Climate finance challenges and investment gaps: the case of Madagascar

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Abstract

Madagascar, highly vulnerable to climate change, faces a significant climate finance deficit, securing only USD 385 million in 2022 against the USD 13.4 billion needed by 2030, as outlined in its Second Nationally Determined Contribution (NDC2). This study examines the barriers limiting Madagascars access to global climate finance, including weak institutional and technical capacities, a global bias favoring mitigation over adaptation, and heavy reliance on multilateral donors like the World Bank, which contributed 55% of 2022 funding. Analysis of financial flows from 20152022 reveals volatile funding patterns, with peaks driven by large-scale projects and troughs reflecting institutional constraints. The energy sector dominates allocations, marginalizing critical adaptation needs in agriculture and water management. To bridge this gap, the paper proposes strengthening institutional capacity through centralized coordination, advocating for equitable global finance at forums like COP, and scaling innovative mechanisms such as local-currency green bonds and partnerships with PROGREEN and PROBLUE. Enhanced regulatory frameworks and transparency are critical to attract private investment and ensure equitable resource distribution. These systemic reforms, combining domestic action and international cooperation, are essential for Madagascar to achieve resilient, sustainable development amidst escalating climate risks.

Keywords: Climate finance, Madagascar, Adaptation, Mitigation, Institutional capacity, Funding gap, Multilateral donors, World Bank, Green bonds, Public-private partnerships, Transparency, Regulatory frameworks, Vulnerability, Resilience, NDC2, COP26, Energy sector, Agriculture

1 Introduction

Climate change stands among the most pressing challenges of our time, with its impacts disproportionately affecting the most vulnerable countries. Madagascar, while responsible for only 0.09% of global greenhouse gas emissions, ranks among the nations most exposed to climate risks. Over the past two decades, the island has experienced a threefold increase in the frequency of cyclones, floods, and severe droughts. With an average of three to four cyclones each year, Madagascar is the most cyclone-prone region in Africa, and cyclone-related losses in 2020 alone reached 4.8% of GDP [5].

Prolonged droughts further exacerbate poverty and food insecurity, particularly in the southern regions.

Climate projections indicate a potential temperature increase of up to 4 řC by 2100, coupled with more erratic rainfall patterns and increasingly intense cyclones, with associated damages expected to quintuple by 2050. The islands unique ecosystems, rich in endemic biodiversity and renowned for their coral reefs, face severe threats from ocean acidification and rising sea levels. Confronted with these challenges, managing climate variability becomes a critical priority for safeguarding this natural heritage and the ecosystem services it provides.

Paradoxically, despite this acute vulnerability and the urgent need for adaptation, Madagascar remains largely marginalized within international climate finance flows. While global climate finance reached a record USD 1.9 trillion in 2023, according to the *Global Landscape of Climate Finance 2025* report [2], Madagascar captures only a negligible share of these resources. In 2022, the country received a mere USD 385 million [4], while its climate-related financial needs are estimated at USD 24.4 billion for the 2022–2030 period, as stated in its Second Nationally Determined Contribution (NDC2) [3].

This situation raises a fundamental question: *Madagascar is one of the most climate-vulnerable countries in the world, yet it receives only a marginal share of international climate finance. Why does this gap persist despite the urgency of its needs, and how can Madagascar enhance both its access to and the effective use of these funds?*

In addressing this complex issue, three main hypotheses emerge to explain the paradox of Madagascars climate finance.

Hypothesis 1: Capacity deficit as a systemic barrier. Madagascars limited access to climate finance can largely be attributed to insufficient technical and institutional capacities to design, submit, and manage eligible projects. International donors require rigorously structured projects, equipped with measurable result indicators, comprehensive risk analyses, and robust monitoring and evaluation frameworks.

Hypothesis 2: Structural bias in the global financial architecture. The global distribution of climate finance is structurally skewed toward middle-income countries and mitigation-focused projects, thereby disadvantaging highly vulnerable countries like Madagascar, whose primary needs revolve around adaptation.

Hypothesis 3: Insufficient innovative financing mechanisms. The absence of innovative financing tools and diversified strategic partnerships significantly limits Madagascars ability to mobilize additional resources and to engage the private sector effectively.

This analysis aims to deconstruct the underlying mechanisms of this paradox in Madagascars climate finance by examining both the global dynamics of climate finance flows and the national specificities that condition Madagascars access to these critical resources for its climate resilience.

2 Climate Finance in 2025: An In-Depth Analysis of the Underfunding of Developing Countries

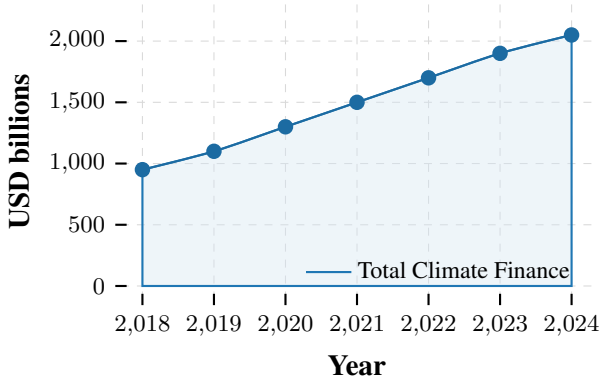
2.1 Overview of global climate finance

The *Global Landscape of Climate Finance 2025* report by the Climate Policy Initiative (CPI) highlights an unprecedented acceleration in financial flows dedicated to climate action. In **2023**, global climate finance reached a record level of **USD 1.9 trillion**, and preliminary estimates suggest it surpassed **USD 2 trillion** in **2024**. This doubling over a six-year period is largely driven by the combined contributions of the public and private sectors, with a strong focus on **renewable energy** and **low-carbon transportation**.

However, the report underscores a significant im-

balance in distribution: the majority of these financial flows are directed toward **advanced economies**, while **developing countries**and particularly emerging markets and developing economies (EMDEs)receive amounts far below their actual needs for both mitigation and adaptation efforts.

Figure 1: Climate Finance Trends



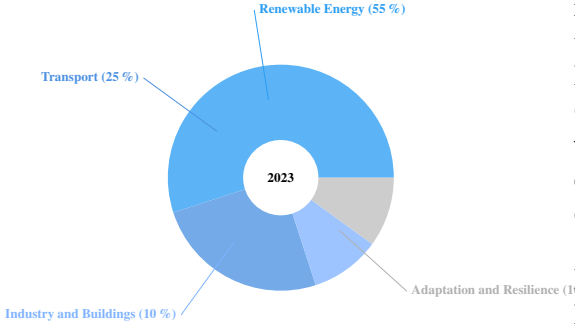
Source: CPI 2025

Record growth and sectoral concentration.

Annual flows increased by approximately **USD 200 billion** per year between 2021 and 2023. The **energy sector**, dominated by solar photovoltaics and onshore wind power, reached USD 831 billion in 2023, representing a **234%** increase since 2018.

Private financing now exceeds **USD 1 trillion**, driven by household investments (electric vehicles, solar water heaters, renewable HVAC systems) and corporate initiatives. Adaptation finance remains marginal, amounting to only **USD 65 billion** in 2023, of which **USD 18 billion** originated from green bondsa figure likely underestimated due to methodological gaps.

Figure 2 Sectoral distribution of global climate finance



Sources: Climate Policy Initiative (CPI), Global Landscape of Climate Finance 2025

Regional disparities.

Nearly **79%** of global climate finance in 2023 was concentrated in just three regions: **East Asia and the Pacific** (primarily China), **Western Europe**, and **North America**. **Developing countries** received only a small fraction of these flows, amounting to **USD 196 billion** in 2023, of which **USD 152 billion** originated from public sources and **USD 42 billion** from the private sector. Although this figure has doubled since 2018, it remains insufficient when measured against the rapidly growing needs.

Developing countries, particularly those in **Sub-Saharan Africa**, **South Asia**, and **Central Asia**, face disproportionate financing requirements. To remain on a **1.5 řC trajectory**, an annual investment effort of approximately **USD 6.3 trillion** is required between 2024 and 2030. Current flows to Sub-Saharan Africa and Central Asia would need to increase by factors of **9.4** and **8.7**, respectively, whereas advanced economies would need only to double their current levels.

Adaptation finance remains particularly inadequate, amounting to just **USD 65 billion** in 2023. Of this, **USD 22.3 billion** was allocated to water and wastewater management, and **USD 6.3 billion** to disaster risk management. Emerging markets and developing economies (EMDEs), despite their heightened vulnerability to droughts, floods, and cyclones, continue to receive only a marginal share of these funds.

2.2 Barriers to climate finance in developing countries in 2025

The *Global Landscape of Climate Finance 2025* report by the Climate Policy Initiative (CPI) highlights a significant increase in global climate finance, reaching USD 1.9 trillion in 2023 and likely surpassing USD 2 trillion in 2024. However, emerging markets and developing economies (EMDEs), which are particularly vulnerable to climate change impacts, receive an insufficient share of resources compared to their enormous mitigation and adaptation needs. Mitigation requirements alone are estimated at USD 6.3 trillion annually through 2030 to limit global warming to 1.5 řC. This shortfall results from several systemic obstacles hindering the mobilization of essential capital.

Lack of bankable projects. A major constraint in EMDEsespecially in Sub-Saharan Africa and small island developing statesis the scarcity of viable investment projects. These regions face significant deficits in technical expertise and institutional capac-

ity to design projects that meet international investor standards, particularly in complex sectors such as agriculture, forestry, and other land uses (AFOLU) or resilient infrastructure. Developing such projects requires comprehensive feasibility studies, rigorous environmental and social assessments, and structured financial mechanisms, which collectively limit the attraction of private and public capital.

Currency risks. Exchange rate volatility constitutes a significant barrier, as revenues generated by climate projects in EMDEs are often denominated in unstable local currencies, while international financing is typically disbursed in hard currencies such as USD or euro. This mismatch exposes investors to potential losses, thereby discouraging private capital inflows. Innovative solutionssuch as green bonds issued in local currencies or loans provided through national development banks backed by concessional international financeare being piloted but remain limited in scale and adoption.

Insufficient catalytic capital. Despite a tripling of development finance to EMDEs between 2018 and 2023reaching USD 196 billion, of which USD 152 billion originated from public sourcesthe amount of catalytic capital, particularly concessional financing such as grants and low-cost loans, remains inadequate to de-risk investments in low-commercial-return sectors like adaptation (estimated at USD 65 billion in 2023, mostly directed towards water and disaster risk management). The share of concessional finance decreased from 12% in 2022 to 7% in 2023, further limiting EMDEs capacity to attract private investors.

Data gaps. Accurate tracking of climate finance flowsespecially adaptation financeis hampered by inconsistent reporting and methodological limitations. Current estimates, such as the USD 65 billion allocated to adaptation in 2023, are likely underestimated, as private investments are often misclassified as risk management measures or maintenance operations. These data gaps are more pronounced in EMDEs, where data collection and reporting capacities remain limited, complicating efforts to assess actual finance flows.

Weak policy and institutional frameworks. The absence of clear regulatory frameworks and stable policies in many developing countries exacerbates investor risk perception. Insufficient regulations related to carbon markets or green bonds hinder the deployment of innovative financial solutions. Moreover, local institutionssuch as national development banksoften lack adequate resources to structure complex projects or coordinate effectively with international partners, thereby diminishing the efficiency of finance mobilization.

Impact and solutions. These barriers disproportionately affect regions like Sub-Saharan Africa, where climate finance flows must increase by a factor of 9.4 to meet mitigation needs, or South Asia, where Bangladesh, despite a 190% increase in flows between 2018 and 2023, remains underfunded relative to its mitigation targets. To overcome these challenges, the report recommends the development of project preparation facilities, expansion of local currency financing solutions, increased concessional funding, improved tracking methodologies, and strengthened regulatory frameworks. These measures are essential to mobilize private capital and ensure equitable distribution of climate finance ahead of COP30 in Belém, November 2025.

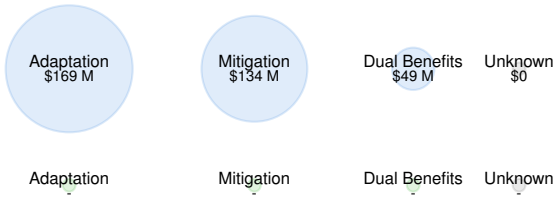
2.3 Conclusion

Despite significant progress, with over **USD 2 trillion** invested in 2024, climate finance remains profoundly inequitable. Developing countriesthose most exposed to the impacts of climate changecontinue to face structural underfunding, exacerbated by persistent institutional and financial barriers. Enhanced private sector engagement, improved governance of financial flows, and greater transparency in tracking climate finance are essential conditions to ensure a more equitable and effective allocation of global climate resources.

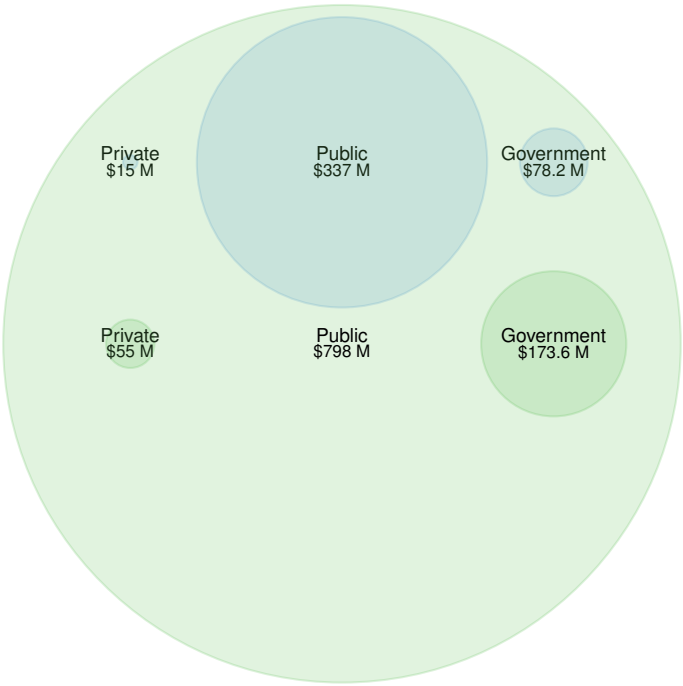
3 Overview of climate finance in Madagascar based on CPI data

- Year 2019/2020
- Year 2021/2022

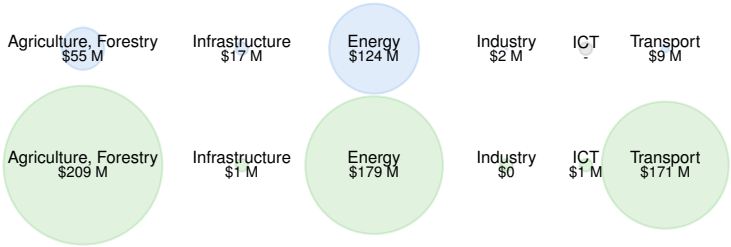
By Climate Objective



By Institution Type



By Sector



Source: Climate Policy Initiative (CPI), 2025

Madagascars climate finance landscape reveals a **strong concentration of funding on adaptation measures**, with $169 million allocated in 2019/2020, underscoring the countrys acute vulnerability to climate hazards such as cyclones, floods, and droughts.

Mitigation efforts ($134 million) remain secondary due to the countrys low emissions profile, while the absence of recorded flows in 2021/2022 highlights delays in project execution and reporting gaps.

Public institutions are the primary drivers of climate finance, with international donors and multilateral funds contributing the bulk of resources, while private sector participation, though slightly increasing to $55 million, remains marginal.

Sectorally, **agriculture, forestry, and renewable energy dominate**, reflecting a focus on rural resilience, sustainable land use, and energy access, whereas sectors like industry and ICT remain underfunded.

Overall, the data suggests that Madagascars climate finance is heavily reliant on external support, with limited diversification and a need to strengthen domestic investment capacity to ensure sustained and balanced climate action.

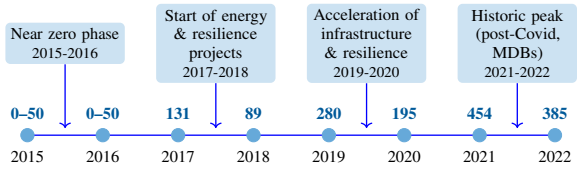
4 CLIMATE FINANCE STRUCTURES BASED ON CCDR

4.1 Historical climate finance flows in Madagascar (2015–2022)

Climate finance flows directed to Madagascar remain relatively recent and exhibit strong annual variability, reflecting both the countrys reliance on the contingent decisions of donors and its still uneven national capacity to design projects that meet international eligibility criteria. An analysis of the period 2015–2022, based on data from the World Banks *Country Climate and Development Report*, reveals an overall upward trend marked by structural instability. This trajectory unfolds through successive *multi-year investment cycles*, characterized by alternating phases of expansion and contraction in financing, driven by the dynamics of multilateral programs and the absorption capacity of national institutions.

The period **2015–2016** stands out for its negligible or marginal amounts (below USD 50 million), corresponding to the establishment phase of initial financial mechanisms. In **2017**, a notable increase occurred, with approximately USD 131 million mobilized, reflecting the emergence of structuring projects in energy and resilience, supported by World Bank instruments. This progress was followed in **2018** by a decline to around USD 89 million, marking the end of the first project cycle initiated in previous years. In **2019**, funding surged to nearly USD 280 million, driven by large-scale climate-compatible infrastructure programs, thereby initiating a new investment cycle. The trend reversed in **2020**, with a decrease to about USD 195 million, a direct consequence of the slowdown induced by the COVID-19 pandemic and related disbursement delays. The year **2021** established a historic record with approximately USD 454 million, owing to a marked strengthening of multilateral commitments, notably from the World Bank and the African Development Bank. Finally, **2022** registered a still elevated volume of USD 385 million, slightly below the 2021 peak, illustrating the cyclical nature and dependence on multi-year commitments.

These data highlight the absence of a structurally stable financing flow, as peaks are often correlated with large-scale projects funded through concessional loans or grants from major donors. This volatility underscores Madagascars ongoing challenge in maintaining a sufficiently robust project pipeline to ensure continuous and predictable absorption of climate funds.



Sources: World Bank, Country Climate and Development Report, October 2024

4.2 Distribution of major donors and analysis of their contributions in 2022

In 2022, climate finance directed to Madagascar amounted to approximately USD 385 million. The allocation is as follows:

The **World Bank Group** stands as the principal donor, contributing USD 194 million, representing 55% of the total. This support is delivered through the International Development Association (IDA),

the International Bank for Reconstruction and Development (IBRD), as well as the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA). The groups financing primarily targets energy projects, resilient infrastructure, and social adaptation mechanisms.

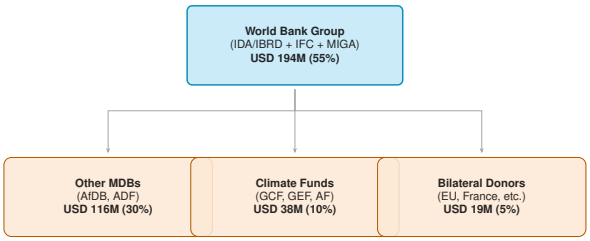
Other multilateral development banks, including notably the African Development Bank (AfDB) and the African Development Fund (ADF), provide support amounting to roughly USD 116 million, or nearly 30%. Their interventions focus mainly on programs in the energy, transport, and agriculture sectors.

Multilateral climate funds, comprising the Green Climate Fund (GCF), the Global Environment Facility (GEF), the Adaptation Fund, and the United Nations Development Programme (UNDP), account for approximately USD 38 million, or 10%. These resources are principally directed toward community adaptation, forestry, and coastal resilience.

Finally, **bilateral donors**, such as the European Union, Japan, and France, mobilize around USD 19 million, or 5%, focusing on targeted projects notably in agroecology and local renewable energy.

This distribution reveals a strong concentration of financing around the World Bank Group, which plays a leading role through its co-financing and guarantee mechanisms. However, this dependence increases Madagascars vulnerability to potential fluctuations, especially if a major donor modifies its commitments or conditions disbursements on institutional reforms. Furthermore, diversification of funding sources remains limited, particularly concerning private or innovative instruments such as green bonds or public-private partnerships. The relatively modest share of specialized funds and bilateral donors also highlights persistent challenges in designing and implementing projects aligned with international standards, reinforcing the hypothesis of limited technical and institutional capacity.

Climate Finance Distribution in Madagascar in millions of US dollars (USD)



Sources: World Bank,CCDR, October 2024

4.3 Sectoral breakdown of climate finance in Madagascar

An analysis of the sectoral allocation of climate finance received by Madagascar reveals a markedly asymmetric structure, reflecting both the strategic priorities of donorsparticularly multilateral development banksand the nature of projects deemed *bankable*, i.e., likely to attract funding due to their potential profitability or measurable impact. For 2022, available data indicate a clear dominance of the energy sector, followed by agriculture and land use, infrastructure, water management, and finally, cross-sectoral programs integrating multiple dimensions.

The **energy** sector alone accounts for nearly **45 %** of climate finance, approximately **USD 174 million** out of the total USD 385 million in 2022. This predominance stems from donors preference for greenhouse gas mitigation projects, such as hybrid solar power plants, decentralized mini-grids, and hydropower infrastructure, which combine profitability prospects with easily quantifiable performance indicators. The modernization program of the national electricity company (**JIRAMA**), alongside the expansion of off-grid renewable energy, represents a significant portion of these funds, illustrating a commitment to align energy transition with economic development.

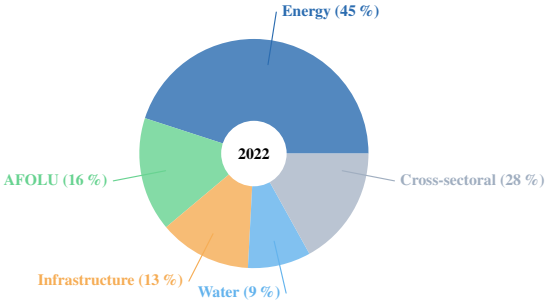
The **agriculture, forestry, and other land uses** sector (grouped under the acronym **AFOLU**) receives a more modest allocation, ranging between **USD 55 and 70 million**, corresponding to roughly **15 to 18 %** of total funding in 2022. Resources in this sector primarily support forest restoration initiatives (notably **REDD+** programs), community reforestation, agroforestry, and efforts to enhance agricultural resilience in drought-prone regions, particularly in the countrys south. The relatively limited share allocated to this sector appears paradoxical given agricultures central role in Madagascars economy and its direct exposure to climate risks.

Infrastructure and transport projects absorb approximately **USD 45 to 55 million**, or **12 to 15 %** of climate finance in 2022. This sector holds strategic importance by strengthening the countrys resilience to extreme events such as cyclones and floods. Donors tend to favor projects incorporating sustainability standards, including climate-resilient roads, anti-erosion works, and protective dikes, though the lack of domestic co-financing often constrains the scope and pace of these initiatives.

The **water and water resource management** sector captures between **USD 30 and 40 million**, roughly **8 to 10 %** of climate finance flows. These funds aim to protect and restore watersheds, establish potable water systems in vulnerable areas, and develop integrated water resource management. These projects embody a dual focus on adaptationsecuring resources amid droughtand mitigation, notably through reducing losses and improving distribution networks.

Finally, a substantial portion of funding, estimated at nearly **USD 108 million** (approximately **28 %**), is classified under intersectoral or cross-cutting programs. These initiatives typically combine multiple componentsenergy, agriculture, social protectionwhile incorporating institutional capacity building, governance enhancement, and monitoring and evaluation frameworks. They are often spearheaded by major actors such as the World Bank or the Green Climate Fund, reflecting a holistic approach designed to maximize the overall impact of climate finance on national resilience.

Figure 3 Sectoral breakdown for Madagascar



Sources: World Bank, Country Climate and Development Report, October 2024

Note: AFOLU = Agriculture, Forestry, and Other Land Uses.

4.4 Findings and analysis

The examination of climate finance flows to Madagascar over the period 20152022 reveals pronounced instability, marked by significant annual fluctuations. This variability reflects not only a dependency on the contingent decisions of international donors but also an institutional capacity still insufficient to sustain a continuous and structured project pipeline. Peaks in financing typically correspond to major operations led by multilateral actors, underscoring the absence of a durable embedding within national planning frameworks.

The near-hegemonic concentration of funding within the World Bank Group (55 %) illustrates heightened vulnerability to the uncertainties of international commitments. While this dominance facilitates resource mobilization and coordination, it exposes Madagascar to systemic risk should this key donor withdraw or shift strategic priorities. Moreover, the limited contributions from specialized funds and bilateral donors, combined with the near-total absence of private or innovative finance, attest to an embryonic diversification that constrains both strategic flexibility and financial innovation.

At the sectoral level, the predominance of the energy sector (45 %) aligns with a mitigation logic favoring projects with measurable performance indicators and economic profitability. Conversely, the modest share allocated to agriculture, forestry, and water resource managementdespite their crucial role in climate adaptationreveals a disconnect between actual needs and financial allocations. Such underrepresentation may hinder the resilience of rural populations, who remain especially vulnerable to climatic shocks.

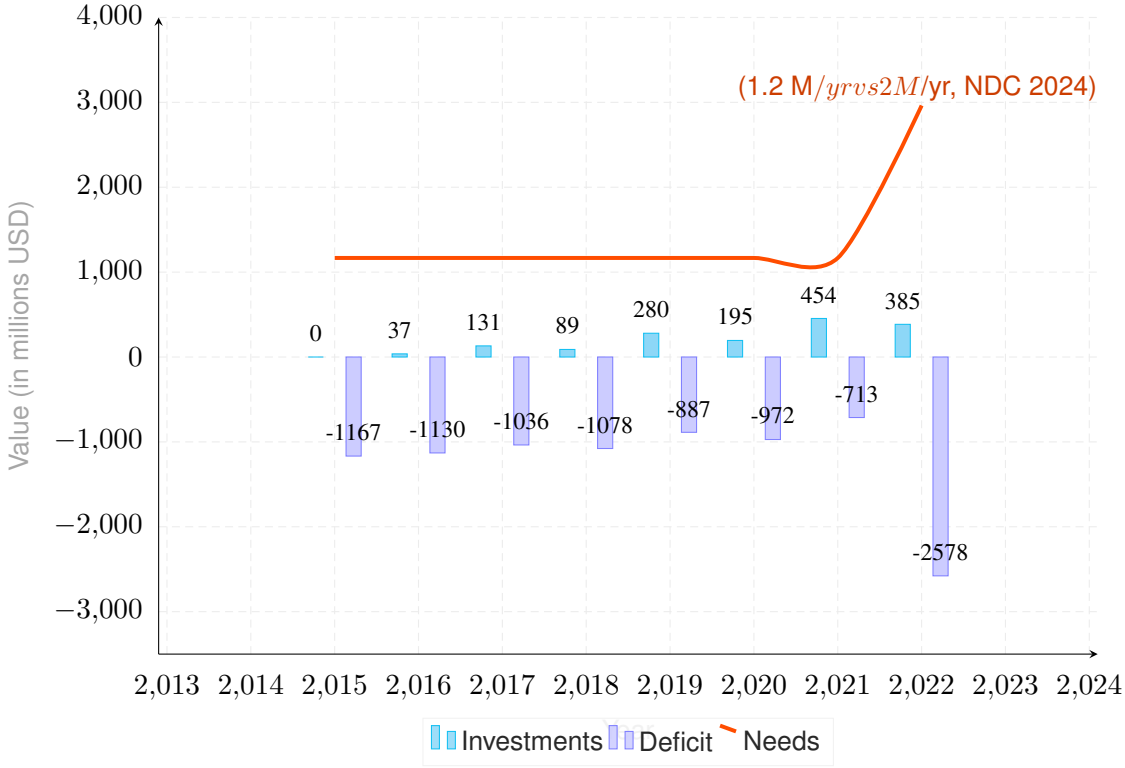
Finally, the significant proportion of intersectoral programs (28 %) indicates a growing awareness of the complexity of climate challenges, which demand integrated responses. However, the success of these approaches requires a substantial strengthening of national institutional capacities, alongside rigorous monitoring to ensure both effectiveness and sustainability of interventions.

5

Analysis of climate finance needs and gap in Madagascar

As one of the countries most vulnerable to climate change, Madagascar faces a critical climate finance gap that restricts its ability to implement both adaptation and mitigation measures. This deficit stems from an excessive reliance on traditional public funding, which often falls short, limited institutional capacity, and a lack of transparency in resource allocation (Republic of Madagascar, 2022, Second Nationally Determined Contribution). **Climate impacts, including intensifying tropical cyclones, droughts, and floods, could reduce GDP by 16 % by 2050** under a pessimistic scenario absent climate action (World Bank, 2024, Madagascar CCDR). This shortfall exacerbates multidimensional poverty, particularly in rural and coastal areas where populations are most vulnerable (World Bank, 2024, Madagascar CCDR).

Figure 3 Historical Climate Financing Needs in Madagascar



Source: CCDR, 2025.

The chart highlights a persistent and structural gap between actual climate investments in Madagascar and the financing needs outlined in the countrys Nationally Determined Contributions (NDCs), a gap that widened dramatically in 2022.

While historical investments show a gradual increasefrom 37 million USD in 2016 to 454 million USD in 2021they remain negligible compared to the steady annual financing requirements of around 1.2 billion USD up to 2021. The financing deficit, which hovered around 1 billion USD per year between 2015 and 2020, escalated sharply in 2022, reaching a record high of nearly 2.6 billion USD, coinciding with a surge in estimated needs to 2.96 billion USD.

This widening shortfall signals not only the countrys limited ability to mobilize financial flows at the scale required to meet international climate commitments, but also an increasing risk of misalignment between Madagascars development trajectory and global climate objectives.

The volatility of received funding and the absence of a sustained investment dynamic underscore the countrys heavy reliance on external donors and the fragility of domestic financing mechanisms.

5.1 Climate finance needs

5.1.1 According to the second nationally determined contribution (NDC2)

The first Nationally Determined Contribution (NDC1) initially estimated total climate finance needs at **USD 42.1 billion**, of which **USD 28.7 billion** was specifically allocated to adaptation efforts [3]. The Second Nationally Determined Contribution (NDC2), covering the period 20222030, revised these projections downward, now estimating overall needs at **USD 24.4 billion**.

Figure 5 Climate finance needs by sector, 2022 2030 (in billions of dollars)

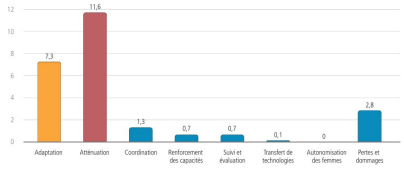


Figure 1:

This budget is divided into three main components.

First, **7.3 billion dollars** are allocated to adaptation, prioritizing projects such as the restoration of **170,000 hectares of degraded mangroves**, the development of drought- and flood-resilient crop varieties, and the establishment of a **centralized multi-hazard early warning system**.

Second, **11.6 billion dollars** are dedicated to mitigation efforts, primarily focused on the expansion of renewable energy and emission reductions through **REDD+** mechanisms.

Finally, a smaller portion of the needs covers intersectoral coordination, capacity building, monitoring and evaluation, technology transfer, as well as loss and damage management.

The Malagasy government plans to mobilize between **700 and 900 million dollars**, representing barely **3 to 4%** of the total, through domestic public resources. The remaining balance, estimated at **23.7 billion dollars**, will therefore need to come from external financing, including multilateral donors, bilateral partners, and to a lesser extent, the private sector.

5.1.2 According to the World Banks climate and development report (CCDR)

The World Banks Climate and Development Report (CCDR) offers a more focused and narrowed estimate of Madagascars climate finance needs. It assesses the required climate financing at **7.49 billion dollars** over the period 2024 2050, concentrating on priority investments in adaptation and resilience [4].

For the period **2024 2030**, a budget of **3.37 billion dollars** is deemed necessary to support urgent actions such as the construction and interconnection of four strategic hydropower projects, the reinforcement of electrical grids, and the modernization of municipal infrastructure to enhance climate resilience.

From **2030 to 2050**, an additional **4.12 billion dollars** would be required for longer-term measures, including sustainable landscape management and the development of a resilient multimodal transport system.

This total envelope represents approximately **46% of the 2022 GDP**, underscoring the scale of the macroeconomic effort required. The planned investments aim to limit economic losses due to climate impacts, estimated between **3.9% and 5.1% of GDP** depending on climate scenarios. Moreover, they seek to strengthen the resilience of infrastructure, productive sectors, and vulnerable communities against natural disasters.

5.2 Analysis of the financing gap

The climate finance deficit remains a principal barrier to implementing Madagascars national adaptation and mitigation strategies. This shortfall primarily stems from a strong dependence on external financing: only **3 to 4%** of the needs identified in the second Nationally Determined Contribution (NDC2)amounting to between **700 and 900 million dollars**can be covered by domestic resources, leaving a gap of **23.7 billion dollars** to be filled by international donors and private actors [3].

Limited institutional capacities exacerbate this deficit. Public administrations, particularly at the subnational level, suffer from a shortage of qualified personnel, financial resources, and sufficient coordination to effectively manage climate projects. For instance, the National Risk and Disaster Management Office (BNGRC) has established only **3 regional offices** out of the **18 planned** [4]. Furthermore, access to innovative financing remains constrained: carbon markets, notably **REDD+** initiatives, are underutilized due to regulatory and technical obstacles, despite the potential to reduce forest emissions by an estimated **40 to 45 Mt CO_2e**, with an average

price ranging from **1 to 5 dollars per ton** [4].

This is compounded by a lack of transparency and predictability in budgetary processes and public procurement procedures, discouraging private investment. Finally, growing economic vulnerability, intensified by the increasing frequency of climate disasterswhose damages could multiply fivefold by 2050aggravates multidimensional poverty and diminishes the local populations financial capacity to contribute.

5.3 Proposed solutions to bridge the financing gap

Among innovative financial mechanisms, the issuance of **green and blue bonds** could enable the funding of marine and coastal ecosystem conservation programs, notably mangroves and coral reefs, while simultaneously promoting the blue economy. The development of **climate insurance** products, either microinsurance or index-based, would also enhance protection for vulnerable economic actors, as exemplified by the pilot project funded by **GIZ** for peanut producers in the south. Furthermore, optimizing the regulatory framework, notably through **Decree 2021-1113**, would strengthen the exploitation of carbon markets and credits generated by **REDD+** initiatives.

On the fiscal and budgetary front, the gradual elimination of fossil fuel subsidies, combined with the introduction of environmental taxes and water pricing mechanisms, could generate additional revenues to finance the NDC2 and reinforce the **National Contingency Fund (NCF)**, initially endowed with **420,000 dollars in 2023**. A **national climate finance strategy** clarifying priorities, channels, and preferred partnerships would contribute to increasing transparency and attracting new private investors.

Capacity building is equally essential. The establishment of a **centralized early warning system**, governed by a unified authority, would improve responsiveness to disasters. Likewise, strengthening local administrations, training technical staff, and integrating climate risks into sectoral and subnational planning are identified as priority levers. Improved project evaluation and rigorous monitoring would further optimize resource allocation.

Finally, closer international cooperation appears indispensable. Mobilizing funds through dedicated mechanisms such as **PROGREEN** and **PROBLUE**, or via instruments like the World Banks **Catastrophe Deferred Drawdown Option (CAT/DDD)**, amounting to **50 million dollars**, would provide significant support. Concurrently, developing public-private partnerships, particularly for interconnected electrical infrastructure or hydropower projects, could enhance the countrys resilience.

5.4 Critical analysis

A comparative analysis of the two reference frameworks reveals significant divergences. While the NDC2 adopts a comprehensive, global vision with a total amount of **24.4 billion dollars** covering adaptation, mitigation, and coordination needs, the CCDR focuses on a **core of priority investments amounting to 7.49 billion dollars**, already representing **46% of the 2022 GDP**. The estimated financing gap of **23.7 billion dollars** for the NDC2 highlights Madagascars structural dependence on international financing, which is exacerbated by institutional, technical, and regulatory constraints.

Although the proposed solutionssuch as green bonds, carbon markets, and public-private partnershipsoffer promising prospects, their success will depend on the countrys ability to establish clear, transparent, and performance-oriented governance. Fiscal reforms, including progressive water pricing, must be implemented cautiously to avoid exacerbating social inequalities, especially in rural areas where access to safe drinking water remains limited to **53.5%** of the population [4].

In sum, bridging the climate finance gap requires a systemic approach combining financial innovation, ambitious institutional reforms, and enhanced international cooperation. Absent such efforts, the growing vulnerability to climatic hazards risks undermining sustainable development goals and intensifying the countrys socio-economic fragilities.

6 Discussion

The analysis of climate finance flows to Madagascar, as presented in the *Global Landscape of Climate Finance 2025* report by the Climate Policy Initiative and the World Banks *Madagascar Country Climate and Development Report (CCDR)*, highlights a major issue: despite a significant increase in global climate financereaching 1.9 trillion USD in 2023 and surpassing 2 trillion USD in 2024Madagascar remains marginalized in accessing these resources. Three hypotheses help explain this discrepancy.

First, limited technical and institutional capacities constrain Madagascars ability to design bankable projects, as evidenced by the difficulty in meeting donors requirements for complex initiatives. Second, the global allocation of funds favors mitigation projects in middle-income countries, to the detriment of adaptationcrucial for Madagascar given its vulnerability to cyclones, droughts, and floods. Third, the absence of innovative financial mechanisms, such as green bonds or public-private partnerships, restricts diversification of funding sources, resulting in a marked dependence on the World Bank Group (accounting for 55.5% of financing in 2022).

Sectorally, the predominance of investments in energy (48% of 2022 financing) reflects a prioritization of projects with measurable returns, marginalizing key sectors such as agriculture and water management that are essential for rural resilience. The significant share of intersectoral projects (28%) suggests growing awareness of the need for integrated approaches, though their effectiveness hinges on strengthening institutional capacities. Moreover, the volatility of financial flowsfrom 50 million USD in 2015 to 455 million USD in 2021, then 385 million USD in 2022illustrates reliance on the contingent decisions of donors, exacerbating Madagascars vulnerability to fluctuations in international commitments.

Proposed solutionsincluding the development of project preparation platforms, expansion of green bonds, and enhanced international cooperation through funds like PROGREEN and PROBLUEare relevant but require coordinated implementation. Limited transparency in tracking flows, particularly for adaptation, alongside a lack of robust regulatory frameworks, continue to hinder private capital attraction, rendering institutional reform imperative.

7 Conclusion

Madagascar faces a critical climate finance gap, securing only USD 385 million in 2022 against the USD 13.4 billion required by 2030 per the Second Nationally Determined Contribution (NDC2). This shortfall reflects a core problematic: limited access to global climate finance due to institutional weaknesses, a global bias prioritizing mitigation over adaptation, and over-reliance on multilateral donors like the World Bank (55% of 2022 funding). These align with the hypothesis that inadequate technical capacity, skewed global priorities, and lack of diversified funding hinder Madagascars climate resilience.

To address this, Madagascar must act decisively. First, bolster institutional capacity through targeted training and a centralized climate finance authority to design bankable projects and enhance transparency. Second, advocate at global forums like COP, for increased adaptation funding for vulnerable nations. Third, expand innovative financing, such as local-currency green bonds and partnerships with PROGREEN and PROBLUE, to diversify funding and attract private investment. Finally, strengthen regulatory frameworks to build investor confidence and ensure equitable resource allocation.

By tackling these barriers, Madagascar can bridge the finance gap, safeguard its ecosystems, and build resilience against climate hazards, securing a sustainable future through domestic reform and equitable global support.

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