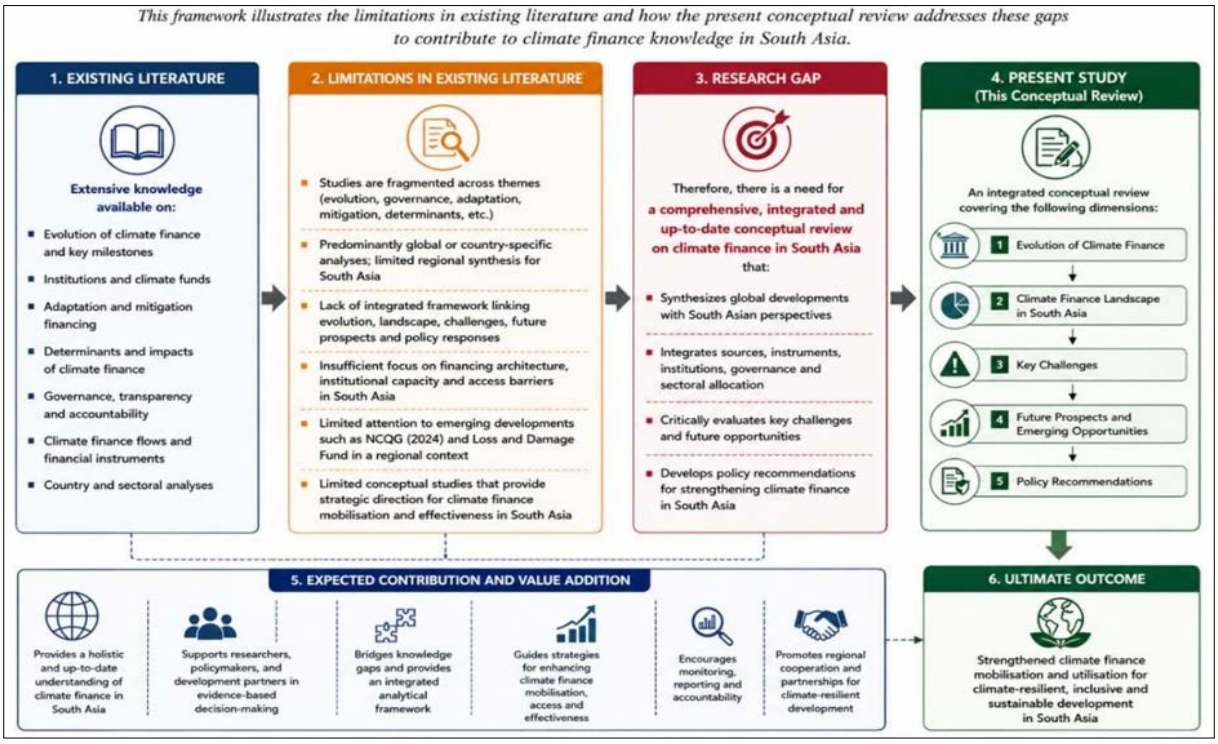

Fig 2: Research Gap Framework of the study

Figure 2 highlights the key research gaps identified from the literature review. It demonstrates that limited attention has been given to integrated analyses of climate finance evolution, institutional architecture, regional challenges, and future policy directions within the South Asian context. Addressing these gaps forms the primary motivation and contribution of the present conceptual review.

Objectives of the Study

The present study aims to achieve the following objectives:

- To examine the evolution of climate finance and its changing policy and institutional landscape from global to South Asian perspectives.
- To synthesize and critically review the existing literature on climate finance, with particular emphasis on South Asia, in order to identify major trends, challenges, and knowledge gaps.
- To develop an integrated conceptual understanding of the climate finance architecture in South Asia, including funding sources, institutions, financial instruments, and priority investment sectors.
- To identify the key challenges and emerging opportunities influencing the mobilization, allocation, and effectiveness of climate finance in South Asia.
- To propose a comprehensive policy framework and future strategic directions for strengthening climate finance and promoting climate-resilient and sustainable development in South Asia.

Research Methodology

1. Research Design

This study adopts a systematic narrative review approach to synthesise and critically evaluate the existing body of knowledge on climate finance in South Asia. The review combines a structured literature search with thematic synthesis to examine the evolution, institutional architecture, financing landscape, implementation challenges, emerging opportunities, and policy implications of climate finance. A systematic narrative review is particularly appropriate for this study because it enables the integration of conceptual, empirical, and policy-oriented evidence into a coherent analytical framework rather than statistically synthesising empirical findings (Snyder, 2019; Torraco, 2016; Paul & Criado, 2020).

2. Data Sources

The review draws upon peer-reviewed journal articles together with reports and policy documents published by internationally recognised organisations, including the UNFCCC, IPCC, Asian Development Bank (ADB), Green Climate Fund (GCF), Climate Policy Initiative (CPI), OECD, UNEP, World Bank, International Monetary Fund (IMF), Global Environment Facility (GEF), and Climate Investment Funds (CIFs). Academic literature was identified from Scopus, Web of Science, and Google Scholar to ensure broad coverage of both scholarly and policy literature.

3. Literature Search Strategy

The literature search focused primarily on publications from 1992 to 2025, corresponding to the evolution of international climate finance following the adoption of the UNFCCC. Keywords included Climate Finance, South Asia, Climate Change Finance, Adaptation Finance, Mitigation Finance, Green Climate Fund, Climate Investment, Climate Governance, Climate Finance Architecture, and Climate Finance Gap. Reference lists of selected studies were also examined to identify additional relevant publications.

4. Inclusion and Exclusion Criteria

The review included English-language peer-reviewed journal articles, books, book chapters, and reports published by recognised international organisations that addressed climate finance, financing mechanisms, governance, institutions, adaptation, mitigation, and climate policy. Publications not directly related to climate finance, duplicate records, conference abstracts, and non-English studies were excluded.

5. Data Analysis

The selected literature was analysed using thematic synthesis. The reviewed studies were organised into six major themes: (i) evolution of climate finance; (ii) theoretical and conceptual perspectives; (iii) empirical evidence; (iv) climate finance in South Asia; (v) implementation challenges and future prospects; and (vi) policy recommendations. This thematic synthesis enabled the identification of major research trends, areas of consensus, knowledge gaps, and future research priorities while supporting the development of an integrated conceptual framework for understanding climate finance in South Asia.

To ensure a systematic and transparent review process, this study adopts a structured conceptual review methodology based on published academic literature, institutional reports, and policy documents. The overall methodological framework is presented in Figure 3.

Fig 3: Research Methodology Framework of the study

Figure 3 presents the methodological framework adopted in this study. It illustrates the sequential process of research design, literature identification, study selection, thematic analysis synthesis used to develop an integrated understanding of climate finance in South Asia. This approach ensures transparency, consistency, and academic rigor throughout the review.

Evolution of Climate Finance

Climate finance has evolved through successive international agreements, institutional reforms, and financing innovations over the past three decades, transforming from a relatively limited environmental funding mechanism into a comprehensive global financial architecture supporting climate change mitigation, adaptation, technology transfer, capacity building, disaster risk reduction, and sustainable development (UNFCCC, 1992; Gupta *et al*., 2007; Halimanjaya, 2015; Roberts & Weikmans, 2017[27, 77]; Buchner *et al*., 2019; OECD, 2024). Figure 4 summarises the major milestones in this evolution and highlights their implications for the development of climate finance in South Asia.

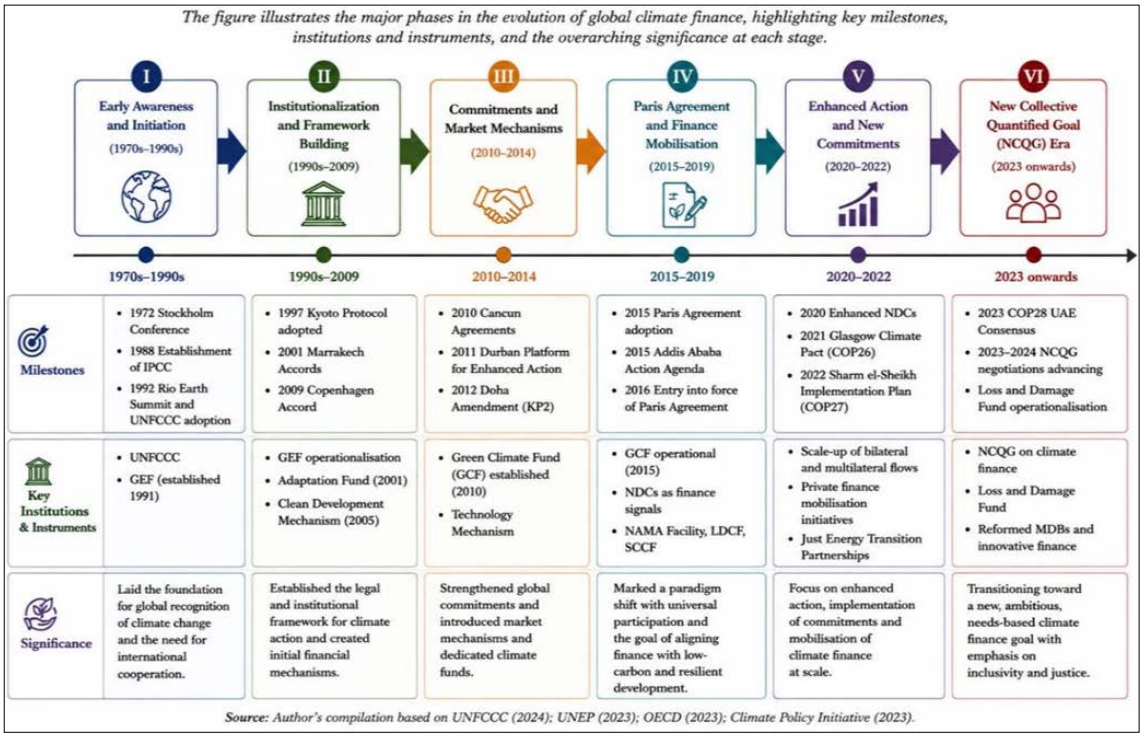

Fig 4: Evolution of Global Climate Finance: A Timeline

Figure 4 illustrates the progressive evolution of climate finance from early international environmental cooperation to the current emphasis on resilient, low-carbon, and sustainable development. It demonstrates how successive international agreements, specialised climate funds, multilateral development banks, and innovative financing mechanisms have collectively shaped the global climate finance architecture while influencing climate policy and investment priorities across South Asia (UNFCCC, 2024; OECD, 2024; CPI, 2024; ADB, 2024) [81].

1. Evolution of Climate Finance in the World

The evolution of climate finance reflects the international community's growing recognition that achieving global climate goals requires predictable, adequate, and accessible financial resources alongside effective institutional arrangements (UNFCCC, 1992; Gupta *et al*., 2007; Bodansky, 2016). Since the adoption of the UNFCCC, successive international agreements have progressively strengthened financial commitments, governance structures, and implementation mechanisms to support developing countries in addressing climate change (Roberts & Weikmans, 2017; Weikmans & Roberts, 2019; IPCC, 2022; OECD, 2024) [32, 48, 76, 77]. Over time, climate finance has expanded beyond traditional public assistance to include multilateral development banks, bilateral cooperation, private-sector investment, carbon markets, green bonds, blended finance, and other innovative financial instruments, thereby creating a more diversified global climate finance architecture (Buchner *et al*., 2019; OECD, 2023; CPI, 2023; Buchner *et al*., 2023) [9, 48].

The following subsections examine the major international milestones that have shaped the evolution of climate finance and established the institutional foundations of the contemporary global climate finance system.

1.1 United Nations Framework Convention on Climate Change (UNFCCC), 1992[64]

The adoption of the UNFCCC at the Rio Earth Summit in 1992 established the institutional foundation of modern climate finance by recognising climate change as a shared global challenge requiring collective action. Central to the Convention was the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC), which acknowledged the greater historical responsibility of developed countries and their obligation to provide financial and technological support to developing nations (UNFCCC, 1992[64]; Gupta, 2014; Bodansky, 2016). Article 4 of the Convention introduced financial commitments for mitigation, adaptation, technology transfer, and capacity building, while the Global Environment Facility (GEF) was designated as the Convention's financial mechanism to support developing countries through grants and concessional finance (UNFCCC, 1992; GEF, 2023; Roberts & Weikmans, 2017) [75, 77]. Although early climate finance remained modest and closely linked to Official Development Assistance (ODA), the Convention established the principles of equity, international cooperation, and differentiated financial responsibility that

continue to underpin the global climate finance architecture (Halimanjaya, 2015; UNEP, 2023; OECD, 2023) [25, 75].

1.2 Kyoto Protocol, 1997 [65]

The Kyoto Protocol marked the first legally binding international agreement requiring industrialised countries to reduce greenhouse gas emissions while strengthening international climate finance through market-based mechanisms (UNFCCC, 1997; Bodansky, 2016) [65, 78]. Its most significant innovation was the Clean Development Mechanism (CDM), which enabled developed countries to finance emission-reduction projects in developing countries in exchange for Certified Emission Reductions (CERs), thereby encouraging private-sector participation in renewable energy, energy efficiency, methane recovery, and other low-carbon investments (Michaelowa & Michaelowa, 2011; Ellis *et al*., 2007[54]; OECD, 2023).

The CDM substantially increased climate investment in emerging economies, particularly China, India, and Brazil, demonstrating the potential of carbon markets to mobilise private finance. However, benefits were unevenly distributed, with least-developed countries receiving comparatively limited investment owing to weaker institutional capacity and lower market attractiveness. Moreover, mitigation continued to dominate climate finance, while adaptation remained underfunded (Betzold & Weiler, 2017; Roberts & Weikmans, 2017; UNEP, 2023) [4, 7, 77].

1.3 Marrakesh Accords (2001) [66]

The Marrakesh Accords operationalised the Kyoto Protocol by establishing detailed implementation rules and strengthening the institutional framework of climate finance (UNFCCC, 2001; Gupta, 2014) [28, 66]. A major achievement was the establishment of the Least Developed Countries Fund (LDCF), Special Climate Change Fund (SCCF), and the framework for the Adaptation Fund, broadening climate finance beyond mitigation to include adaptation planning, technology transfer, institutional strengthening, and resilience building (UNFCCC, 2001[66]; GEF, 2023; Roberts & Weikmans, 2017) [77].

These developments marked an important shift towards recognising the financing needs of vulnerable developing countries, particularly Least Developed Countries (LDCs) and Small Island Developing States (SIDS), thereby laying the groundwork for a more balanced climate finance architecture (Halimanjaya, 2015; UNEP, 2023; OECD, 2023) [25, 75].

1.4 Adaptation Fund

Operationalised in 2007, the Adaptation Fund represented the first multilateral financing mechanism dedicated exclusively to climate adaptation in developing countries (UNFCCC, 2007; Adaptation Fund, 2024) [24, 67]. Unlike earlier funds dependent primarily on voluntary contributions, it introduced an innovative financing model through a 2% levy on Certified Emission Reductions (CERs) generated under the CDM (Michaelowa & Michaelowa, 2011; OECD, 2023).

The Fund supports climate-resilient agriculture, water resource management, disaster risk reduction, coastal protection, ecosystem restoration, and community resilience while pioneering the Direct Access approach, enabling accredited national institutions to receive funding directly. This strengthened country ownership, institutional capacity, and accessibility, influencing the design of subsequent climate finance mechanisms, including the Green Climate Fund (Roberts & Weikmans, 2017; GCF, 2024; Adaptation Fund, 2024) [24, 77]. Although its financial resources remain relatively modest compared with global adaptation needs, the Fund established important principles of accessibility, resilience, and national ownership that continue to shape international adaptation finance (UNEP, 2023; IPCC, 2023) [75].

1.5 Bali Action Plan (2007) [67]

The Bali Action Plan, adopted at COP13 in 2007[67], marked an important shift by integrating climate finance into broader climate policy negotiations and recognising that effective climate action required enhanced, predictable, and long-term financial support for mitigation, adaptation, technology transfer, and capacity building (UNFCCC, 2007; Gupta, 2014; Roberts & Weikmans, 2017) [77]. The Action Plan also encouraged greater participation by multilateral development banks, bilateral agencies, and private investors, thereby broadening the institutional basis of climate finance and laying the foundation for subsequent negotiations on large-scale climate finance commitments and the establishment of the Green Climate Fund (ADB, 2024; OECD, 2023; CPI, 2023) [23, 24].

1.6 Climate Investment Funds (2008)

The Climate Investment Funds (CIFs), established in 2008 under the leadership of the World Bank and other multilateral development banks, complemented the Bali Action Plan by accelerating investments in low-carbon and climate-resilient development (World Bank, 2023; CIF, 2024) [1, 56]. Through the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF), the CIFs introduced blended finance by combining grants, concessional loans, guarantees, and private capital to support renewable energy, sustainable transport, climate resilience, and forest conservation (CIF, 2024; Buchner *et al*., 2023; OECD, 2023) [34, 76]. The CIF model demonstrated how public finance could leverage substantially larger private investment and subsequently influenced the financing strategies of other international climate funds (CPI, 2023; ADB, 2024) [23, 24].

1.7 Copenhagen Accord (2009) [68]

The Copenhagen Accord placed climate finance at the centre of international climate negotiations by introducing quantified financial commitments for developing countries (UNFCCC, 2009; Gupta, 2014). Developed countries pledged US$30 billion in Fast-Start Finance (2010–2012) and committed to mobilising US$100 billion annually by 2020[21] from public and private sources (UNFCCC, 2009; OECD, 2023) [4]. Although the Accord lacked legally binding obligations and faced criticism regarding implementation and transparency, it transformed climate finance into a central pillar of global climate governance and created the political momentum for establishing the Green Climate Fund (Betzold & Weiler, 2017; Roberts & Weikmans, 2017; CPI, 2023) [7, 23, 77].

1.8 Cancun Agreements and the Green Climate Fund (2010) [69]

The Cancun Agreements (COP16) institutionalised the financial commitments introduced under the Copenhagen Accord by establishing the Green Climate Fund (GCF) as the principal multilateral financing mechanism under the UNFCCC (UNFCCC, 2010; GCF, 2024) [69, 83]. Designed to balance mitigation and adaptation finance, the GCF prioritises support for Least Developed Countries (LDCs), Small Island Developing States (SIDS), and other climate-vulnerable nations through grants, concessional loans, equity investments, guarantees, and private-sector financing (GCF, 2024; Roberts & Weikmans, 2017) [77].

Beyond expanding financial resources, the Cancun Agreements strengthened the principles of country ownership, direct access, transparency, and accountability, enabling accredited national institutions to access and implement climate finance more effectively (UNFCCC, 2010; GCF, 2024; OECD, 2023) [2, 69, 75]. Today, the GCF remains the world's largest dedicated climate fund and a cornerstone of international climate finance, supporting mitigation, adaptation, and resilience-building projects across developing countries, including South Asia (ADB, 2024; CPI, 2023; World Bank, 2023) [1, 80, 81].

1.9 Durban Platform for Enhanced Action (2011) [70]

The Durban Platform for Enhanced Action, adopted at COP17 in 2011[70], initiated negotiations for a universal climate agreement applicable to all countries, ultimately leading to the Paris Agreement (UNFCCC, 2011[43]; Bodansky, 2016). Although it did not establish new financing mechanisms, it reinforced the need to scale up climate finance, improve transparency, strengthen institutional effectiveness, and encourage greater participation by multilateral development banks, private investors, and international financial institutions in meeting long-term climate investment needs (OECD, 2023; Buchner *et al*., 2023; CPI, 2023) [34].

1.10 Rio+20 Conference (2012)

The Rio+20 Conference strengthened the integration of climate finance with sustainable development by promoting green economy financing and encouraging investments in renewable energy, sustainable infrastructure, natural resource management, and climate-resilient development (United Nations, 2012; UNEP, 2023; World Bank, 2023) [1, 10, 59]. Although no new climate finance institutions were created, Rio+20 broadened the scope of climate finance by linking environmental sustainability with inclusive economic growth and poverty reduction, thereby reinforcing its contribution to the Sustainable Development Goals (SDGs) (OECD, 2023; IPCC, 2022) [1, 5].

1.11 Paris Agreement (2015) [71]

The Paris Agreement, adopted at COP21 in 2015[71], represents the most significant milestone in the evolution of climate finance by establishing a universal framework for climate action and placing finance at the centre of global climate governance (UNFCCC, 2015; Bodansky, 2016; IPCC, 2023) [19, 34, 78]. Through Article 9, developed countries reaffirmed their commitment to provide financial support to developing nations while encouraging broader international contributions and aligning global financial flows with low-carbon and climate-resilient development pathways (UNFCCC, 2015; OECD, 2023; Roberts & Weikmans, 2017) [1, 27, 77].

Beyond increasing financial commitments, the Agreement strengthened the balance between mitigation and adaptation finance, enhanced transparency and accountability, and encouraged countries to integrate climate finance into their Nationally Determined Contributions (NDCs) and long-term development strategies (IPCC, 2023; Buchner *et al*., 2023; CPI, 2023) [1, 9]. It also accelerated investments in renewable energy, resilient infrastructure, green bonds, blended finance, and private-sector participation, firmly establishing climate finance as a cornerstone of sustainable development policy (World Bank, 2023; OECD, 2024; ADB, 2024) [1, 56].

1.12 Glasgow Climate Pact, Loss and Damage Fund, and the New Collective Quantified Goal (NCQG)

Recent COP negotiations have shifted attention from establishing climate finance mechanisms to improving their scale, accessibility, and effectiveness. The Glasgow Climate Pact (COP26) called for a substantial increase in adaptation finance and recognised that existing financial support remained inadequate for vulnerable countries (UNFCCC, 2021; UNEP, 2023). At COP27, Parties agreed to establish the Loss and Damage Fund, acknowledging that many developing countries face irreversible climate-related losses beyond the scope of adaptation (UNFCCC, 2022; IPCC, 2023) [32, 34].

More recently, negotiations on the New Collective Quantified Goal (NCQG) have sought to replace the earlier US$100 billion annual commitment with a more ambitious, transparent, and needs-based climate finance framework beyond 2025 (UNFCCC, 2024; OECD, 2024; CPI, 2024) [76]. Collectively, these developments demonstrate that climate finance has evolved from limited grant-based assistance into a diversified financial architecture involving multilateral climate funds, development banks, private investors, innovative financial instruments, and international partnerships. Nevertheless, persistent financing gaps, unequal resource distribution, and rapidly growing adaptation needs continue to shape the future direction of global climate finance (IPCC, 2023; UNEP, 2023; Buchner *et al*., 2023) [9, 75].

2. Evolution of Climate Finance in South Asia

South Asia is among the world's most climate-vulnerable regions, facing recurrent floods, cyclones, droughts, heatwaves, glacier retreat, sea-level rise, and changing monsoon patterns that threaten food security, water resources, infrastructure, livelihoods, and long-term economic development (IPCC, 2023; ADB, 2024; World Bank, 2023) [1, 3, 80]. Consequently, climate finance has become an increasingly important instrument for supporting mitigation, adaptation, disaster risk reduction, and climate-resilient development across the region. Although the evolution of climate finance in South Asia has broadly followed global developments, its trajectory has been shaped by regional institutional capacity, national policy reforms, and the growing involvement of multilateral development banks and international climate funds (OECD, 2024; CPI, 2024) [56].

2.1 Emergence of Climate Finance (1992[64]–2008)

The initial phase of climate finance in South Asia was characterised by relatively limited financial assistance,

primarily channelled through the Global Environment Facility (GEF), bilateral development agencies, and Official Development Assistance following the adoption of the UNFCCC and the Kyoto Protocol (UNFCCC, 1992; GEF, 2023; Gupta, 2014) [53]. During this period, financial support focused mainly on renewable energy, biodiversity conservation, afforestation, energy efficiency, and institutional capacity building, while adaptation received comparatively little attention despite the region's high climate vulnerability (Halimanjaya, 2015; UNEP, 2023) [25, 34].

The introduction of the Clean Development Mechanism (CDM) represented the region's first significant engagement with market-based climate finance. India emerged as one of the world's leading hosts of CDM projects because of its expanding renewable energy sector, favourable policy environment, and stronger institutional capacity. Other countries, including Bangladesh, Pakistan, Nepal, and Sri Lanka, also attracted climate investments, although at a much smaller scale because of limited technical expertise, weaker institutions, and fewer investment-ready projects (Michaelowa & Michaelowa, 2011; UNEP, 2012; ADB, 2024).

2.2 Expansion of Climate Finance (2009–2015) [19, 68]

The period following the Copenhagen Accord, Cancun Agreements, and the establishment of the Green Climate Fund (GCF) marked a substantial expansion of climate finance across South Asia (UNFCCC, 2010; GCF, 2024) [69, 81]. Financial priorities broadened beyond mitigation to include adaptation, disaster risk reduction, climate-resilient agriculture, water resource management, ecosystem conservation, and resilient infrastructure (OECD, 2023; CPI, 2023). During this phase, multilateral development banks—particularly the Asian Development Bank (ADB) and the World Bank—significantly increased investments through grants, concessional loans, technical assistance, and capacity-building programmes (ADB, 2024; World Bank, 2023) [63, 80]. Countries such as Bangladesh, Nepal, Bhutan, and the Maldives increasingly accessed international climate finance for coastal protection, disaster preparedness, and climate resilience, reflecting a gradual shift towards a more balanced allocation between mitigation and adaptation finance (GCF, 2024; OECD, 2023) [75].

2.3 Transformation under the Paris Agreement (2015 [71]–Present)

The Paris Agreement accelerated the transformation of climate finance in South Asia by encouraging countries to integrate climate objectives into national development planning through Nationally Determined Contributions (NDCs) and long-term climate strategies (UNFCCC, 2015; IPCC, 2023) [19, 34]. Governments strengthened domestic policy frameworks while international financial institutions expanded support for renewable energy, sustainable transport, resilient infrastructure, disaster risk management, and climate adaptation (ADB, 2024; World Bank, 2023) [2, 80].

Several countries also introduced domestic climate financing mechanisms to complement international assistance. India expanded climate investments through the National Action Plan on Climate Change (NAPCC), while Bangladesh strengthened adaptation financing through the Bangladesh Climate Change Trust Fund (BCCTF) and the Bangladesh Climate Change Resilience Fund (BCCRF). Nepal, Bhutan, Pakistan, Sri Lanka, and the Maldives similarly incorporated climate finance into national development strategies, demonstrating growing institutional commitment to climate action (Government of India, 2008; Government of Bangladesh, 2023; UNDP, 2023) [34].

Despite these advances, climate finance remains unevenly distributed across the region. India continues to receive the largest share because of its economic scale, stronger institutional capacity, and larger portfolio of bankable projects, whereas smaller economies—including Bhutan, Nepal, the Maldives, and Afghanistan—continue to face challenges in mobilising adequate resources owing to institutional constraints, limited technical capacity, and complex funding procedures (ADB, 2024; Betzold & Weiler, 2017; OECD, 2024) [7, 24]. Furthermore, adaptation finance remains substantially below estimated needs despite the region's increasing exposure to climate risks (UNEP, 2023; IPCC, 2023) [34].

Recent years have also witnessed growing interest in green bonds, blended finance, public–private partnerships, sustainability-linked finance, and other innovative financial instruments to complement traditional public funding (CPI, 2024; OECD, 2024; World Bank, 2023) [24, 80]. Nevertheless, strengthening domestic institutions, improving project preparation capacity, mobilising private investment, and enhancing regional cooperation remain essential for closing South Asia's climate finance gap and supporting resilient, low-carbon development (ADB, 2024; World Bank, 2023) [1, 3].

Climate Finance Architecture and Financing Landscape in South Asia

South Asia has become one of the principal destinations for international climate finance because of its high climate vulnerability, large population, rapid economic transformation, and increasing demand for climate-resilient development. Climate finance now supports mitigation, adaptation, disaster risk reduction, renewable energy, resilient infrastructure, climate-smart agriculture, water resource management, coastal protection, and technological innovation across the region (IPCC, 2023; ADB, 2024; World Bank, 2023) [80, 83]. Despite increasing financial commitments following the Paris Agreement, available resources remain considerably below regional investment requirements, particularly for adaptation and resilient infrastructure (CPI, 2023; UNEP, 2023) [4].

Climate finance in South Asia operates through a multi-level institutional architecture linking global climate governance, international funding sources, multilateral development banks, national governments, private investors, and local implementing agencies. This architecture facilitates the mobilisation, allocation, and implementation of climate finance through diverse financial instruments and delivery mechanisms. Figure 5 illustrates this institutional framework and the flow of climate finance across South Asia.

Fig 5: Climate Finance Architecture in South Asia

Figure 5 presents the institutional architecture of climate finance in South Asia, highlighting the interaction between global governance frameworks, funding sources, financial institutions, financing instruments, and national implementation systems. The framework demonstrates that coordinated institutional arrangements and diversified financing mechanisms are essential for supporting climate-resilient and low-carbon development across the region (ADB, 2024; OECD, 2024; GCF, 2024) [3].

1. Major Sources of Climate Finance

Climate finance in South Asia is mobilised through four principal sources: multilateral institutions, bilateral development partners, private-sector finance, and domestic public finance (ADB, 2024; OECD, 2023) [3, 75]. Their comparative characteristics are summarised in Table 3.1. Multilateral institutions remain the largest providers of climate finance. Organisations such as the Asian Development Bank (ADB), World Bank Group, Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation Fund, and Climate Investment Funds (CIFs) provide grants, concessional loans, guarantees, equity investments, and technical assistance to support renewable energy, resilient infrastructure, climate-smart agriculture, disaster risk reduction, technology transfer, and institutional capacity building (ADB, 2024; World Bank, 2023; GCF, 2024; GEF, 2023) [56, 80].

Bilateral development partners, including Japan, Germany, France, the United Kingdom, the United States, the European Union, and Nordic countries, complement multilateral finance by supporting policy reforms, technical cooperation, project preparation, institutional strengthening, and sector-specific climate investments (OECD, 2023) [34].

The role of the private sector has expanded considerably through commercial banks, institutional investors, infrastructure funds, ESG investments, and public–private partnerships, particularly in renewable energy, sustainable transport, green buildings, and energy efficiency. However, private climate finance remains constrained by regulatory uncertainty, underdeveloped capital markets, investment risks, and a limited pipeline of bankable projects (CPI, 2023; OECD, 2023) [1].

Recognising that international finance alone is insufficient, domestic public finance has become increasingly important. Governments across South Asia have introduced climate budget tagging, renewable energy incentives, national adaptation programmes, climate-resilient infrastructure investments, and dedicated climate funds to integrate climate action into national development planning (ADB, 2024; World Bank, 2023) [1, 3].

Table 1: Major Sources of Climate Finance in South Asia

Source	Major Institutions	Type of Finance	Major Focus Areas
Multilateral Development Banks (MDBs)	Asian Development Bank (ADB), World Bank, AIIB	Grants, concessional loans, technical assistance, equity	Renewable energy, resilient infrastructure, agriculture, transport, water management
Dedicated Climate Funds	Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation Fund, Climate Investment Funds (CIFs)	Grants, concessional finance, project finance	Mitigation, adaptation, capacity building, technology transfer
Bilateral Development	Japan (JICA), Germany (KfW & GIZ), UK	Grants, concessional loans,	Renewable energy, governance,

Partners	(FCDO), USA (USAID), France (AFD), EU	technical assistance	resilient infrastructure, disaster management
Private Sector	Commercial banks, institutional investors, ESG funds, corporations	Equity, debt finance, PPPs	Solar, wind, green buildings, electric mobility, energy efficiency
Domestic Public Finance	National governments, ministries, climate funds	Budgetary allocation, subsidies, tax incentives	Adaptation, renewable energy, public infrastructure
Capital Markets	Green bonds, sustainability-linked bonds, climate bonds	Debt financing	Large-scale infrastructure and clean energy projects

Source: Compiled by the author based on ADB (2024), World Bank (2023), OECD (2023), CPI (2023), and GCF (2024) [56, 80, 83].

2. Climate Finance Instruments

Climate finance in South Asia is delivered through a diverse range of financial instruments that address different investment requirements, project risks, and implementation capacities. The principal instruments include grants, concessional and commercial loans, equity investments, guarantees, technical assistance, green bonds, blended finance, carbon markets, and climate risk insurance, each serving complementary functions within the regional climate finance architecture (OECD, 2023; World Bank, 2023; CPI, 2023; UNEP, 2023) [75, 80]. Their characteristics, advantages, and limitations are summarised in Table 3.2. Traditional instruments, particularly grants and concessional loans, continue to dominate adaptation and public infrastructure financing because they reduce financial burdens on developing countries. By contrast, equity finance, guarantees, blended finance, and green bonds are increasingly used to mobilise private investment in renewable energy, sustainable transport, energy efficiency, and other low-carbon technologies. The growing diversification of financing instruments reflects a gradual transition from donor-dependent funding towards more market-oriented and risk-sharing approaches capable of leveraging larger volumes of climate investment (Buchner *et al*., 2023; OECD, 2024; CPI, 2024; ADB, 2024) [2, 34].

Table 2: Major Climate Finance Instruments Used in South Asia

Instrument	Description	Advantages	Limitations
Grants	Non-repayable financial assistance	Suitable for adaptation and capacity building	Limited availability
Concessional Loans	Loans with below-market interest rates	Supports large infrastructure projects	Increases public debt
Commercial Loans	Market-based financing	Large investment potential	Higher financial risk
Equity Investment	Ownership investment in climate projects	Encourages innovation	High investment risk
Guarantees	Risk-sharing mechanism	Mobilises private investment	Complex implementation
Technical Assistance	Policy and institutional support	Strengthens project quality	Limited direct financial impact
Green Bonds	Debt securities financing environmentall sustainable projects	Mobilises private capital	Requires mature capital markets
Blended Finance	Combination of public and private finance	Reduces investment risk	Complex financial structuring
Carbon Markets	Trading emission reductions	Encourages emission reduction	Carbon price volatility
Climate Risk Insurance	Financial protection against climate disasters	Enhances resilience	Limited coverage in developing countries

3. Sectoral Distribution of Climate Finance

The allocation of climate finance in South Asia broadly reflects the region's climate vulnerabilities and development priorities. Although renewable energy, energy efficiency, and sustainable transport continue to attract the largest share of mitigation finance, increasing climate-related disasters have shifted greater attention towards adaptation, particularly in agriculture, water resource management, disaster risk reduction, coastal protection, and climate-resilient infrastructure (IPCC, 2023; ADB, 2024; GCF, 2024; OECD, 2024) [2, 34]. Table 3.3 summarises the major sectors and their corresponding investment priorities.

Recent evidence indicates that climate finance is becoming increasingly diversified across sectors as governments seek to balance mitigation and adaptation objectives while integrating climate considerations into broader development planning. Investments in resilient infrastructure, ecosystem restoration, sustainable urban development, and nature-based solutions have expanded considerably in response to rising climate risks and the implementation of Nationally Determined Contributions (NDCs) under the Paris Agreement (UNFCCC, 2015; World Bank, 2023; CPI, 2024; UNEP, 2023) [56, 71, 80]. Nevertheless, adaptation finance remains below estimated regional requirements, highlighting the need for greater investment in resilience-building initiatives across South Asia (IPCC, 2023; UNEP, 2023; ADB, 2024) [1, 81].

Table 3: Major Sectoral Priorities of Climate Finance in South Asia

Sector	Representative Climate Finance Priorities
Renewable Energy	Solar, wind, hydropower, biomass
Sustainable Transport	Public transport, electric mobility
Agriculture	Climate-smart agriculture, irrigation
Water Resources	Flood management, water security
Disaster Risk Reduction	Early warning systems, resilient infrastructure
Forestry	Afforestation, ecosystem restoration
Urban Development	Green buildings, resilient cities
Coastal Protection	Mangrove restoration, shoreline protection

Table 3.3 shows that renewable energy continues to dominate mitigation finance, whereas investments in agriculture, water resources, disaster risk reduction, and coastal protection have expanded in response to growing adaptation needs across South Asia (ADB, 2024; GCF, 2024; IPCC, 2023) [1, 81].

4. Country-wise Climate Finance Landscape in South Asia

Climate finance allocation across South Asia exhibits considerable variation owing to differences in economic size, climate vulnerability, institutional readiness, governance quality, project preparation capacity, and national development priorities (ADB, 2024; GCF, 2024; World Bank, 2023) [3, 80]. Larger economies, particularly India, receive the highest absolute volume of climate finance because of their diversified economies, extensive renewable energy programmes, stronger institutional capacity, and well-developed financial markets. In contrast, smaller economies—including Bhutan, Nepal, and the Maldives—often receive comparatively higher levels of climate finance relative to their population size and climate vulnerability, reflecting greater international support for highly exposed countries (OECD, 2023[34]; CPI, 2024). The composition of climate finance also differs across the region. While mitigation finance remains concentrated in renewable energy, sustainable transport, and low-carbon infrastructure, adaptation finance is increasingly directed towards coastal protection, climate-resilient agriculture, disaster risk reduction, water resource management, and ecosystem conservation (IPCC, 2023; ADB, 2024; GCF, 2024). Countries such as Bangladesh and the Maldives prioritise adaptation because of their exceptional exposure to floods, cyclones, and sea-level rise, whereas Pakistan and Afghanistan continue to face significant institutional and governance constraints that limit their access to international climate finance (Betzold & Weiler, 2017; OECD, 2023; World Bank, 2023) [7, 75, 80]. Table 3.4 presents a comparative overview of climate risks, financing priorities, funding sources, and implementation challenges across South Asian countries.

Table 4: Comparative Climate Finance Profile of South Asian Countries

Country	Major Climate Risks	Climate Finance Priorities	Major Funding Sources	Key Challenges
Afghanistan	Droughts, floods, water scarcity	Water management, agriculture, disaster resilience	World Bank, ADB, GCF, UN agencies	Political instability,weak governance,limited implementation capacity
Bangladesh	Cyclones, floods, sea-level rise	Coastal protection, resilient agriculture, disaster management	GCF, ADB, World Bank, bilateral donors	Financing gap, population pressure, coastal vulnerability
Bhutan	Glacier retreat, biodiversity loss	Hydropower, forest conservation, watershed management	GCF, GEF, ADB	Small economy, dependence on external finance
India	Heatwaves, floods, emissions	Renewable energy, green hydrogen, transport, adaptation	ADB, World Bank, GCF, private investment	Large investment needs, regional disparities
Maldives	Sea-level rise, coastal erosion	Coastal adaptation, renewable energy, resilient tourism	GCF, ADB, World Bank	Limited fiscal capacity, sea-level rise
Nepal	Glacier retreat, landslides	Hydropower, watershed management, disaster resilience	GCF, ADB, World Bank	Institutional capacity, mountain vulnerability
Pakistan	Floods, droughts	Flood management, agriculture, water security	World Bank, ADB, GCF	Fiscal constraints, governance challenges
Sri Lanka	Coastal erosion, floods	Renewable energy, coastal resilience, biodiversity	ADB, World Bank, bilateral agencies	Debt crisis, climate vulnerability

Source: Compiled by the author based on ADB (2024), World Bank (2023), OECD (2023), GCF (2024), CPI (2023) [56, 80, 83], and national climate policy documents.

Table 3.4 demonstrates substantial cross-country variation in climate finance priorities, funding sources, and implementation challenges across South Asia. Although all countries depend on international climate finance, differences in institutional readiness, governance quality, economic size, and climate vulnerability significantly influence both the volume and effectiveness of climate finance mobilisation and utilisation (ADB, 2024; World Bank, 2023; GCF, 2024; OECD, 2023) [2, 56, 80].

5. Emerging Trends in Climate Finance in South Asia

The climate finance landscape in South Asia is undergoing a significant transformation as countries gradually shift from a predominantly donor-driven financing model towards a more diversified, integrated, and market-oriented system. This transition has been driven by increasing climate risks, stronger international commitments under the Paris Agreement, expanding participation of multilateral development banks, growing private-sector engagement, and the emergence of innovative financing mechanisms (UNFCCC, 2015; ADB, 2024; OECD, 2024; CPI, 2024) [27, 83]. Consequently, climate finance is increasingly embedded within national development strategies rather than being treated solely as environmental assistance.

At the same time, climate finance is becoming more innovative, technology-enabled, and collaborative. The increasing use of digital technologies, sustainable financial instruments, climate-risk assessment tools, and regional cooperation mechanisms is improving project preparation, financial transparency, investment efficiency, and institutional coordination across South Asia (World Bank, 2023; OECD, 2024; UNEP, 2023) [56, 80]. Nevertheless, achieving climate-resilient development will require continued efforts to mobilise larger volumes of private capital, strengthen institutional capacity, improve governance, and enhance equitable access to international climate finance, particularly for the region's most vulnerable countries (IPCC, 2023; ADB, 2024; GCF, 2024) [75, 83].

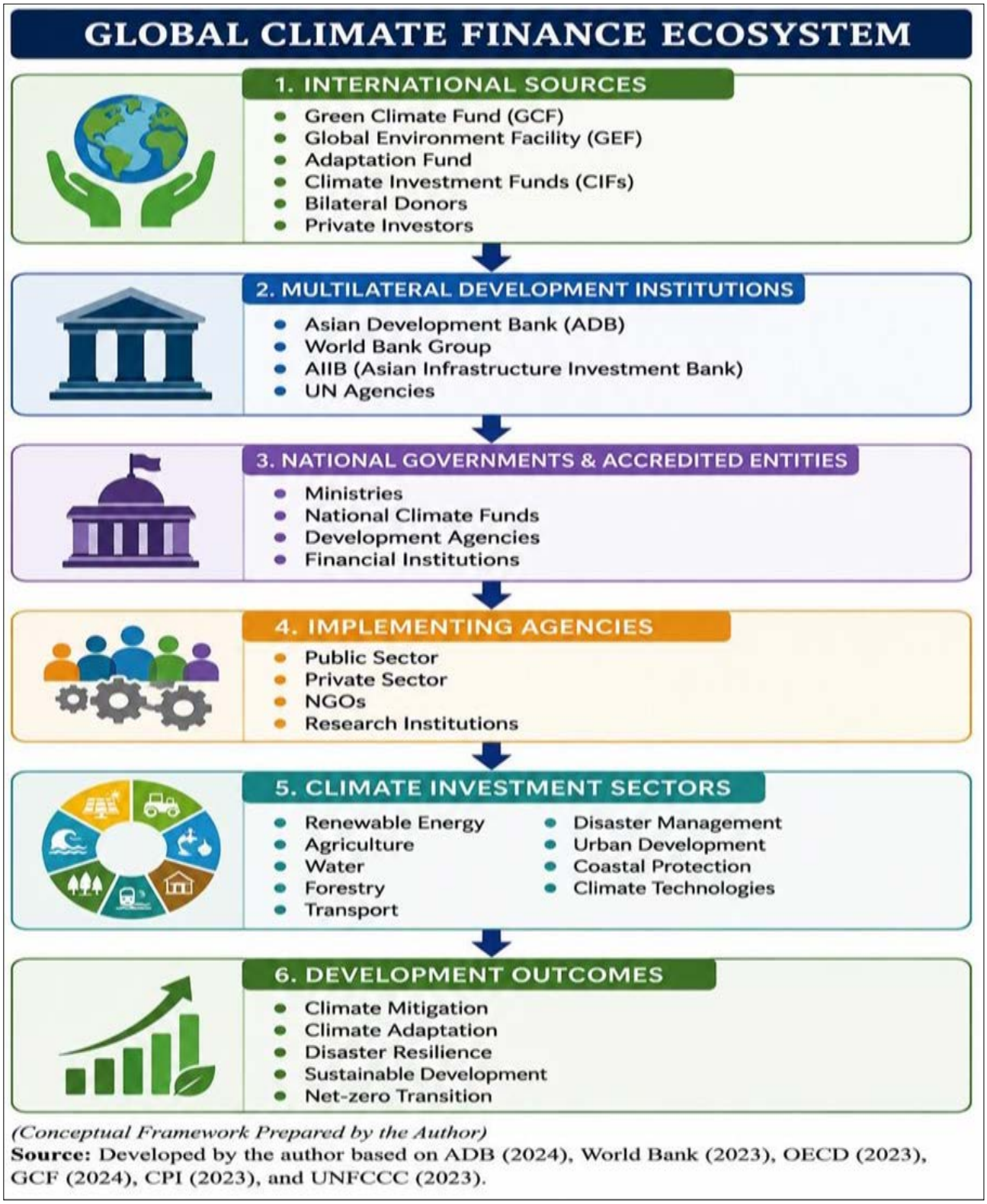

Fig 6: Climate Finance Ecosystem in South Asia

Figure 6 illustrates the evolving climate finance ecosystem in South Asia, highlighting the increasing interaction between multilateral institutions, national governments, private investors, innovative financial instruments, digital technologies, and regional cooperation. Collectively, these components demonstrate the transition towards a more integrated, diversified, and resilient climate finance system capable of supporting sustainable development and climate resilience across the region (ADB, 2024; OECD, 2024; CPI, 2024) [2].

Major Challenges of Climate Finance in South Asia

Despite significant progress in global climate finance over the past two decades, South Asia continues to face multiple financial, institutional, and governance-related constraints that limit both the mobilisation and effective utilisation of climate finance. Although international commitments have expanded under the Paris Agreement, available financial resources remain substantially below the region's growing investment requirements for mitigation, adaptation, disaster risk reduction, and climate-resilient development (IPCC, 2023; UNEP, 2023; ADB, 2024) [1, 3]. These challenges are

intensified by high climate vulnerability, rapid urbanisation, infrastructure deficits, limited fiscal capacity, and uneven institutional development across countries (World Bank, 2023; OECD, 2024) [56, 80]. Consequently, strengthening the effectiveness, accessibility, and equitable distribution of climate finance has become a major policy priority for South Asia (CPI, 2024; GCF, 2024) [81].

Figure 7 presents the major barriers affecting climate finance in South Asia and illustrates how financial, institutional, governance, and operational constraints collectively influence climate finance mobilisation and implementation across the region.

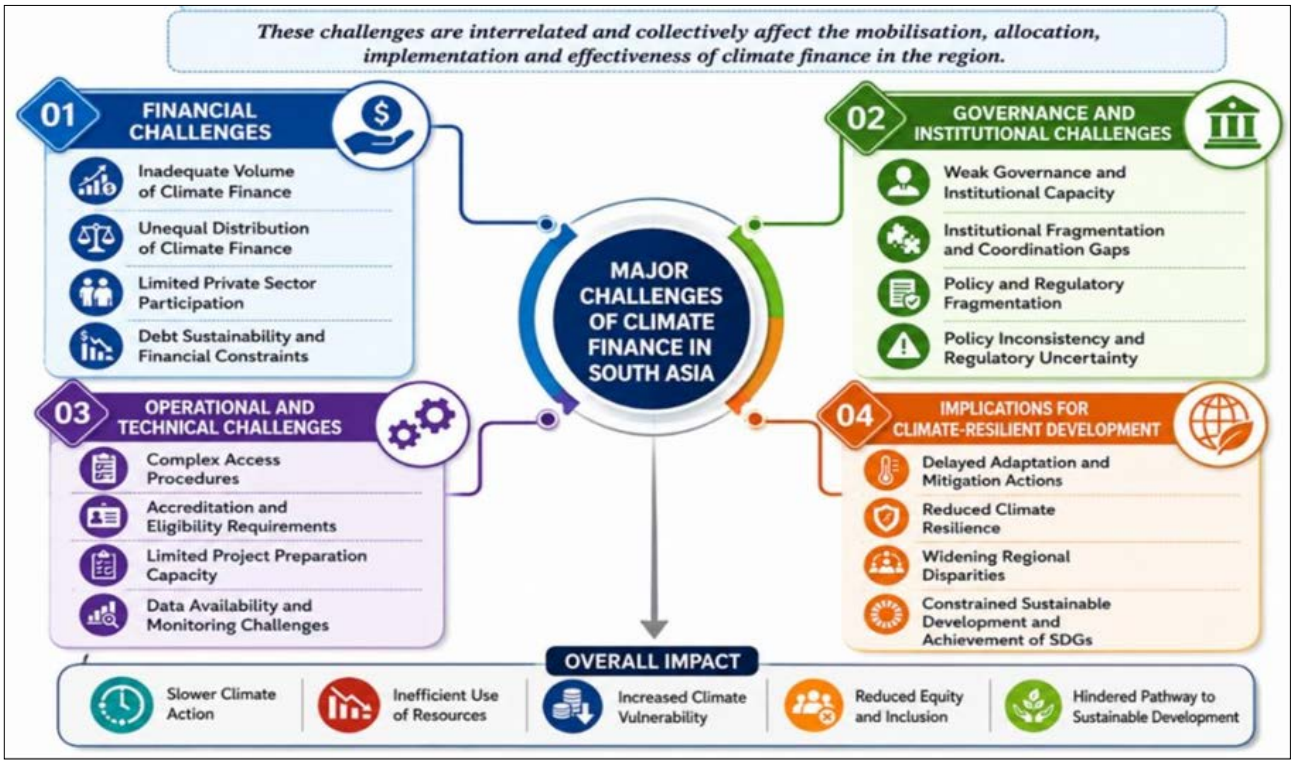

Fig 7: Barriers to Effective Climate Finance in South Asia

Figure 7 illustrates the interconnected barriers affecting climate finance in South Asia. It shows that financing gaps, institutional weaknesses, governance challenges, limited private-sector participation, complex access procedures, and inadequate data systems reinforce one another, reducing the efficiency and effectiveness of climate finance mobilisation and utilisation. Addressing these constraints requires coordinated policy reforms, stronger institutions, and enhanced international cooperation (ADB, 2024; OECD, 2024; World Bank, 2023) [80, 85].

1. Financial Challenges

The foremost challenge confronting South Asia is the persistent gap between available climate finance and rapidly increasing investment needs. Although global climate finance has exceeded US$1 trillion annually, current financial flows remain insufficient to achieve the objectives of the Paris Agreement, particularly in highly vulnerable developing regions (CPI, 2023; Buchner *et al.*, 2023; OECD, 2023) [9]. Rising climate risks, population growth, rapid urbanisation, and expanding infrastructure needs have substantially increased demand for investments in renewable energy, resilient infrastructure, climate-smart agriculture, water resource management, and disaster risk reduction across South Asia (ADB, 2024; World Bank, 2023) [80, 81].

In addition to the overall financing gap, climate finance remains unevenly distributed across countries and sectors. Larger economies with stronger institutional capacity and greater project readiness generally attract a larger share of international climate finance, whereas smaller and more vulnerable countries continue to experience difficulties in accessing adequate resources (Betzold & Weiler, 2017[7]; ADB, 2024; GCF, 2024). Furthermore, mitigation projects continue to receive greater financial support than adaptation initiatives, despite South Asia's increasing exposure to floods, cyclones, droughts, glacier retreat, and sea-level rise (IPCC, 2023; UNEP, 2023). Private-sector participation also remains below its potential because of regulatory uncertainty, underdeveloped capital markets, investment risks, and a limited pipeline of bankable climate projects. At the same time, excessive reliance on concessional borrowing raises concerns regarding long-term debt sustainability, particularly in low-income economies with constrained fiscal capacity (IMF, 2023; IFC, 2023; OECD, 2023). Expanding blended finance, green bonds, sustainability-linked finance, and innovative risk-sharing mechanisms will therefore be essential for mobilising larger

volumes of climate investment while reducing pressure on public finances (CPI, 2024; World Bank, 2023) [2, 80].

2. Governance and Institutional Challenges

Effective climate finance depends not only on the availability of financial resources but also on robust governance systems, strong institutional capacity, and coherent policy frameworks. Across South Asia, climate finance governance remains fragmented because responsibilities are often distributed among multiple ministries and agencies, resulting in overlapping mandates, weak coordination, bureaucratic delays, and inconsistent implementation (Halimanjaya, 2015[25]; OECD, 2023; ADB, 2024). Such institutional fragmentation reduces the efficiency of climate finance mobilisation, allocation, and utilisation while limiting the integration of climate objectives into national development planning (World Bank, 2023; UNDP, 2023) [1].

Institutional capacity also varies considerably across the region. Countries such as India and Bangladesh have established relatively stronger climate finance institutions and implementation mechanisms, whereas Afghanistan, Nepal, Bhutan, and the Maldives continue to face shortages of technical expertise, accredited implementing entities, fiduciary systems, and project management capacity (ADB, 2024; World Bank, 2023) [80]. In addition, frequent policy changes, regulatory uncertainty, and weak monitoring and accountability mechanisms discourage both domestic and international investment while reducing stakeholder confidence (Doku *et al*., 2021; OECD, 2023) [13, 36]. Strengthening governance, improving inter-agency coordination, enhancing institutional capacity, and integrating climate finance into national budgeting and long-term development strategies are therefore essential for improving climate finance effectiveness across South Asia (ADB, 2024; OECD, 2024; UNDP, 2023) [1, 81].

3. Operational and Technical Challenges

Beyond governance constraints, operational and technical barriers continue to limit South Asian countries' ability to access and utilise international climate finance effectively. Accessing major climate finance mechanisms—including the Green Climate Fund (GCF), Global Environment Facility (GEF), and Adaptation Fund—requires detailed project preparation, compliance with fiduciary and environmental safeguards, accreditation procedures, and comprehensive monitoring and evaluation systems (GCF, 2024; GEF, 2023; Adaptation Fund, 2024) [24]. Many countries in the region lack the technical expertise and institutional capacity needed to meet these requirements, resulting in lengthy approval processes, implementation delays, and underutilisation of available financial resources (Betzold & Weiler, 2017; Roberts *et al*., 2021[52, 55]; ADB, 2024).

Another persistent challenge is the limited availability of reliable and standardised climate finance data. Differences in reporting methodologies, fragmented databases, and inconsistent definitions make it difficult to track financial flows, evaluate project performance, and compare progress across countries (OECD, 2023; CPI, 2023; UNFCCC, 2023). Weak monitoring and evaluation systems further reduce transparency, accountability, and evidence-based decision-making (World Bank, 2023) [80]. Strengthening project preparation support, simplifying access procedures, harmonising reporting standards, and expanding digital monitoring technologies will therefore be essential for improving the efficiency, transparency, and overall effectiveness of climate finance in South Asia (ADB, 2024; OECD, 2024; World Bank, 2023) [1, 81].

4. Implications for Climate-Resilient Development

The financial, governance, institutional, and operational challenges discussed above are closely interconnected and collectively influence the effectiveness of climate finance in South Asia. Persistent financing gaps, uneven resource allocation, weak institutional capacity, complex administrative procedures, and inadequate monitoring systems slow the implementation of climate projects, delay adaptation and mitigation efforts, and reduce the region's capacity to respond to increasing climate risks (IPCC, 2023; UNEP, 2023; ADB, 2024) [2, 34]. These constraints are particularly critical for vulnerable countries with limited fiscal resources and high exposure to climate hazards, where inadequate climate finance can undermine sustainable development and widen socioeconomic inequalities (World Bank, 2023; OECD, 2024) [56, 80].

Addressing these challenges requires an integrated policy approach that combines increased international financial support with stronger national institutions, improved governance, enhanced technical capacity, greater private-sector participation, and more transparent monitoring systems (Halimanjaya, 2015; Doku *et al*., 2021; Roberts & Weikmans, 2017) [13, 25, 77]. At the same time, expanding innovative financing mechanisms, strengthening regional cooperation, and improving access to international climate funds will be essential for scaling up climate finance and supporting long-term climate-resilient development across South Asia (CPI, 2024; GCF, 2024; ADB, 2024) [81].

To synthesise the preceding discussion, Table 4.1 presents an integrated analytical summary of the major climate finance challenges in South Asia. The framework groups the principal challenges into four interrelated dimensions—financial, governance and institutional, operational and technical, and development implications—while linking each dimension with its key issues, major development implications, and corresponding policy priorities. This synthesis provides a comprehensive overview of the critical constraints affecting climate finance mobilisation and utilisation across the region (ADB, 2024; OECD, 2024; World Bank, 2023) [80, 83].

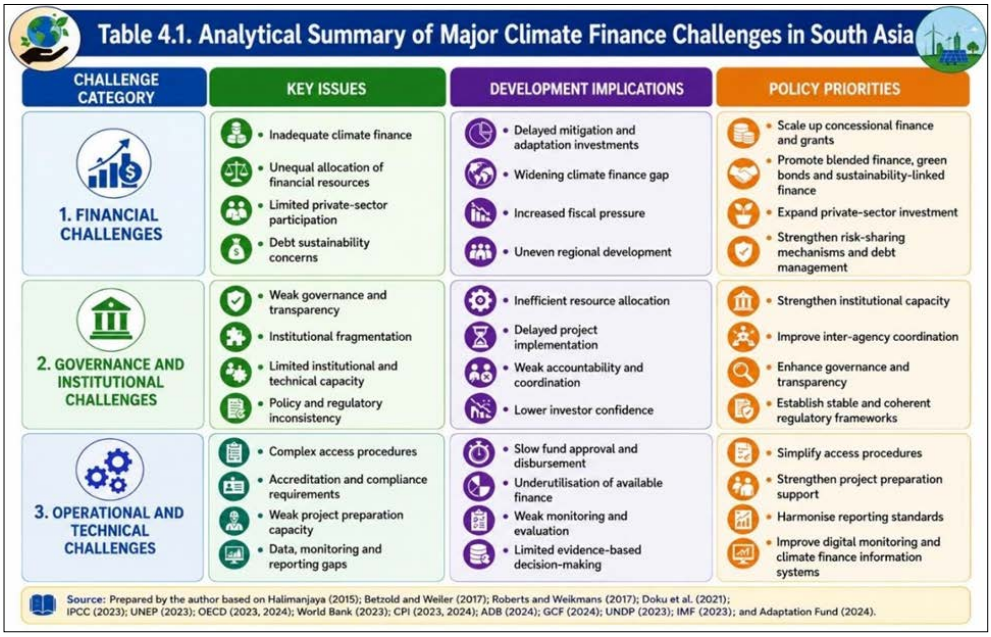

Table 4.1. Analytical Summary of Major Climate Finance Challenges in South Asia

CHALLENGE CATEGORY	KEY ISSUES	DEVELOPMENT IMPLICATIONS	POLICY PRIORITIES
1. FINANCIAL CHALLENGES	• Inadequate climate finance • Unequal allocation of financial resources • Limited private-sector participation • Debt sustainability concerns	• Delayed mitigation and adaptation investments • Widening climate finance gap • Increased fiscal pressure • Uneven regional development	• Scale up concessional finance and grants • Promote blended finance, green bonds and sustainability-linked finance • Expand private-sector investment • Strengthen risk-sharing mechanisms and debt management
2. GOVERNANCE AND INSTITUTIONAL CHALLENGES	• Weak governance and transparency • Institutional fragmentation • Limited institutional and technical capacity • Policy and regulatory inconsistency	• Inefficient resource allocation • Delayed project implementation • Weak accountability and coordination • Lower investor confidence	• Strengthen institutional capacity • Improve inter-agency coordination • Enhance governance and transparency • Establish stable and coherent regulatory frameworks
3. OPERATIONAL AND TECHNICAL CHALLENGES	• Complex access procedures • Accreditation and compliance requirements • Weak project preparation capacity • Data, monitoring and reporting gaps	• Slow fund approval and disbursement • Underutilisation of available finance • Weak monitoring and evaluation • Limited evidence-based decision-making	• Simplify access procedures • Strengthen project preparation support • Harmonise reporting standards • Improve digital monitoring and climate finance information systems

Source: Prepared by the author based on Halimanjaya (2015); Betzold and Weiler (2017); Roberts and Weikmans (2017); Doku et al. (2021); IPCC (2023); UNEP (2023); OECD (2023, 2024); World Bank (2023); CPI (2023, 2024); ADB (2024); GCF (2024); UNDP (2023); IMF (2023); and Adaptation Fund (2024).

Table 4.1 demonstrates that climate finance challenges in South Asia are multidimensional and mutually reinforcing. Financial constraints, governance and institutional weaknesses, and operational and technical limitations collectively hinder the mobilisation, allocation, and effective utilisation of climate finance, leading to adverse development outcomes. The table further highlights that strengthening institutional capacity, improving governance, simplifying access procedures, mobilising private investment, and promoting innovative financing mechanisms are essential policy priorities for enhancing climate resilience and supporting sustainable development across South Asia (IPCC, 2023; UNEP, 2023; ADB, 2024) [1, 81].

Future Prospects of Climate Finance in South Asia

The future of climate finance in South Asia will play a decisive role in strengthening climate resilience, accelerating low-carbon development, and achieving the Sustainable Development Goals (SDGs). Although climate finance has expanded considerably through multilateral climate funds, development banks, bilateral agencies, and private investment, available financial resources remain insufficient to meet the region's rapidly growing adaptation and mitigation requirements (IPCC, 2023; UNEP, 2023; CPI, 2024) [4, 83]. Increasing climate risks, infrastructure demands, and commitments under the Paris Agreement require South Asian countries to mobilise larger and more predictable financial resources while improving the effectiveness of climate finance governance and implementation (ADB, 2024; OECD, 2024) [2].

Future progress will depend not only on increasing the volume of climate finance but also on expanding innovative financing mechanisms, strengthening institutional capacity, mobilising private-sector investment, promoting regional cooperation, and integrating climate finance into national development planning (Halimanjaya, 2015; Roberts & Weikmans, 2017; Doku *et al.*, 2021) [27, 52, 77]. Recent international developments—including negotiations on the New Collective Quantified Goal (NCQG), operationalisation of the Loss and Damage Fund, and the rapid expansion of green finance—provide new opportunities to enhance climate finance mobilisation across South Asia (UNFCCC, 2024; OECD, 2024; CPI, 2024) [81]. The following discussion outlines the principal opportunities and strategic priorities that are expected to shape the future of climate finance in the region.

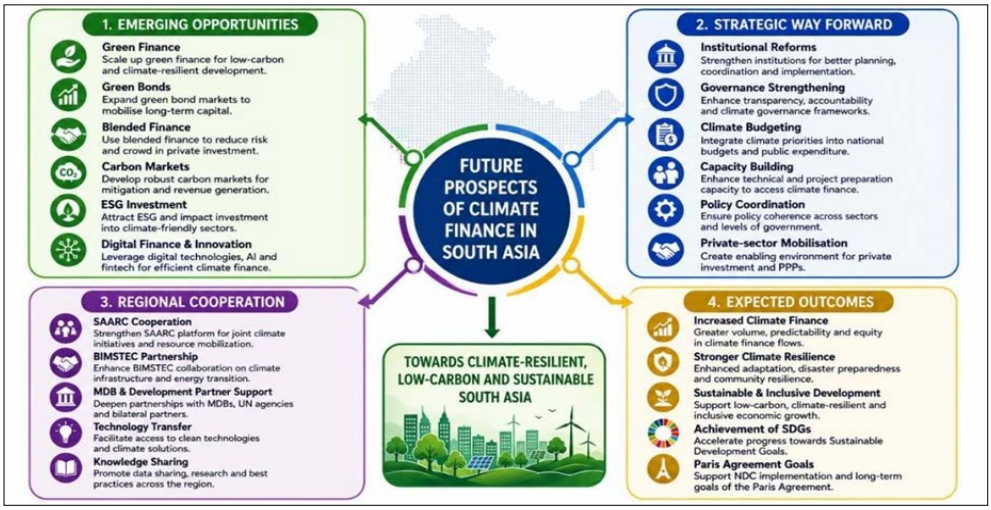

Fig 8: Future prospects of climate finance in south asia

Figure 8 summarises the major pathways expected to strengthen climate finance in South Asia. It highlights that expanding financial resources, promoting innovative financing instruments, strengthening governance and institutional capacity, enhancing regional cooperation, and accelerating technological innovation are mutually reinforcing priorities for improving climate finance mobilisation and supporting climate-resilient and sustainable development across the region (ADB, 2024; OECD, 2024; World Bank, 2023) [1, 3].

1. Emerging Opportunities

South Asia possesses significant opportunities to expand climate finance through both international support and domestic financial reforms. The evolving global climate finance architecture is creating new financing channels that can help bridge the region's substantial investment gap while supporting adaptation, mitigation, and resilient development (IPCC, 2023; CPI, 2024) [1, 3]. One major opportunity lies in the expansion of innovative financial instruments, including green bonds, sustainability-linked bonds, blended finance, carbon markets, and environmental, social, and governance (ESG) investment. These instruments have gained increasing international recognition for mobilising private capital alongside public finance and reducing investment risks associated with climate projects (OECD, 2024; World Bank, 2023; CPI, 2024) [2, 56, 80]. Among South Asian countries, India has emerged as a leading green bond market, while Bangladesh, Sri Lanka, and Pakistan are gradually strengthening sustainable finance frameworks to encourage environmentally responsible investment (ADB, 2024) [63].

Another promising opportunity is the growing role of multilateral development banks and dedicated climate funds. Institutions such as the Asian Development Bank (ADB), World Bank, Green Climate Fund (GCF), Global Environment Facility (GEF), and Adaptation Fund continue to expand financial support for renewable energy, resilient infrastructure, climate-smart agriculture, disaster risk reduction, and ecosystem conservation (ADB, 2024; GCF, 2024; World Bank, 2023) [2, 80]. Furthermore, the proposed New Collective Quantified Goal (NCQG) is expected to mobilise larger and more predictable financial resources beyond 2025, particularly for highly climate-vulnerable developing countries (UNFCCC, 2024; OECD, 2024) [2].

Digital technologies also present important opportunities for improving climate finance management. Artificial intelligence, satellite monitoring, geographic information systems (GIS), blockchain, climate-risk analytics, and digital financial platforms can enhance project identification, monitoring, transparency, and impact assessment while reducing administrative costs and improving accountability (World Bank, 2023; OECD, 2024) [56, 80]. Together, these developments provide a strong foundation for expanding climate finance and strengthening climate resilience across South Asia.

2. Strategic Way Forward

Realising the future potential of climate finance in South Asia requires coordinated action at the international, regional, and national levels. Increasing the volume of climate finance alone will be insufficient unless accompanied by stronger institutions, improved governance, enhanced technical capacity, and effective policy implementation (Halimanjaya, 2015; Doku *et al*., 2021; OECD, 2024) [13, 25, 85]. Therefore, future climate finance strategies should emphasise both resource mobilisation and institutional strengthening to ensure that financial resources are efficiently allocated and effectively utilised.

A key priority is to strengthen national climate finance governance by integrating climate objectives into development planning, public budgeting, and sectoral policies. Climate budget tagging, transparent financial reporting, robust monitoring and evaluation systems, and stronger inter-agency coordination can improve accountability and enhance the effectiveness of climate investments (ADB, 2024; World Bank, 2023; OECD, 2024) [2, 56, 80]. At the same time, expanding institutional capacity through technical assistance, project preparation facilities, and accreditation support will enable countries to access a larger share of international climate finance (GCF, 2024; UNDP, 2023) [2, 75].

Mobilising greater private-sector participation should also remain a strategic priority. Governments can encourage private investment by establishing stable regulatory frameworks, strengthening sustainable finance policies, expanding green bond markets, promoting blended finance mechanisms, and developing risk-sharing instruments that reduce investment uncertainty (CPI, 2024; IFC, 2023; OECD, 2024). Greater collaboration between governments, multilateral development banks, financial institutions, and private investors will be essential for scaling up climate investments across renewable energy, resilient infrastructure, sustainable agriculture, and clean technologies (ADB, 2024; World Bank, 2023) [76, 80].

Regional cooperation offers another important pathway for strengthening climate finance. Enhanced collaboration through regional organisations and development partners can facilitate knowledge sharing, capacity building, technology transfer, disaster-risk management, and coordinated climate investment programmes (ADB, 2024; ESCAP, 2023) [34, 63]. Furthermore, continued international support through the New Collective Quantified Goal (NCQG), the Loss and Damage Fund, and other multilateral financing initiatives will be critical for addressing the region's growing climate finance gap while ensuring equitable access to financial resources for vulnerable countries (UNFCCC, 2024; OECD, 2024; IPCC, 2023) [84].

The future of climate finance in South Asia depends on the region's ability to transform emerging opportunities into effective policy action. While recent global initiatives have created new avenues for climate finance mobilisation, persistent financing gaps, governance challenges, and institutional constraints continue to limit their potential. Strengthening national institutions, expanding innovative financing mechanisms, mobilising private investment, enhancing regional cooperation, and improving access to international climate funds will be essential for building a more inclusive, resilient, and sustainable climate finance system (Halimanjaya, 2015; Roberts & Weikmans, 2017; Doku *et al*., 2021[25, 52, 77]; ADB, 2024; OECD, 2024). These strategic priorities provide a practical pathway for enabling South Asian countries to meet their climate commitments while advancing climate-resilient and sustainable development.

Conclusion

Climate finance has become a central pillar of the global response to climate change, evolving from limited

environmental assistance under the United Nations Framework Convention on Climate Change (UNFCCC) into a comprehensive financial architecture encompassing multilateral climate funds, development banks, bilateral assistance, private investment, innovative financial instruments, and market-based mechanisms. This review demonstrates that successive international agreements—including the Kyoto Protocol, Paris Agreement, Glasgow Climate Pact, and recent Conference of the Parties (COP) decisions—have progressively strengthened institutional arrangements and expanded financial commitments for climate mitigation, adaptation, resilience building, and sustainable development (UNFCCC, 1992; IPCC, 2023; OECD, 2024) [1, 3, 64]. Nevertheless, despite significant progress in mobilising climate finance, substantial financing gaps persist, particularly in developing regions where climate vulnerability continues to increase.

The review highlights that South Asia occupies a unique position within the global climate finance landscape because of its high exposure to climate-related hazards, large and rapidly growing population, widespread socioeconomic vulnerability, and increasing demand for climate-resilient development. Although climate finance has expanded considerably through multilateral development banks, dedicated climate funds, bilateral development partners, and emerging private-sector investments, the region continues to face significant challenges relating to the adequacy, accessibility, allocation, and effectiveness of climate finance (ADB, 2024; World Bank, 2023; UNEP, 2023) [2, 80]. Climate finance remains unevenly distributed among countries and sectors, with mitigation activities generally receiving greater financial support than adaptation despite the region's urgent adaptation requirements (CPI, 2024; IPCC, 2023) [4, 83].

The review further demonstrates that the effectiveness of climate finance in South Asia depends not only on the availability of financial resources but also on the quality of governance, institutional capacity, policy coherence, technical expertise, and project implementation systems. Weak governance, fragmented institutional arrangements, complex funding procedures, limited project preparation capacity, insufficient private-sector participation, and inconsistent monitoring frameworks continue to constrain the mobilisation and effective utilisation of climate finance across several South Asian countries (Halimanjaya, 2015; Betzold & Weiler, 2017; Doku *et al*., 2021; OECD, 2024) [3, 7, 13, 25]. At the same time, the emergence of innovative financing mechanisms—including green bonds, blended finance, sustainability-linked finance, carbon markets, and digital financial technologies—offers promising opportunities to diversify climate finance and strengthen long-term climate resilience. This review contributes to the growing climate finance literature by providing an integrated synthesis of the historical evolution, institutional architecture, financing landscape, major challenges, and future prospects of climate finance in South Asia. Unlike many previous studies that primarily focus on individual countries, specific financing mechanisms, or empirical analyses, the present review combines academic research with recent evidence from international organisations to develop a comprehensive regional perspective. By linking global climate finance developments with South Asian experiences, the study provides a coherent conceptual framework that can support future research, policy formulation, and regional cooperation while identifying important priorities for strengthening climate finance systems across the region.

From a policy perspective, strengthening climate finance in South Asia requires coordinated action at the international, regional, and national levels. Priority should be given to increasing concessional climate finance, improving access to international climate funds, strengthening institutional capacity, enhancing governance and transparency, mobilising greater private-sector participation, promoting innovative financial instruments, and integrating climate finance into national development planning (ADB, 2024; OECD, 2024; World Bank, 2023) [1, 3]. Furthermore, successful implementation of the New Collective Quantified Goal (NCQG), operationalisation of the Loss and Damage Fund, expansion of blended finance mechanisms, and strengthened regional cooperation through knowledge sharing and technology transfer will be critical for narrowing the region's climate finance gap and accelerating climate-resilient development (UNFCCC, 2024; CPI, 2024) [3].

Although climate finance in South Asia has expanded considerably over the past three decades, the region's financing needs continue to outpace available resources. Achieving the objectives of the Paris Agreement and the Sustainable Development Goals will therefore require sustained international support, stronger domestic institutions, and greater collaboration among governments, multilateral development banks, development partners, the private sector, and civil society. Future research should further examine the effectiveness, equity, and developmental impacts of climate finance while exploring emerging issues such as climate finance quality, private climate investment, loss and damage financing, digital climate finance, and innovative financing mechanisms within the South Asian context. Strengthening these areas will not only improve climate finance mobilisation but also contribute to a more resilient, inclusive, and sustainable development pathway for the region.

The present review contributes to the expanding body of climate finance literature by providing an integrated and up-to-date synthesis of the evolution, institutional architecture, financing landscape, major challenges, and future prospects of climate finance in South Asia. Unlike many previous studies that examine specific countries, financing mechanisms, or empirical determinants in isolation, this review adopts a broader regional perspective by combining evidence from academic research with recent reports published by international organisations. By integrating these diverse sources, the study offers a comprehensive understanding of how global climate finance developments have influenced South Asia while identifying key priorities for strengthening climate finance systems and supporting future policy formulation and regional cooperation (ADB, 2024; OECD, 2024; World Bank, 2023) [80, 85].

From a policy perspective, strengthening climate finance in South Asia requires coordinated efforts at the international, regional, and national levels. Increasing the volume of concessional climate finance, improving access to multilateral climate funds, strengthening institutional capacity, enhancing governance and transparency, and mobilising greater private-sector investment should remain central policy priorities. In addition, expanding the use of innovative financing mechanisms—including green bonds,

blended finance, sustainability-linked finance, and climate-risk insurance—can help diversify funding sources and reduce dependence on traditional public finance. Continued implementation of the New Collective Quantified Goal (NCQG), effective operationalisation of the Loss and Damage Fund, and stronger regional cooperation through technology transfer, knowledge sharing, and capacity building will further support climate-resilient and low-carbon development across South Asia (UNFCCC, 2024; OECD, 2024; CPI, 2024; ADB, 2024; GCF, 2024) [81].

In conclusion, although climate finance in South Asia has expanded substantially over the past three decades, the region's financial requirements continue to exceed available resources, particularly for adaptation and resilience-building. Addressing these challenges will require sustained international support, stronger domestic institutions, effective governance, innovative financing approaches, and greater collaboration among governments, multilateral development banks, development partners, the private sector, and civil society. Future research should move beyond measuring climate finance volumes to examine its effectiveness, equity, accessibility, developmental outcomes, and long-term contribution to climate resilience. Such research will provide valuable evidence for improving climate finance policies and ensuring that financial resources contribute more effectively to sustainable, inclusive, and climate-resilient development across South Asia (IPCC, 2023; UNEP, 2023; World Bank, 2023; OECD, 2024) [1, 56].

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