Madagascar
Adaptation Investment Pipeline and Financing Instruments

Technical report

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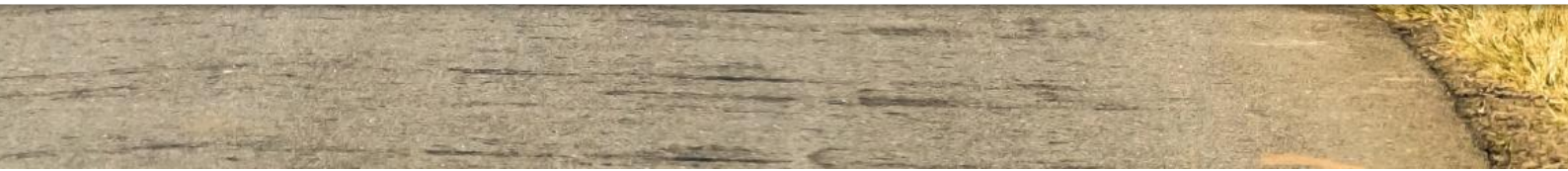

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GLOBAL CENTER ON ADAPTATION

ABOUT THE GLOBAL CENTER ON ADAPTATION

The Global Center on Adaptation (GCA) is an international organization, hosted by the Netherlands, which works as a solutions broker to accelerate action and support for adaptation solutions from the international to the local, in partnership with the public and private sector, to ensure we learn from each other and work together for a climate resilient future.

AFRICA ADAPTATION ACCELERATION PROGRAM

GCA is providing technical assistance under the African Adaptation Acceleration Program (AAAP), a joint initiative launched by the GCA and the African Development Bank in 2021.

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CONTEXT

The Global Center on Adaptation (GCA) is supporting the Government of Madagascar in operationalizing the IMF's Resilience and Sustainability Facility (RSF) to embed climate adaptation into the country's economic and institutional reform agenda. At a time when climate change could reduce Madagascar's GDP by nearly 6% by 2050 and adaptation investment needs are estimated to be around four times current levels, GCA, in collaboration with UNICEF and the World Bank, has helped develop the country's Climate Finance Strategy as a cornerstone for scaling adaptation finance. This support is aims to help Madagascar move from fragmented project-based responses toward a more systemic, investment-ready approach to resilience.

GCA's technical assistance focused on developping a comprehensive evidence base and investment framework for climate adaptation. This included conducting climate risk assessments and identifying a pipeline of priority adaptation investments, alongside the preparation of targeted investor briefs to facilitate engagement with financing partners. GCA also undertook an analysis of existing adaptation finance flows, as well as potential future funding sources and financing instruments, to help inform strategic resource mobilization. Building on this work, the team drafted the Adaptation and Finance pillar of the Climate Finance Strategy, which was refined through three iterative review rounds incorporating detailed feedback from government counterparts. Throughout the process, GCA ensured broad stakeholder ownership by facilitating validation and consultation across multiple platforms, including sub-working groups, thematic roundtables, in-person technical workshops, technical validation meetings, and large regional and national consultations.

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EXECUTIVE SUMMARY

Madagascar faces escalating climate risks that could have up to a 6% GDP impact on the economy, push 1.7 million people into poverty by 2050 and threaten development gains across urban systems, transport, energy, agriculture, water, and coastal livelihoods.

To safeguard development objectives and reduce vulnerability, the country must rapidly fourth-fold investments in climate adaptation. Adaptation already absorbs 44% of total climate finance, but current flows of about USD 490 million/year (2020–2030) would need to increase roughly 4x to meet estimated NDC needs of USD 1.75–2.0 billion/year through 2030.

A Pipeline of Priority Investments in Adaptation

Investing in a priority Pipeline of Investments in Adaptation of 4—15 Bn USD by 2050 is required to safeguard development objectives and the economy: transport is the largest priority because it underpins the whole economy; urban risk is highly concentrated in a small number of cities, making targeted action efficient; agriculture and water are central for livelihoods and food security; and energy, blue economy, and health require smaller but still critical investments to protect economy-wide resilience.

Madagascar is strategically well positioned, with solid policy frameworks through the NAP, NDC, and PANEDD, and sector-specific adaptation plans.

The proposed Adaptation Investment Pipeline focuses on three priorities: (1) integrating resilience into all development investments, (2) scaling protective and adaptive infrastructure, and (3) strengthening preparedness, governance, and enforcement.

Priority investment needs include:

- Urban resilience, especially in 10–20 high-risk cities where most annual losses occur.
- Transport corridor upgrades (RN2, RN4, RN44, RN6, RN7, railways), vital for trade and food security.
- Resilient energy systems, including cyclone-proofed grids, robust hydropower, and distributed solar.
- Climate-resilient health systems and emergency preparedness.
- Water and WASH security, especially in drought-prone and fast-growing urban areas.
- Climate-smart agriculture, improved irrigation, and strengthened value chains.
- Blue economy protection, including mangrove restoration, resilient ports, and coastal risk management.

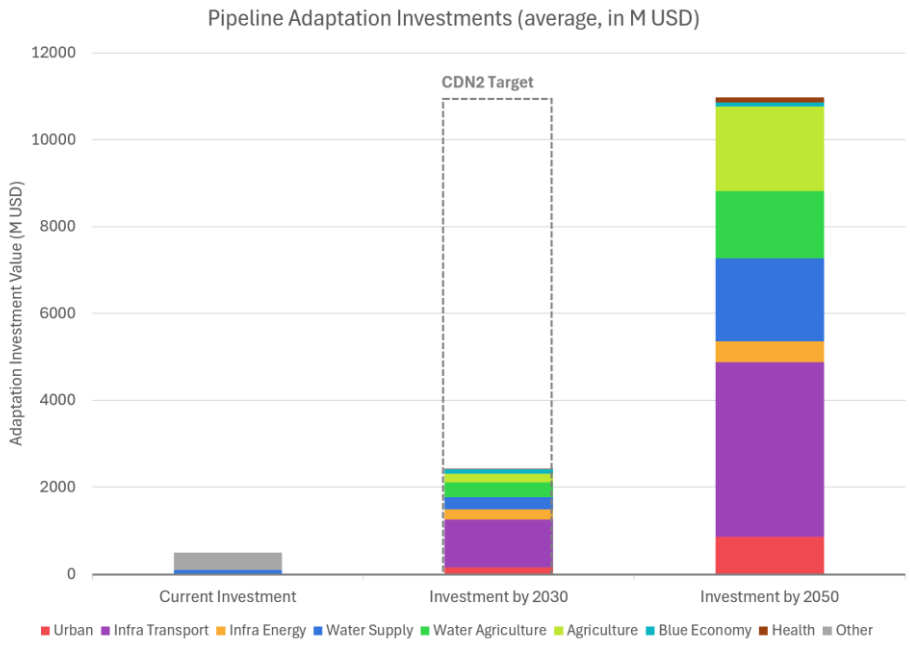
Transport dominates investment needs because it underpins the whole economy: it is the largest sectoral ticket at USD 450–1,700 million by 2030 and USD 1,700–6,400 million by 2050; this reflects severe fragility—64% of roads are in poor condition, only 10–20% are all-weather, 17 million people lack all-season access, and climate damage already costs about 0.2% of GDP annually.

A small number of urban areas drive most urban climate risk, making targeting highly efficient: in cities, cyclones account for 85% of average annual losses, cyclone frequency has tripled in 20 years, and just 10 priority cities capture 75% of total urban risk while 20 cities cover 98%—suggesting strong returns from focused investments in drainage, resilient housing, coastal protection, and planning enforcement.

Agriculture and water are central adaptation priorities because they protect both livelihoods and food systems: agriculture contributes 24% of GDP, supports most livelihoods, and is highly exposed to droughts, cyclones, floods, and erratic rainfall; priority needs include USD 240–840 million by 2030 and USD 1.8–5.2 billion by 2050 across resilient farming, irrigation, integrated water management, livestock resilience, climate-smart practices, and market-linked value chains, while water supply and WASH require another USD 120–450 million by 2030 and USD 600 million–3.2 billion by 2050, reflecting severe water stress and projected ~30% declines in water availability in vulnerable regions.

The rest of the pipeline is composed of targeted but critical needs in energy, blue economy, and health: energy needs USD 130–350 million by 2030 and USD 250–700 million by 2050, blue economy USD 60–120 million by 2030 and USD 70–130 million by 2050, and health USD 3–5 million by 2030 and USD 70–150 million by 2050—showing that safeguarding corridors, cities, power systems, coastal livelihoods, and public services is essential for economy-wide resilience.

Figure 1: Priority Adaptation Investment Pipeline (in M USD)



Finance Flows and Instruments for Adaptation

Madagascar's climate finance system is still highly external and concessional: adaptation funding is dominated by international concessional sources, with 54% from multilateral financial institutions and 37% from governments, highlighting both strong donor dependence and limited domestic/private depth.

A wide mix of domestic public and private finance, international partners, and private investors can support this agenda. Key instruments to mobilize capital for adaptation include guarantees, cash collateral facilities, technical assistance for MSMEs, sustainability bonds (sovereign and private), PPPs, project preparation facilities, carbon credit mechanisms, and debt-for-nature swaps. Many require enabling reforms such as regulatory updates, sustainability taxonomies, and strengthened PPP and debt management frameworks. Blended

finance—combining public funds, MDB support, and private capital—will be essential to de-risk investments.

Main gaps are implementation –particularly in institution reinforcement, better project preparation and prioritization of adaptation investments–, **de-risking to mobilize private capital** –via guarantees, blended finance, PPPs, and technical assistance– and **scale-up of underused financing instruments matched to market segments** --MSMEs need guarantees and first-loss support; large infrastructure needs PPPs, sustainability-linked instruments, and project preparation facilities:

- **The bottleneck is now execution**, not just fundraising: Madagascar's key gap is moving from fragmented, project-based finance to a systemic pipeline approach, requiring stronger institutions, better project preparation, and capital-channeling mechanisms that align finance with NDC/NAP priorities and maximize leverage.
- **Private capital will only scale with de-risking**: the most actionable levers are guarantees, first-loss/cash collateral, blended finance, PPPs, and technical assistance, especially for MSMEs and infrastructure; for example, Solidis already covers 70–80% partial guarantees, and estimates a minimum USD 50 million climate guarantee facility is needed.
- **Project preparation and market readiness are major constraints**: bankability is limited by weak PPP/bond/MRV capacity, lack of climate budget tagging, FX risk, and shallow domestic capital markets; importantly, project preparation facilities cost 5–10% of project value and take 18–36 months, making preparation itself a major financing bottleneck.
- **The most actionable financing levers are differentiated by market segment**: for MSMEs, de-risking tools such as guarantees and first-loss capital are critical—Solidis already covers 70–80% partial guarantees and estimates at least a USD 50 million climate guarantee facility is needed—while for large infrastructure, the priority instruments are PPPs, sustainability bonds, sustainability-linked loans, and PPFs; meanwhile, some options like debt-for-nature swaps appear marginal, with only about USD 10–15 million savings over 10 years against high transaction costs.

1. PIPELINE OF INVESTMENTS IN ADAPTATION

Madagascar's exposure to escalating climate impacts, high vulnerability to extreme events, and development challenges will require substantial investments in adaptation to safeguard development goals and prevent climate shocks from undermining poverty reduction, infrastructure development, and economic growth. Without adaptation, climate impacts could cost the country up to 6% of GDP and push 1.7 million people into poverty by 2050; however, targeted investments could offset most of these losses[1].

The country faces growing threats to urban growth, food and water security, infrastructure, energy, and coastal livelihoods. Due to climate change, cyclones – already responsible for most of the losses – are projected to intensify and shift southward, while flooding will continue to disrupt cities and transport corridors. By mid-century, rising temperatures are expected to place severe stress on fisheries, water resources, agriculture, and urban livability .

Nationally, Madagascar is well equipped at the policy, strategic, and governance levels to drive a broad adaptation agenda, primarily through the programs and objectives outlined in the National Adaptation Plan (NAP), Nationally Determined Contribution (NDC), and National Action Plan for the Environment and Sustainable Development (PANEDD). At the sector level, several ministries – including Health and Agriculture – have developed targeted adaptation plans that identify key risks, investment priorities, and implementation modalities, further highlighting national readiness.

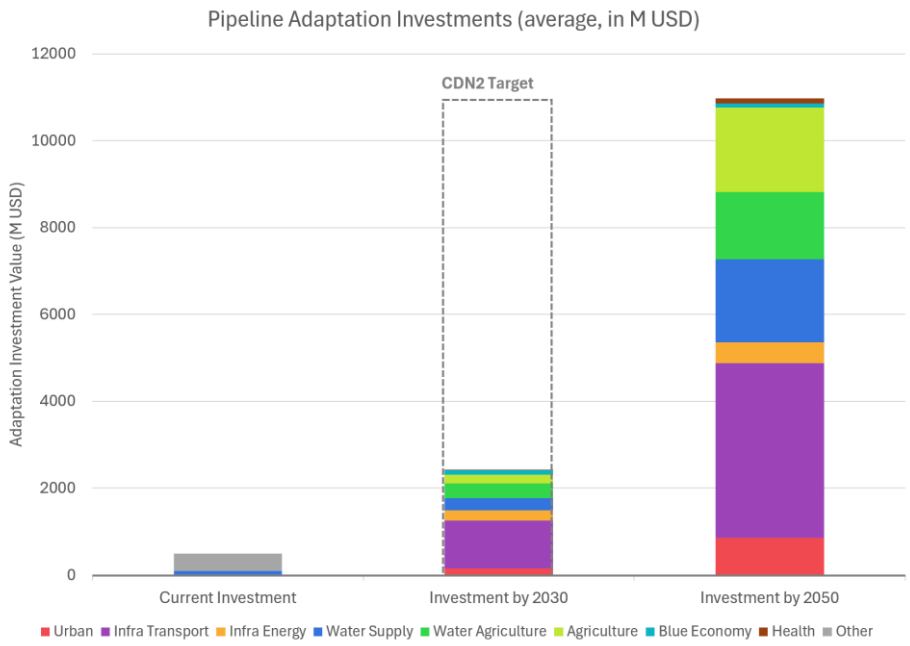
In alignment with these national frameworks, adaptation investment needs have been estimated at USD 12 billion over the 2022–2030[2] period for the 12 National Programs of the NAP. **The Adaptation Investment Pipeline accounts for approximately 20% of this amount and comprises the highest-priority investments.**

The implementation of this priority investment program will require approximately USD 1.5–3.5 billion by 2030, followed by USD 4–15 billion by 2050[3]. Short-term priorities – such as climate-resilient urban infrastructure, emergency road rehabilitation, water supply systems, solar energy, and health preparedness – will require several hundred million dollars annually over the next decade.

Adaptation investment packages have followed a thorough selection and design process, including the level of governance and financial readiness for execution and alignment with short and long-term country priorities. To ensure a comprehensive representation of Madagascar's adaptation needs, regional and national consultations have been incorporated into the work of the Government of Madagascar, the Global Centre on Adaptation, the World Bank, UNICEF, and other technical organisations.

[1] Madagascar Climate Change and Development Report, The World Bank, 2024
[2] Republic of Madagascar. (2024). Madagascar second NDC: Nationally Determined Contribution. United Nations Framework Convention on Climate Change (UNFCCC) Secretariat
[3] Global Center on Adaptation, Adaptation Finance Needs Assessment for Madagascar, 2025. Partnerships: Unicef, World Bank Group. Consulting firms: Groupe Huit, Climate Policy Analysis. Developed under the AAAP.

Figure 2: Priority Adaptation Investment Pipeline (in M USD)



Priority Adaptation Investment Pipeline Components

Based on sectoral Strategic Priorities (SPs), the 12 National Programs of the NAP, and the studies and consultations conducted with the Government, communities, and other stakeholders during the development of this Strategy, a shortlist of highly prioritized investments through 2050 has been established. It constitutes a targeted prioritization of already identified investments, selected according to the following criteria:

- **Impact**: Target assets, populations most vulnerable to climate change, and priority intervention areas, as identified through the participatory process and risk analyses;
- **Bankability and catalytic effect**: Prioritize investments with strong financing potential and the capacity to mobilize new sources of capital, particularly from the private sector (see Chapter 3);
- **Long-term vision**: Integrate future climate projections to ensure financing plans extend to 2050 and remain consistent with the regulatory framework.

The Pipeline is structured around three complementary types of investments applicable across all sectors, addressing both current climate variability and the strengthening of long-term resilience:

Type 1. **Integrate resilience measures into investment projects** to ensure that financed infrastructure, systems, or assets are protected against current and future climate hazards. Only the incremental cost is considered.

Type 2. **Direct investments in adaptation measures** whose primary objective is to reduce vulnerability to climate hazards—for example, through the construction of flood protection infrastructure or by securing water supply in regions affected by drought.

Type 3. **Implement enabling measures for adaptation (capacity, governance, and regulatory frameworks)** to support sustainable, climate risk-informed management and financing.

Key investment areas per sector include:

Table 1. Pipeline priority Adaptation Investments

Investments in Adaptation & Expected Results	Geography & Priorities	Investment (million US $)	
		2030	2050
Urban Sector			
• Climate Resilient Urban Infrastructure and heat-adapted liveable cities • Climate-informed Urban Planning, Governance and Preparation • Cyclone-resistant buildings	**10 priority cities**, hosting 75% of the risk and with climate-informed plans in place	**80–220**	**400–1,300**
Transport			
• Maintenance and Emergency Rehabilitation reinforcement • Rehabilitation, Retrofitting and increased redundancy of Critical Transport Infrastructure • Climate Resilient Standards & Risk-informed Asset Management systems	**National Roads, Bridges, TCE railway** & key feeder roads for rural desenclavage	**450–1,700**	**1,700–6,400**
Energy			
• Climate-Resilient Energy Infrastructure Investments (DRE, Transmission and Hydropower) • Climate Resilient Standards & Risk-informed Management systems	**National** (DRE, Transmission Infrastructure, Hydropower)	**130–350**	**250–700**
Water Supply & WASH			
• Increasing and securing water availability via improving and extending water supply infrastructure and services • Upgrading WASH investments to climate-resilient standards • Governance and recovery mechanisms	**National** Focus on South of Madagascar and large urban areas	**120–450**	**600–3,200**
Agriculture			
Agriculture & Water • Investing in Resilient Agriculture practices • Water management for Agriculture & Livestock Resilience • Increasing farmers long-term resilience, capacity, and risk-sharing Agriculture value chains • Increasing Climate Resilient Agriculture Value-chains infrastructure & capacity • Resilient, market-linked value chains and agribusiness • Increasing SMEs resilience & capacity	**National** Priority to main staple crops production regions	**240–840**	**1,800–5,200**
Blue Economy			
• Resilient Blue-economy infrastructure • Blue-economy diversification for fisheries resilience • Preparedness & Resilient fishing communities • Resilient Tourism sector	**National** Major fishing ports, west, southwest, and northeast coastlines	**60–120**	**70–130**
Health			
• Climate-Resilient Health Infrastructure and Preparedness • Increase capacity in the Health Sector	**National**	**3–5**	**70–150**

Urban sector: investing in climate resilient urban systems

Investment case

Madagascar faces some of the world's highest urban climate risks, with disaster frequency tripling in 20 years, and cyclones alone accounting for 85% of Average Annual Losses (AAL)—including US$658 million in damages in 2022. The vulnerabilities are clear: wind drives two-thirds of losses in many cities, while others face major flood (30%+) and storm surge risks (notably Toamasina and Manakara). These trends are projected to continue increasing towards 2050, with cyclone intensity intensifying and a shift in landing patterns. In the longer term, risks linked to extreme heat are expected to grow and affect liveability [4]. Cities compound other vulnerabilities, with only 48% of urban households having access to electricity, 42% to water, and just 37% living in durable housing, leaving populations highly exposed. Urban expansion, particularly in informal areas prone to flooding, increases vulnerability. Toward the end of the century, extreme heat is also expected to become a major hazard, with maximum temperatures rising by approximately +3 to +7 °C.

Just 10 priority cities with updated urban plans account for 75% of total risk, and scaling to 20 cities covers 98%, making targeted investment highly cost-effective[5]. The most urgent and high-impact areas are:

1. **Reinforcing urban infrastructure** (drainage, waste management, transport, flood defence)
2. **Strengthening enforcement** of existing planning frameworks through institutional capacity and sustainable financing mechanisms
3. **Promoting cyclone-resilient building** practices and investments.

Priority cities with robust planning in place and experiencing the highest risks include Antananarivo, Toamasina, Nosy Be, Mahajanga, Fenerive Est, Antsirabe, Moramanga, Sambava, Fort-Dauphin, and Fianarantsoa.

Directing 0.4–1.4 Bn USD of funding towards 2050 would contribute to addressing a majority of projected climate risks with positive direct BCRs. This will also contribute to preserving the 75% of GDP generated in cities, avert mounting humanitarian crises, and ensure that rapid urban growth—expected to surpass rural population by 2036—becomes an engine of resilience rather than vulnerability.

Investment components

Table 2: Priority adaptation investments in the urban sector

1	Priority Investments in Urban Resilience	Current Invest.	Invest. by 2030	Invest. by 2050	Finance Source
1.1	**Climate-resilient urban infrastructure, and long-term liveable cities**				
(i)	**Upgrade municipal services and priority infrastructure** —municipal services, transport, water supply, electricity— to make them climate- and disaster-resilient, based on cost-effectiveness.[6] • Priority areas: Antananarivo, Toamasina, Mahajanga, Toliara, Morondava	–	5-15	30-90	Public/ PPP
(ii)	**Upgrading Drainage–Sewage Infrastructure**, including enhanced solid waste management operations to reduce blockages, including NbS and retention-infiltration approaches	–	20–50	165–420	Public invest.

[4] Global Center on Adaptation (GCA). *Climate Hazard Assessment, Madagascar.* 2025.

[5] The World Bank. *South West Indian Ocean – Resilient Agriculture and Food Systems (SWIO-RAFI).* Washington, DC.

[6] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.

	• Priority areas: Antsirabe, Moramanga, Ambatondrazaka, Fort-Dauphin, Fianarantsoa, Manakara, Ambositra, Ambatolampy, Antananarivo, Toamasina, Toliara, Morondava, Mahajanga				
(iii)	**Upgrade and expand coastal protection**, especially coastal defence in cyclone-prone and low-lying urban areas, including managed retreat in extreme cases • Priority areas: Toamasina, Nosy Be, Mahajanga, Sambava Cu, Fort Dauphin, Manakara, Toliara	–	–	80–300	Public/ PPP
(iv)	**Promote Urban Agriculture and Reforestation** to reduce extreme heat risks, landslide risks and food insecurity; building on community capacity • Priority areas: Ambilobe, Toliara, Mahajanga, Nosy Be	–	5–15	20–100	Public/ Private
1.2	**Climate-Informed Urban Planning, Governance & Preparedness**				
(i)	**Enhancing enforcement mechanisms for housing resilience**, particularly for effective permitting and inspection: • Enablers: Develop mandate and skills for municipalities; Building quality guidelines (formal, informal, retrofitting, and new); Develop financing mechanisms through tax revenues. • Priority areas: Antananarivo, Nosy Be, Mahajanga, Antsirabe, Moramanga, Ambatondrazaka, Fianarantsoa, Toliaria	–	30–80	90–250	Tax revenue
(ii)	**Develop Climate-informed "Reserves Foncieres"**, both by ensuring risk-informed area identification and prioritizing urban areas where urban growth in floodplains is most acute.	–	10–50	15-65	Public, PPP land value capture
(iii)	**Expand Climate-informed Planning Documents and Resilient Building Guidelines**: Elaborer des PUDi « climat » : • spécificité « villes côtières» : Vohemar, Maroantsetra, Mananara, Nosy Varika, Fort Dauphin, Ambovombe, Maintirano • spécificité « villes à risque inondation » : Ambilobe et Ambatondrazaka	–	10	10	Policy
1.3	**Cyclone-Resilient Built Structures**				
(i)	**Targeted strengthening of residential built structures**, including for auto-construction–as this is the main risk for residential buildings. • Investment case: estimated BCRs of 0.5–3 BCR[7]; Retrofitting to climate resilient standards costs +11–40%, yielding median BCR of 1,5[8]; • Target: 50% of residential stock • Priority areas:	–	0–5	20–50	Private Invest.
(ii)	**Targeted strengthening of commercial built structures:** warehouses, distribution and transformation centres	–	0–5	5–10	Private
(iii)	**Targeted strengthening of critical public infrastructure:** hospitals, schools, markets, designed or retrofitted to withstand extreme winds	–	0–5	5–10	Public
	Total Priority Investments in Urban Resilience	0+	80–220	400–1 300	M USD

Execution, enabling environment and financing

- **Increasing enforcing capacity**, particularly in ten priority cities, via permit enforcement and inspections is identified as a key priority to ensure (1)new constructions do not happen in flood-prone areas; and (2)materials and standards are respected. This is a key enabling condition that requires strong mandates, governance and new financing mechanisms.
- **Addressing minimal finance space**, with transfers from the state budget making <5% of revenues and communes allocating <10% of budgets to investment, remains a critical enabling area for effective execution[9].
- **Fostering private investment on house renovation with climate resilient materials** and standards requires a long term strategy, starting from enhancing the resilience of public buildings and raising awareness to private homeowners.
- **Planning readiness:** investments in urban resilience should account for the diverse planning stages of cities in Madagascar. Even while a number of cities have recent planning documents, many require updates due to recent urban growth.
- **Embedding within national priorities**, by aligning adaptation investments within mechanisms currently being prioritized by the Government of Madagascar, particularly: (1) Land reserves, (2) New cities construction projects, (3) Auto-construction projects, (4) Relocation from flood-prone areas, (5) Traditional housing enhancement and Shelter construction in coastal areas, (6) Centralisation onto an urban housing observatory.

[7] UNISDR. *Working Paper Series: Madagascar*. Final Draft. Retrieved from: Microsoft Word - UNISDR Working Paper Series_Madagascar Final Draft.doc

[8] Executive Summary: The Cost of Improving Vulnerable Housing

[9] Madagascar urbanization Review

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Aménagement du territoire & Infrastructures PS1–5; Habitat & Nouvelles Villes PS1
- CPGU *Guide pour l'amélioration de la résistance des cases d'habitation traditionnelle face aux cyclones. Casses traditionelles – construction/reconstruction des cases traditionelles.*

Infrastructure/ Transport: climate resilient value-chain corridors

Investment case

Madagascar's transport system is the country's economic lifeline, but highly fragile and low-redundant. Over 90% of goods are transported by road, with the Antananarivo–Toamasina RN2/TCE corridor (85% of freight) and the RN7 (a food security corridor) being central to national stability. Yet 64% of roads are in poor condition, only 10–20% are all-weather, and more than 17 million rural people remain isolated. Rail infrastructure is near collapse, with only the Tana–Toamasina line partially functional and highly exposed to floods and landslides.

Climate impacts already cost ~0.2% of GDP annually in road and rail damage, and without action, poor maintenance and rising risks could increase by 50% by 2030[10]. Exposure is high: floods threaten 3,400 km of roads, landslides affect 16,000 km of roads and 4 km of bridges, and cyclones repeatedly cut rail and coastal access[11]. With climate change, disruptions will intensify. Heavier rainfall, stronger cyclones, and coastal erosion will undermine connectivity, disrupt agricultural value chains (such as vanilla, rice, and cotton), heighten food insecurity, and deepen social isolation.

To increase resilience in the transport sector, three key investment areas are identified:

1. **Climate-proof core national corridors** (RN2, RN4, RN6, RN7, RN44), and the TCE railway, ensuring redundancy and resilience of the economic backbone–ensuring bridge long-term resilience
2. **Upgrade feeder and secondary networks**, reducing rural isolation and strengthening food security, trade, and disaster response
3. **Reinforce maintenance** and establish emergency financing mechanisms, as the most cost-effective defence against escalating climate losses.

Projected investment needs are substantial —US$1.7–6.5 billion by 2050— but can generate benefits up to 1.4 times higher than costs, while safeguarding value chains and delivering strong co-benefits.

[10] The World Bank. *Country Climate and Development Report (CCDR): Madagascar*. Washington, DC.
[11] Coalition for Disaster Resilient Infrastructure & UN Office for Disaster Risk Reduction. (2025). *Roadmap for Infrastructure Resilience in Madagascar*. Retrieved from https://cdri.world/governance/roadmap-for-infrastructure-resilience-in-madagascar/

Investment components

Table 3: Priority adaptation investments in the transport sector

2	Priority Investments in Transport Infrastructure Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
2.1	**Maintenance and Emergency Rehabilitation reinforcement**				
(i)	**Increase Maintenance Budgets** to reinstate routine & periodic maintenance • Investment case: ~US$250m/yr for national roads; cuts lifecycle costs and climate losses; without it, transport infrastructure costs could rise ~50% by 2030 [12] • Priority areas: national roads	10	20–105	520–800	Public Invest.
(ii)	**Establish an Emergency Road Rehabilitation fund** for road rehabilitation after extreme events (high short-term ROI[13]) • Enabler: National Road Condition Assessment • Priority areas: national roads(98% value) and TCE railway(2% value)	–	0–390	10–1,900	Public Invest.
2.2	**Rehabilitation, Retrofitting and increased redundancy of Critical Transport Infrastructure**				
(i)	**Retrofitting of TCE Toamasina-Antananarivo Railway infrastructure**, as key value-chain connector, threatened by increasing landslide+flood risks.	–	5–45	45–150	PPP Invest.
(ii)	**Rehabilitation & retrofitting of core road axis** (RN2, RN4, RN44, RN6, RN7)–RN44 and RN7 particularly important for food security • Priority areas: short term investment in RN44 and RN7	–	300–900	900–3,600	Public Invest./ PPP
(iii)	**Investment in the secondary network**: upgrade key feeder roads to climate-resilient standards to increase –key for access to services, economic resilience and disaster response Priority areas: RN1B, RN3A, RN5, RN5A, RN10, RN12, RN12A, RN13, RN31, RN32, RN35, RN43, RN44[14]	–	300–700	600–1,500	Public Invest.
(iv)	**Bridge Program**: including (1)rehabilitation of key critical bridges, (2)acquisition and deployment of modular bridges in highly vulnerable areas, and (3)reinforcing O&M • Priority roads: RN5, RN6, RN2, RN5a, RN12, RN7, RN4, RN13, RN11a, RN34	–	0–150	510–1,020	Public Invest.
(v)	**Desenclavage of rural areas:** investing in last-mile connectivity to increase access to rural areas as part of secondary road investments. This includes investments in feeder roads, but also in alternative transport systems like inland water transport.	–	50–130	110–250	Public Invest.
2.3	**Climate Resilient Standards & Risk-informed Asset Management systems**				
(i)	Develop and enforce **climate-resilient construction standards** for roads and rail / Establish **risk-informed asset management systems** to monitor vulnerabilities, prioritize investments, and extend asset lifespan**.**	–		8-10	Policy
	Total Priority Investments in Transport Resilience	10+	450–1,700	1,700 – 6,400	M USD

Execution, enabling environment and financing

- **While maintenance is the first line of defence,** implementing effective and sustainable maintenance practices will require rising budget allocations, structuring condition assessment campaigns and developing asset management systems.
- **Raising construction standards,** and therefore raising budgets per km is needed to ensure sustainable infrastructure development and climate resilience.
- **Scaling enforcement of NIRIPG standards**, training engineers on climate-resilient design, and improving coordination across transport, agriculture, and disaster response are key priorities to sustain investments.
- **TCE railway line,** because of its financial strength could be a relevant candidate for PPP investment including climate adaptation provisions.
- **Investments in Multimodal transport**, inland river transport for example, could replace road investment for last-mile connectivity of isolated areas, while building systemic resilience and aligning with the Government's priorities.

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Aménagement du territoire & Infrastructures PS5, Agriculture PS3
- NIRIPG guidelines for resilient roads

[12] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.
[13] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.
[14] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.

- Plan National de Transport Multimodal 2015–2040 and the Stratégie National de Transport Multimodal

Infrastructure/ Energy: climate-proofing Madagascar's Electrification Strategy

Investment case

Current Madagascar's energy system is fragile, mostly concentrated around the Antananarivo Metropolitan area and leaving 19 million people underserved. Within the 2030 universal energy access plan of Madagascar, hydropower is expected to account for 75% of supply and distributed solar for 5%, while mini-grids would account for 80% new connections– yet many of these assets are located in cyclone- and flood-prone regions.

Cyclones repeatedly damage hydropower plants, substations, and transmission lines—affecting 9 km of lines and with 2 of 6 substations being in flood zones—, while droughts affect 11 of 13 hydro plants in the Country, cutting output and increasing reliance on thermal generation (which affect affordability); high winds and heat also threaten solar assets, and with nearly 900 MW of new renewable capacity planned by 2030, exposure to variable rainfall, storms, and heat will intensify.

Achieving universal access while ensuring reliability requires climate-proofing the generation, transmission, and distributed systems that will power Madagascar's development. Priority actions include:

1. Resilient distributed solar systems, with cyclone-resistant design, storage, and risk-informed siting;
2. Climate-resilient transmission upgrades in cyclone-exposed central corridors; and
3. Hydropower retrofitting and integrated water management to secure long-term generation.

Overall, investments of US$250–700 million by 2050 could safeguard the country's electrification goals, reduce economic losses, and strengthen energy security. Integrating resilience early will avoid costly retrofits, protect private investment, and ensure that the transition to renewable energy becomes an engine of resilience rather than vulnerability.

Investment components

Table 4: Priority adaptation investments in the energy sector

3	Priority Investments in Energy Infrastructure Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
3.1	**Climate-Resilient Energy Infrastructure Investments**				
(i)	**Investment in resilient distributed solar**–include resilience requirements on private sector contracts (cyclone-resistant, increased storage, risk-informed sitting, etc) • Priority areas: cyclone prone areas in the north and east	–	70–230	130–450	Policy / Private/
(ii)	**Upgrading existing and future transmission infrastructure to climate resilient standards on cyclone areas**, as these are particularly affected by extreme winds, west coast • Priority areas: Central regions around Antananarivo	–	50–100	100–205	PPP /Public
(iii)	**Retrofitting hydropower to climate resilient standards (design changes and implementing IWM at the catchment level),** as these provide most of the power, • Priority areas: new hydropower projects	–	5–10	20–40	PPP /Public
3.2	**Climate Resilient Standards & Risk-informed Management systems**				
(i)	**Develop Climate Resilient Standards, Risk-informed Asset Management systems, and resilient O&M,** especially for hydropower	–	10	–	Policy
	Total Priority Investments in Energy Resilience	0+	130–350	250–700	M USD

Execution, enabling environment and financing

- **The energy sector, specially distributed solar, represents an opportunity to mobilize private finance for adaptation.** Developing new climate resilient standards and incentives/regulations to include them into procurement processes should be a priority to attract finance for adaptation in the sector.

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Aménagement du territoire & Infrastructures PS5
- Aligned with Pacte Énergétique National pour Madagascar, Government of Madagascar

Water Supply: climate-proofing Water Supply Infrastructure and WASH targets

Investment case

Madagascar's water supply system faces growing stress from declining rainfall, stronger cyclones, and chronic droughts, with direct consequences for health, food security, and urban development. Although the country has abundant water resources overall (23,000 m³/person/year), availability is highly uneven—southern regions fall below 8,000 m³/person/year, approaching water stress levels. Rainfall has already decreased by 15–20% since 1961, and is projected to drop another 5–20% by 2100, especially in the East and South[15]. Cyclones, increasingly intense and shifting southward, repeatedly damage intakes, pipelines, and treatment plants, while sea-level rise and saline intrusion threaten coastal aquifers in regions such as Anosy, Androy, and Boeny.

Urban water systems are fragile: with water supplies depending on few sources, and secondary towns and Antananarivo outskirts having poor access to water. Antananarivo faces a daily deficit of 92,000 m³, with 44% non-revenue water and only 33% of households connected. Some infrastructure is aging, networks are undersized, and drought-prone southern regions depend on emergency trucking for supply. Around the country water quality continues to deteriorate due to erosion, sedimentation, and contamination[16]. Cyclone impacts over the years have further put pressure on water systems, with limited capacity to invest in reconstruction and quick service restoration after major events.

To achieve universal access and protect supply reliability, Madagascar must climate-proof its WASH infrastructure. Priorities include:

1. Investing in retrofitting and new water production infrastructure (solar boreholes, modular treatment plants, and water pumps) in vulnerable regions to droughts;
2. Building new WASH systems to climate resilient standards to ensure reliable universal access, in rural and urban areas.
3. Strengthening governance and recovery mechanisms to ensure long-term sustainability

Overall, investments of US$0.6–3.2 Billion by 2050 can deliver substantial economic, social, and health co-benefits—ensuring that water security becomes a foundation for resilience rather than a growing source of vulnerability. These actions will help secure drinking water in drought-prone and cyclone-exposed regions, reduce disease risks, and safeguard development gains.

Investment components

Table 5: Priority adaptation investments in Water Resources

4	Priority Investments in Water Supply and WASH	Current Invest.	Invest. by 2030	Invest. By 2050	Finance Source
4.1	**Increasing and securing water availability via improving and extending water supply infrastructure and services**				
(i)	**Reduction of technical losses in water distribution;** introduction of performance-based contracts with private operators, remote meter reading, digital monitoring, and network sectorization to cut non-revenue water (NRW) • Priority Areas: Antananarivo, Toamasina, Mahajanga, Antsiranana	0–30	30–70	80–400	Public/ PPP
(ii)	**Increasing water production infrastructure:** small retention reservoirs, climate-resilient boreholes, pipelines, modular treatment plants. • Priority areas: South-East (Tôlañaro/Fort Dauphin, Manakara), North East (Antalaha, Sambava, Maroantsetra), Antananarivo peri-urban	0–40	40–80	90–420	Public/ PPP
4.2	**Upgrading WASH investments to climate-resilient standards**				
(i)	**Investing in climate-resilient WASH systems in Urban Areas** • +1-5% extra costs to climate-proof WASH targets; considering 300 (8 USD/person–Unicef estimate) to 1400 M USD/year on WASH projects until 2030; 16% of funding for rural areas.	0–15	15–100	200–1,600	Public/ PPP

[15] Climate Risk and Adaptation Needs Assessment, The Global Center on Adaptation, 2025

[16] The World Bank. (2022, May 25). *Madagascar National Water Project (P174477)*. Retrieved from https://projects.worldbank.org/projects-operations/project-detail/P174477?lang=en

(ii)	**Investing in climate-resilient WASH systems in Rural Areas**	0–10	10–60	80–560	Public/ PPP
4.3	**Governance and recovery mechanisms**				
(i)	**Improvement of governance and decision-making**. Including investment in monitoring stations and water quality monitoring networks to enable harmonization of WASH data for decision-making.	0	0–25	25–50	Public/ PPP
(ii)	**Investment in recovery mechanisms for post disaster reconstruction and quick service recovery:** including post-disaster reconstruction of systems after cyclone collapse, and emergency response equipment to ensure service continuity.	0	25–150	150–200	Public
	Total Priority Investments in Water Supply Resilience	95+	100–450	600–3,200	M USD

Execution, enabling environment and financing

- **Financing challenges:** WASH financing in Madagascar relies primarily on External donor sources (43%), Household expending (43%), and a relatively smaller Government expenditure (16%). With an estimated financing gap of up to 86% (2020), addressing these funding challenges are central to allow for investment in adaptation[17].

Policy, Governance and Institutional Alignment

- **Type of financing:** PPP lease or concession for production/distribution; climate subsidies to reduce the social cost of access; sovereign or municipal loans (depending on city size).
- **NAP Alignment**: Ressource en eau PS3–4

Water and Agriculture: Agriculture and smallholder farming Resilience

Investment case

Madagascar's agriculture, representing the main livelihood for most of the population, is highly vulnerable to erratic rainfall and climate shocks such as droughts, cyclones, and floods. These hazards drive declining productivity, food insecurity, and rising rural poverty.

Adaptation measures can reverse these trends by strengthening food security and stabilizing smallholder incomes. Priorities include expanding family farms with climate-resilient infrastructure in the short-term such as wells, cisterns, micro-dams, and on-farm storage, alongside diversification and drought-resilient staple crops—rice in Alaotra, Boeny, and Sofia; cassava in the South and Menabe; and sweet potato and maize in the South and Highlands in the medium to long term).

Improved water management is critical, through low-cost irrigation technologies like drip systems and solar pumping and integrated water management plans in key rice areas. Strengthening farmers' resilience further requires accessible climate services via SMS, radio, and training, coupled with de-risking instruments such as microfinance, cooperatives, and index insurance. Together, these investments are essential to safeguard livelihoods and secure rural development under a changing climate.

Investment components

Table 6: Priority adaptation investments in Agriculture and Water

5	Priority Investments in Agriculture and Water Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
5.1	**Resilient Agriculture practices**				
(i)	**Support for diversification and drought-resilience of staple crops**: • Priority crops: rice (Alaotra, Boeny, Sofia), cassava (South, Menabe), sweet potato/maize (South and Highlands).	–	60–350	300–1800	Public / Private
5.2	**Water management for Agriculture & Livestock Resilience**				

[17] African Ministers' Council on Water. (2020). *Sanitation Profile: Madagascar 2020*. https://amcow.ams3.cdn.digitaloceanspaces.com/resources/Madagascar%20Sanitation%20Profile_2020_En_Final.pdf

(i)	**Investing in water catchment and climate-smart irrigation systems for small farms:** solar pumps, wells, drip-irrigation, cisterns, micro-dams, on-farm storage.	–	10–130	40–550	Public
(ii)	**Implement Integrated Water Management plans in key rice production areas**, including dams for water storage	–	30–60	145–300	Public
5.3	**Increasing farmers long-term resilience, capacity, and risk-sharing**				
(i)	**Climate services for small farmers** (seasonal forecasts, advice via SMS/radio, training)	–	15–25	–	Public / Private
(ii)	**De-risking mechanisms for farmers:** tailored microfinance, local cooperatives, index insurance for small producers.	–	–	20–40	Public / Private
	Total Priority Investments in Staple Agriculture Resilience	0+	115–560	500–2,600	M USD

Execution, enabling environment and financing

- **Financing:** Leverage existing PPP frameworks (Law 2015-039) and climate funds to co-finance infrastructure modernization and rural access.
- **Utility performance:** Reduce non-revenue water and improve cost recovery to ensure sustainable O&M.

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Agriculture PS1,3,4,5

Agriculture: Climate Resilient agriculture value-chains

Investment case

Madagascar's rural economy suffers from weak infrastructure, limited access to markets, credit, and information, and high post-harvest losses due to poor logistics. Strengthening climate-resilient agricultural value chains is therefore essential to reduce losses, add value, and build export competitiveness, generating higher incomes, foreign exchange, and sustainable jobs.

Priority investments include post-harvest and processing facilities such as cold storage centers, silos, drying platforms, community granaries, and quality laboratories with export certification, valued at around USD 15M (medium to long term). Building resilient, market-linked value chains will be crucial for both staple crops—rice in Alaotra, Boeny, Sofia, and Sava; cassava in Menabe and Atsimo-Andrefana—and cash crops such as vanilla, clove, cocoa, coffee, and pepper in the North and East, supported by quality improvements, traceability systems, agroforestry, and private investment in certification, insurance, and concessional finance (USD 250k–1M per company, long term). Finally, strengthening the resilience and capacity of SMEs and cooperatives through training in climate-smart practices, inclusion of women and youth, access to credit and climate finance, and the adoption of digital tools will be central to sustaining livelihoods and enhancing the overall resilience of agricultural value chains.

Investment components

Table 7: Priority adaptation investments in the agriculture value-chain

6	Priority Investments in Agriculture value chains Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
6.1	**Climate Resilient Agriculture Value-chains infrastructure & capacity**				
(i)	**Post-harvest and processing infrastructures:** cold storage centers, silos, drying platforms, primary processing units, quality laboratories, export certification. **Granaries**: Establish improved community granaries that provide credit to farmers using the crop as collateral and reduce postharvest loss	–	3–25	5–50	Private
6.2	**Resilient, market-linked value chains and agribusiness**				
(i)	**Strengthening of food and cash/export value chains**: • **Cash / export crops:** vanilla, clove, cocoa, coffee, pepper (North and East), with upgrades in quality and traceability • **Agroforestry projects**	–	5–10	40–80	Private

(ii)	**Private investments in the resilience of export value chains:** sustainable certification, crop insurance, concessional financing, and guarantees.	–	120–250	1200–2500	Private
6.3	**Increasing SMEs resilience & capacity**				
(i)	**Support for agricultural and forestry SMEs/cooperatives to strengthen their ability to cope with climate risks and sustain livelihoods:** • Training on climate-smart agricultural and forestry practices • Inclusion of women and youth as key actors in climate adaptation • Access to credit and climate finance for investments in adaptation technologies • Digitalization for resilience, traceability, and market access	–	5–10	40–75	Public/ Private
	Total Priority Investments in Export Value-Chains Resilience	–	130–280	1300–2600	M USD

Execution, enabling environment and financing

- **Financing:** Blended finance (concessional funds + local banks + export guarantee funds); private investments in agro-industrial/export value chains; climate subsidies for nature-based solutions and social inclusion.

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Agriculture PS1,3

Blue economy: investing in resilient marine ressources

Investment case

Madagascar's blue economy is highly exposed to cyclones, putting fishing communities and port infrastructure at risk and threatening coastal livelihoods. Building resilience requires a combination of safer infrastructure, diversified economic activities, and stronger preparedness systems. Investments in resilient fishing and port facilities—including cyclone shelters for boats, reinforced piers, fish markets, and safety equipment—are essential in major hubs such as Mahajanga, Toliara, Toamasina, Morondava, and Antsiranana, with costs estimated at USD 60–100M and benefit-cost ratios above 2.

Diversifying fisheries through sustainable aquaculture and export value chains will further strengthen resilience, with community-managed shrimp farms on the west coast, sea cucumber farming in the southwest, and seaweed farming in the northeast, supported by cold chains and certification for international markets, requiring USD 40–70M and delivering BCRs of 2–5.

Complementary investments in community preparedness—such as safety training, cooperative shelter management, micro-insurance, and improved meteorology—will reduce vulnerability in fishing villages across Sava, Boeny, Menabe, and Atsimo-Andrefana, with costs of USD 15–25M for organizational strengthening and USD 8–12M for expanded coastal stations. Multi-hazard early warning systems using SMS, radio, radars, and community sirens along the cyclone-prone east coast are critical to saving lives and sustaining economies, with BCRs of 3–8 and costs of USD 10–20M. Finally, adaptive management of coastal tourism destinations, supported by climate risk databases and market intelligence, will help secure long-term resilience of the tourism sector, with public-private financing of around USD 250,000 annually over two years.

Investment components

Table 8: Priority adaptation investments in the Blue Economy sector

8	Priority Investments in Blue Economy Resilience	Current Invest.	Invest. by 2030	Invest. by 2050	Finance Source
8.1	**Resilient Blue-economy infrastructure**				
(i)	**Resilient fishing and port infrastructure**: cyclone shelters for boats, reinforced piers and fish markets, safety equipment. • Geographic focus: Major fishing ports: Mahajanga, Toliara, Toamasina, Morondava, Antsiranana • Adaptation benefits: Reduces cyclone-related mortality and asset loss, sustains fisheries-based livelihoods, and ensures continuity of coastal economies under climate shocks	–	60–100	–	*Public + PPP + insurance facilities*

	• BCR: >2 (indicative)				
8.2	**Blue-economy diversification for fisheries resilience**				
(i)	**Sustainable aquaculture & export diversification**: scaling community-managed shrimp, sea cucumber, and seaweed farming; support for cold chains and certification for EU/China markets. • Shrimp: west coast (Boeny, Melaky); sea cucumber: southwest (Toliara, Menabe); seaweed: northeast (Sava, Analanjirofo) • Adaptation benefits: Diversifies livelihoods away from climate-exposed capture fisheries, enhances food security, generates resilient incomes. • BCR: 2–5	–	10–15	40–70	*Private + blue bonds + donor catalytic funds*
8.3	**Preparedness & Resilient fishing communities**				
(i)	**Organizational strengthening of fishing communities**: safety training, cooperative shelter management, micro-insurance. • Adaptation benefits: same as above • Geographic focus: Fishing villages in Sava, Boeny, Menabe, Atsimo-Andrefana	–	0–5	15–25	*Public + insurance + donor support*
(ii)	**Local meteorology and forecasting**: expansion of coastal stations, improved cyclone forecasts. • Adaptation benefits: same as above • Geographic focus: Coastal stations in Diana, Atsimo-Andrefana, Anosy, Analanjirofo	–	*0–2*	8–12	*Public + bilateral technical grants*
8.4	**Resilient Tourism sector**				
(i)	**Develop participatory, public-private, adaptive management strategies of coastal and marine destinations,** particularly by involving the private sector and communities Priority areas: touristic coastal areas in the NW	–	*0–5*	5–25	*Public + Private*
(ii)	**Develop of tourism-climate change databases, including sectorial Climate Risk database and Market intelligence,** to measure risks, inform strategies, monitor impacts, and develop climate-specific tourism promotion – with the private sector leading the data collection effort on the[18]	–	0–5	5–25	*Public + Private*
	Total Priority Investments in Blue Economy resilience	–	75–130	70–130	M USD

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Zones Cotieres PS1,2; Aménagement du territoire & Infrastructures PS5

Health: operationalizing sectorial climate resilience strategy[19]

Investment case

Madagascar's health system is highly vulnerable, with many facilities (CSBs, CHRDs, CHRRs, CHUs) lacking cyclone- and flood-resilient design and suffering repeated damage, as seen during Cyclone Enawo in 2017, which caused 81 deaths, and Cyclone Ava in 2018, which caused 51 deaths. Service coverage remains deeply unequal, with remaining access challenges especially in rural areas, and emergency preparedness limited by weak stockpiling and coordination mechanisms. Climate change is set to amplify these risks, as cyclones, floods, and droughts increasingly damage health infrastructure and services, exacerbating malnutrition, water- and vector-borne diseases, and heightening vulnerability to outbreaks. Rising temperatures and pollution further add to cardiovascular risks, while shifting climate patterns are expected to create alternating flood–drought WASH crises and greater uncertainty around epidemic dynamics.

The GoM has elaborated a roadmap for climate-proofing the health sector in Madagascar (Plan Strategique d'Adaptaiton au Changement Climatique du Secteur Sante, 2021). This pipeline of investments is an operationalization of that strategy.

[18] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.

[19] All information coming from: Gouvernement de Madagascar. (2016). *Plan d'action national d'adaptation du secteur santé au changement climatique à Madagascar* [Final version]. ClimHealthAfrica. Retrieved from https://climhealthafrica.org/wp-content/uploads/2021/10/PNASS-VERSION-FINALE-3-1.pdf

Investment components

Table 9: Priority adaptation investments in the Health sector

9	Priority Investments in Health Sector Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
9.1	**Climate-Resilient Health Infrastructure and Preparedness**				
(i)	**Upgrade emergency response** during extreme events (cyclones) • Priority areas: cyclone-prone areas	–	–	–	Public
(ii)	**Investment in cyclone and climate proof healthcare systems,** from distribution, improved access and facilities constructed to higher standards	–	–	–	Public
(iii)	**Investment in increasing emergency preparedness** (stockpiling + coordination)– this includes medical and supporting supplies (e.g. fuel)	–	–	–	Public
(iv)	**Include Climate Change in disease preparedness**	–	–	–	
9.2	**Increase capacity in the Health Sector**				
(i)	**Increase capacity of actors and facilities:** • Climate and Health data to improve coordination and risk communication; • Train health staff on climate-health risks and emergency preparedness • Equip for air & water quality monitoring.	–	–	–	Public
	Total Priority Investments in Health Sector Resilience	0+	3–5	70–150	M USD

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Secteur Santé PS1—2
- **Institutional/Policy alignment:** Plan Strategique d'Adaptaiton au Changement Climatique du Secteur Sante intégrant la transparence de l'accord de Paris, Gouvernement Madagascar, 2021; Climate Change and Development Report Madagascar, The World Bank, 2024

Biodiversity: scaling up biodiversity restoration for climate resilience

Investment case

Deforestation, water resource degradation, and illegal pressures are undermining ecosystems and increasing vulnerability, making nature-based solutions, stronger governance and enforcement, and community co-management essential to protect ecosystems, secure water services, and strengthen adaptation.

Large-scale restoration and conservation projects focus on reforestation and wetland restoration in the Highlands and wetlands such as Lake Alaotra, Tsiribihina, Boeny, and Menabe, with benefits including reduced flood and drought risks and more reliable water supply, supported by investments of USD 80–120M over 10–20 years, delivering benefit-cost ratios of 2–6. Green belts and ecological corridors around cities like Antananarivo, Toamasina, Toliara, and Fort Dauphin will further reduce erosion, protect urban assets, and lower heat island effects, requiring USD 40–60M. Nature-based solutions for urban and infrastructure resilience represent an additional USD 17M by mid-century. Strengthening governance and enforcement through eco-guards, drones, and action against poaching, illegal logging, and mining in key ecosystems such as Atsinanana, Makira, Masoala, and Menabe Antimena is estimated at USD 25–40M, with benefit-cost ratios of 1.5–3. Community co-management and economic valorization, through conservation contracts, ecotourism, sustainable fisheries, and non-timber forest products in areas like the west coast mangroves and lakes Alaotra and Itasy, will diversify livelihoods and reduce dependence on climate-exposed activities, with investments of USD 30–50M and benefit-cost ratios of 2–5. Together, these measures aim to build ecological and social resilience while safeguarding biodiversity.

Investment components

Table 10. Priority adaptation investments in inland Biodiversity (in M USD)

7	Priority Investments in Biodiversity and Resilience	Current Invest.	Invest. by 2030	Invest. by2050	Finance Source
7.1	**Large-scale Restoration and Conservation projects to reduce climate risks**				
(i)	**Protection of watersheds & wetlands**: targeted reforestation, riverbank and wetland restoration to reduce erosion, improve recharge and water quality. • Geographic focus: Highlands (Lake Alaotra, Tsiribihina), wetlands (Boeny, Menabe) • Adaptation benefits: Reduces flood/drought risks, secures urban and rural water supply. • BCR: 2–6 (indicative)			80–120 M USD	*GCF, GEF, PES (utilities, industries)*
(ii)	**Green belts & ecological corridors**: around coastal cities & water catchments to reduce climate risks and preserve habitats. • Geographic focus: Antananarivo, Toamasina, Toliara, Fort Dauphin • Adaptation benefits: Lowers heat island effect, reduces erosion, protects urban assets. • BCR: 2–4 (indicative)			40–60 M USD	*Green/ blue bonds, agro-industry co-financing*
(iii)	**Nature-based solutions for Urban and Infrastructure Resilience**, 4.2 MUSD in 2030; 12.6 MUSD in 2050[20]		17 M USD		*Public financing*
7.2	**Community and economic resilience & Governance**				
(i)	**Strengthening law enforcement:** eco-guards, drones, tackling poaching, illegal logging/mining in PAs. • Geographic focus: Atsinanana forests, Makira, Masoala, Menabe Antimena • Adaptation benefits: Prevents ecosystem degradation that buffers climate shocks. • BCR: 1.5–3 (indicative)		25–40 M USD		*Public + climate funds*
(ii)	**Community co-management & economic valorization**: conservation contracts, ecotourism, sustainable fisheries, NTFPs. • Geographic focus: West coast mangroves, lakes Alaotra & Itasy • Adaptation benefits: Diversifies livelihoods, reduces dependence on climate-exposed activities. • BCR: 2–5			30–50 M USD	*PES, tourism /industry*

**Insufficient data to provide estimates for all components*

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Biodiversité et Forets PS1,2,5,6

DDR Infrastructure: Increase cross-sectorial preparedness and DRR Infrastructure Resilience

Investment case

Madagascar faces recurrent and intensifying cyclones that repeatedly disrupt lives and connectivity. Over the past 20 years, cyclones have left 700,000 people homeless and caused up to 100 deaths per year, mostly in rural areas where housing and community infrastructure cannot withstand extreme winds. During disasters, entire regions become physically and digitally isolated, severely constraining emergency response and recovery.

Telecommunications are a critical yet fragile lifeline. Over 10% of antennas are exposed to cyclone and flood impacts (25-year event), with 261 antennas serving 880,000 people in high-risk zones. Weak redundancy and reliance on fragile infrastructure cause frequent service breakdowns, undermining early warning and crisis coordination.

Investments in climate-resilient telecom and preparedness systems are essential to protect lives and maintain critical communication. Priorities include hardening telecom networks, building multi-purpose cyclone shelters, and expanding multi-hazard early warning systems combining SMS, radio, and community alerts. These interventions yield high returns—BCRs of 3–8—and US$40–120 million by 2050 could significantly reduce casualties, enhance crisis response, and strengthen national resilience.

[20] The World Bank. *Country Climate and Development Report (CCDR): Madagascar.* Washington, DC.

Investment components

Table 11. Priority adaptation investments in Preparedness (in M USD)

10	Priority Investments in Preparedness and Communications Resilience	Current Invest.	Invest. by 2030	Invest. by 2050	Finance Source
10.1	**Climate Resilient DRR Infrastructure**				
(i)	**Upgrade telecom infrastructure to cyclone-proof standards:** retrofitting existing network and increasing redundancy in isolated rural areas; key for access to services, disaster response and prevention (Short-term, Private investment)				*Policy, Private led*
(ii)	**Cyclone Shelter Program**, mostly by building large multi-purpose shelters and mini-shelters to up to 50 people • Priority areas: remote, rural areas in Atsinanana, Sava			15–80 M USD	*Public*
10.2	**Expanding cross-sectorial preparedness mechanisms**				
(i)	**Urban hazard Monitoring and Climate Data**, Forecasting and risk modelling, Dissemination & last-mile communication, preparedness and contingency planning		10–20 M USD		
(ii)	**Marine multi-hazard early warning systems**: weather/ocean alerts via SMS/radio, coastal radars, community sirens • Adaptation benefits: same as above • Geographic focus: East coast cyclone corridor: Atsinanana, Analanjirofo, Sava • BCR: 3–8 (indicative)		10–20 M USD		*Public (climate funds), telecom partnerships*

**Insufficient data to provide estimates for all components*

Execution, enabling environment and financing

- Crucial to align with UN CREWS initiative in Madagascar

Policy, Governance and Institutional Alignment

- **NAP Alignment**: Cross-sector PS

2. FINANCE FLOWS AND INSTRUMENTS TO SCALE ADAPTATION INVESTMENTS

The analysis demonstrates that a four-fold increase in adaptation finance is needed: current flows are about USD 490 million/year, versus USD 1.75–2.0 billion/year needed through 2030. Funding is primarily donor driven, private and domestic capital mobilization would need to increase to reach needed investments.

Climate finance in Madagascar has made notable progress over the past decade. However, it remains heavily dependent on external resources – particularly multilateral development banks and climate funds – while national capacities for coordination and implementation are still strengthening.

The country has significant potential to mobilise financing at scale, particularly in the renewable energy, forestry, carbon, and blue economy sectors. Madagascar has also begun to structure emerging financing levers, such as the IMF–World Bank Country Platform, sustainable bonds, a green taxonomy, climate budget tagging, and the development of carbon markets. These initiatives provide essential foundations for strengthening the national climate finance architecture.

The current challenge is no longer solely to mobilise financing, but to structure a system capable of efficiently channelling resources toward national priorities while maximising their leverage effect. The transition from a project-based to a systemic financing approach, therefore, represents a strategic priority. This shift requires stronger institutional frameworks, improved investment preparation, and the deployment of financial instruments capable of mobilising capital at scale.

Financing Madagascar's climate priorities, as outlined in its Nationally Determined Contribution (NDC), will require the large-scale mobilisation of new sources, instruments, and stakeholders. Capital will need to come from domestic public revenues, local financial institutions, international development partners, and private investors. Three priority levers emerge:

- Structuring a robust pipeline of bankable projects aligned with the NDC and the National Adaptation Plan (NAP);
- Strengthening institutional, regulatory, and monitoring frameworks to reduce perceived investor risks;
- Deploying de-risking instruments—such as guarantees, first-loss mechanisms, and blended finance—to catalyse private sector participation.

This transformation is essential to close the financing gap, which is currently largely covered by international concessional resources[21] yet remains insufficient to achieve climate objectives.

[21] Les ressources concessionnelles sont des financements accordés à des conditions préférentielles par rapport aux financements commerciaux, se caractérisant généralement par des taux d'intérêt plus faibles, des échéances de remboursement plus longues ou des périodes de grâce, et incluant parfois une composante de don.

At the Micro, Small, and Medium Enterprise (MSME) level, risk-sharing tools such as guarantees, cash collateral accounts[22], and origination incentives[23] can help banks and microfinance institutions expand lending to smallholders and local businesses that play a critical role in adaptation. For large-scale infrastructure, sustainable bonds, public-private partnerships (PPPs), and sustainability-linked loans offer opportunities to attract diversified, long-term investment while aligning financing with climate objectives. Although each instrument entails specific requirements—from legal and regulatory reforms to the development of taxonomies and sustainability-tracking systems—collectively they provide a practical roadmap for channelling finance toward Madagascar's adaptation pipeline. By combining public and private resources, leveraging multilateral development banks and climate funds to mitigate risks, and strengthening enabling frameworks, Madagascar can scale up adaptation finance and safeguard its development trajectory against growing climate risks.

For Madagascar, potential climate finance sources can be categorised into:

1. **Domestic public finance** (i.e. government revenues)
2. **Domestic private finance** (commercial banks, MFIs, domestic pension funds/insurers)
3. **International public finance** (MDBs, bilateral governments, multilateral climate funds)
4. **International private finance** (corporates, commercial investors, impact funds).

[22] Cash collateral accounts can be financed through a combination of domestic public resources, development partners (such as multilateral development banks and climate funds), and, in some cases, contributions from the private sector. These mechanisms are typically structured within risk-sharing programmes aimed at facilitating access to credit for MSMEs and smallholder farmers.

[23] Origination incentives are financial or regulatory measures that encourage banks and microfinance institutions to issue new loans to priority sectors or borrowers. By offsetting higher transaction costs and perceived risks—through mechanisms such as subsidies, performance-based payments, or concessional refinancing—they help expand access to credit and scale up financing for activities such as climate adaptation.

To support these ambitions, key strategic considerations are presented in the table below:

Table 12. Analysis of Climate Finance Flows, Barriers, and Strategic Levers

	Financing Adaptation
Current financing flows and investment needs	• 44% of total climate finance • Current flows would need to increase fourfold. USD 490 million/year allocated to adaptation and dual-use investments for 2020–2030—well below NDC needs (USD 1.75–2.0 billion/year through 2030). • Financing is predominantly concessional and largely sourced internationally: 54% from multilateral financial institutions, 37% from governments. • Relatively diversified financing, dominated by AFOLU (33% of flows). • Several critical NAP sectors remain underfunded (<3%)—biodiversity, terrestrial and marine conservation, and disaster risk management.
Priority instruments, sources, and levers	**Short-term objective**: scale concessional finance mainly through international public funders. **Long-term objective**: unlock additional financing from domestic, private and public capital. Key Instruments: • Guarantees (e.g., Solidis, Fonds de Garantie Malgache SA, etc). • Technical assistance + investment funds; PPPs (water, coastal, transport, energy). • Project Preparation Facilities (PPFs). • Sovereign/private sustainability-linked bonds. • Nature-based solutions (carbon credits, depending on design).
Barriers	• Dependence on external funders; limited private contribution and tracking challenges. • Absence of climate budget tagging. • Limited capacities (PPPs, bond structuring, MRV); high preparation costs and timelines (PPFs represent 5–10% of project cost; 18–36 months). • Foreign exchange risk and limited depth of the domestic market.
Strategic priorities	• Prioritize and finance an adaptation pipeline (NDC/NAP) and strengthen project preparation (PPFs). • Deploy de-risking mechanisms (guarantees, first-loss, credit enhancement) alongside technical assistance for MSMEs. • Establish a GSS taxonomy and clear rules for bond issuance/PPPs. • Strengthen MRV, data transparency, and (where feasible) climate budget tagging. • Rebalance toward underfunded critical sectors (biodiversity, DRM).

1. Analysis of climate finance flows for adaptation

The following document includes 3 sections: 1) The Landscape of Adaptation Finance Flows in Madagascar, 2) Climate Finance Instruments to Scale Adaptation Finance, and 3) Instrument Deep Dives. The goal of this document is to provide an overview of current climate finance flows in Madagascar and an introduction to various instruments and approaches that might be suitable to address the adaptation finance gap in Madagascar. The document is meant to serve as an introduction to various approaches and the considerations required to implement those approaches, rather than as a definitive guide or set of policy recommendations. .

The Landscape of Adaptation Finance Flows in Madagascar

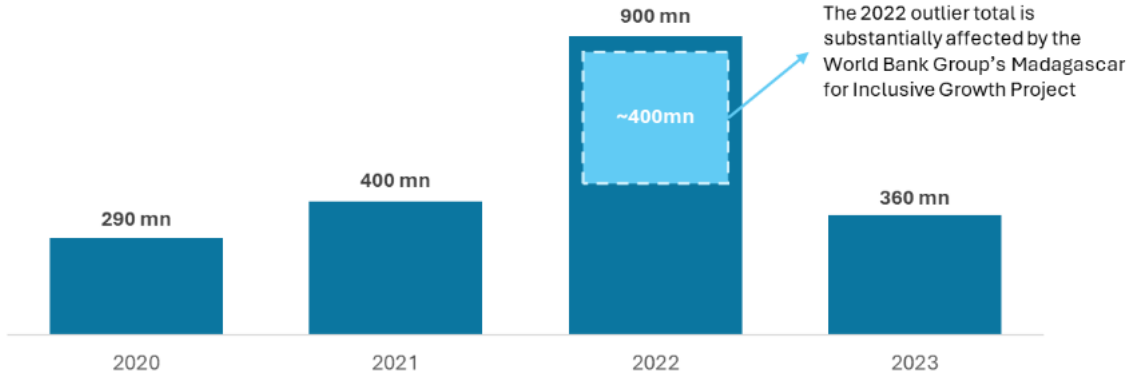


Figure 3: Adaptation and Dual Use Flows to Madagascar, 2020-2030

In 2020-2023, adaptation and dual use finance flows to Madagascar averaged USD 490 million on an annual basis, well below the nearly USD 2 billion annually in adaptation needs through 2030 suggested by Madagascar's NDC.[1] On average, two-thirds of the financial flows were purely adaptation finance, while one-third was dual-use finance. The vast majority of tracked climate finance in the country is finance flows from international public finance,[2] with minimal amounts from the private sector. Notably, 2022 was an outlier year at USD 900 million due to the large World Bank project "Connecting Madagascar for Inclusive Growth."

As context, total tracked climate finance to Madagascar (mitigation, adaptation, and dual benefits) in 2021-2022[3] was USD 850 million, of which 44% was adaptation, 32% dual benefits, and 23% mitigation. Madagascar's distribution of climate finance across uses distinguishes it from the African average, where in the same years, USD 19.9 billion was tracked to mitigation, while 13.8 billion went to adaptation and USD 9.3 billion to dual benefits. Of the mitigation finance tracked to Madagascar in this period, about 50% was in the form of project-level market rate debt, 20% in the form of low-cost project debt, and the remainder in grants. This instrument distribution differs from adaptation and dual benefits finance to the country, which, as illustrated in Figure 3, is predominantly grants and low-cost project debt.

Gaps remain in tracking adaptation and dual-use finance flows in Madagascar, largely around private finance and domestic public finance. This is both indicative of the limited flows of private sector adaptation and dual-use finance flows and the challenges in tracking private adaptation finance. There is also a significant data gap in domestic public climate finance

flows, because the Government of Madagascar does not currently have a climate budget tagging system in place.

Adaptation and dual-use finance in Madagascar is well distributed across multiple sectors compared to other African countries. The Agriculture, Forestry, and Other Land Use (AFOLU) sector received the largest share of finance, representing 33% of all adaptation and dual use flows to Madagascar in 2022-23. Biodiversity, Land & Marine Conservation and Disaster-risk Management are priorities in Madagascar; the sectors only received on average 3% and 2% of total adaptation finance in 2022-2023. If unaddressed, underinvestment in these key sectors could increase Madagascar's vulnerability to climate shocks.

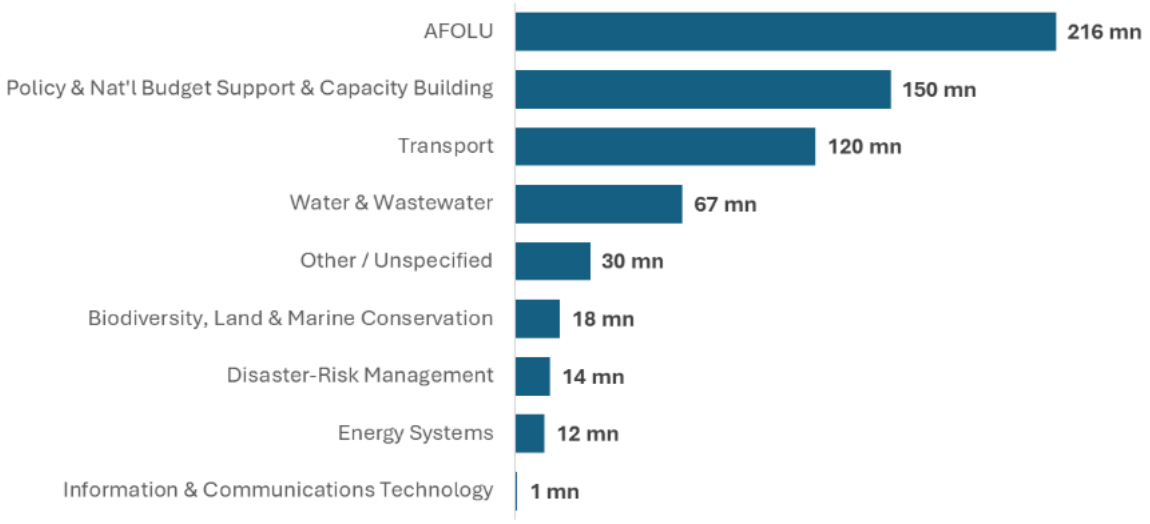


Figure 4: Adaptation and Dual Use Flows by Sector, Average 2022-2023

Multilateral DFIs are the largest provider (54%) of adaptation and dual-use finance in Madagascar comes from Multilateral DFIs, followed by international governments (37%). Multilateral DFIs not only provide the largest total amount of adaptation finance in Madagascar, but also provide the widest range of instruments, including (i) grants, (ii) low-cost project debt, and (iii) project-level market rate debt.

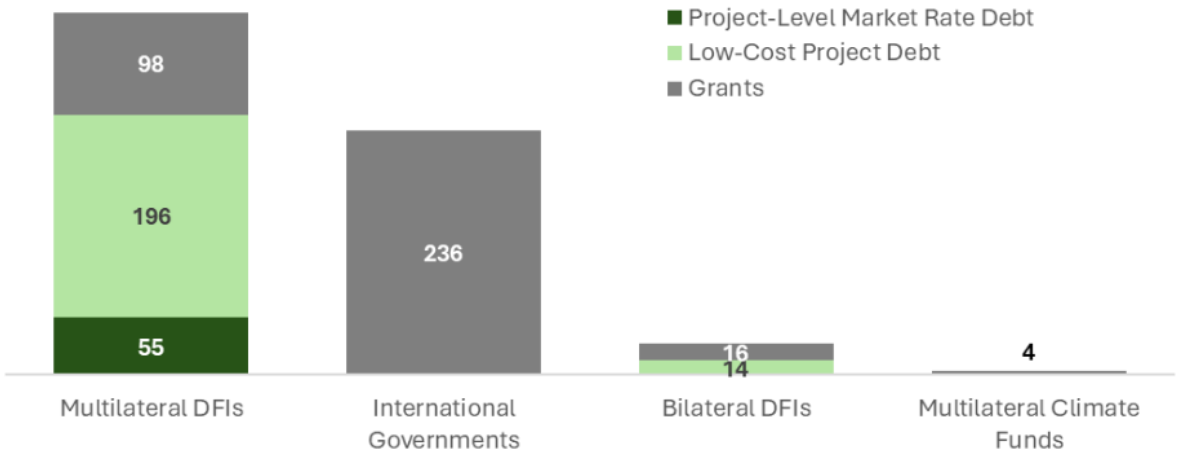


Figure 5: Adaptation and Dual Use Finance to Madagascar, by Source and Instrumental Type

The majority of adaptation and dual-use finance deployed to Madagascar is concessional: grants are the main instrument for international public adaptation finance in Madagascar, representing 57% of all flows on average in 2022-23. Low-cost project debt was the second most commonly used instrument, representing 33% of flows.

1. The Adaptation Finance Need in Madagascar

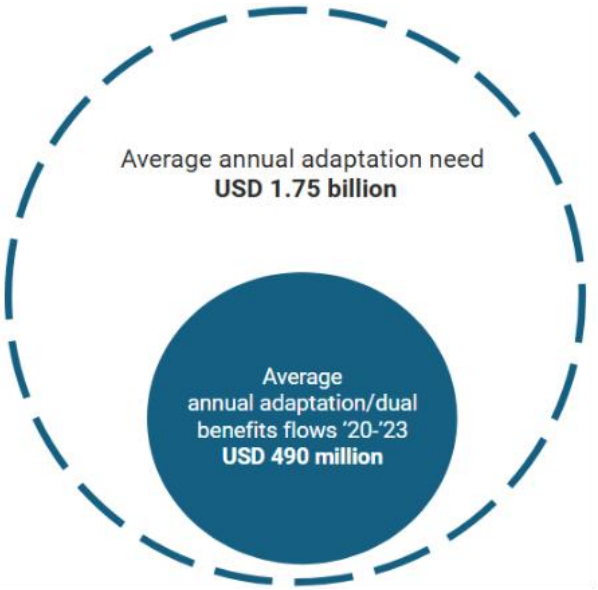


Figure 6: Madagascar Adaptation Needs vs Flows

Adaptation and dual use finance flows must scale at least 3.6 times to meet Madagascar's costed adaptation finance needs.[5] Madagascar's Nationally Determined Contribution (NDC) outlines USD 14 billion in costed adaptation finance needs from 2022-2030, or USD 1.75 billion in adaptation finance annually on average annually. If current levels of adaptation and dual-use finance flows continue, Madagascar would annually receive only USD 3.8 billion in adaptation-related financing between 2022-2030. This is significantly less than what is required, and, given that adaptation finance needs are often under-costed, Madagascar's adaptation finance needs may likely be higher than this estimate.

To address this significant adaptation financing gap, new sources of climate finance are needed. Madagascar must continue to efficiently utilise adaptation and dual-use finance flows from existing sources, while scaling up new and additional sources of financing.
For Madagascar, potential climate finance sources can be categorised into:

1. **Domestic public finance** (i.e. government revenues)
2. **Domestic private finance** (commercial banks, microfinance institutions, domestic pension funds/insurers)
3. **International public finance** (MDBs, bilateral governments, multilateral climate funds)
4. **International private finance** (corporates, commercial investors, impact funds).

Further analysis on the available climate finance instruments and approaches to scale adaptation in Madagascar follows.

2. Climate Finance Instruments to Scale Additional Sources of Finance

This table provides a list of potential climate finance instruments and next steps and considerations. It should be used as a starting point for understanding the potential universe of climate finance options that may be suitable for Madagascar's needs. It is not meant to be an exhaustive list or a set of prescriptions for the Malagasy government.

Table 13: Climate Finance Instrument to Scale Additional Sources of Finance

Instrument/ Approach	Rationale	Next Steps to Scale & Notable Considerations
Driving finance need: MSME finance debt with ticket sizes USD 250,000–1 million		
Guarantees	Partial portfolio guarantees transfer risk from commercial banks to the guarantor, encouraging commercial banks to lend into this sector	Next steps: • Scale up funded guarantees through local and international Guarantee Providers, particularly via Solidis —which currently provides partial guarantees of 70-80% to commercial banks in Madagascar, supported by the government and World Bank— and the Fonds de Garantie Malgache SA). • Identify priority adaptation sectors and priority investment pipeline for guarantee window based on pipeline maturity, bank risk appetite, adaptation impact. • Identify funding sources to support guarantees (MDBs, philanthropies, bilateral governments) • Identify sectors aligned with country priorities (NDC/NAP) and business models in Madagascar that may have an appropriate risk profile for unfunded guarantees and develop a strategy for incorporating unfunded guarantees into Solidis' model • Undertake a feasibility and readiness assessment for scaling guarantee instruments, covering cost of capital, refinancing risks, regulatory and issuance constraints, and indirect transaction costs; based on this, develop a phased roadmap that initially prioritises concessional funded guarantees and capacity strengthening of local guarantee providers. Include long-term considerations for incorporation of unfunded guarantees. *Considerations of Note: Solidis estimates that a guarantee facility of at least USD 50m is needed for climate in Madagascar.*
Cash Collateral Accounts	Provides first loss to a bank in case of default of a certain sector/company type by depositing first loss funds into a reserve account	Next steps: • Identify sectors where a guarantee might not be appropriate due to the risk profile, and where first loss may be more catalytic. • Identify any legal or regulatory conditions necessary for establishment of cash collateral accounts.

Instrument/ Approach	Rationale	Next Steps to Scale & Notable Considerations
		Considerations of note: CCAs are more expensive than guarantees, as they require money to be placed in a collateral account.
Technical Assistance and Investment Funds	MSMEs need technical assistance to become investment-ready, as well as investment funds that can take on risk and invest into earlier stage businesses, as compared to corporate banks	Next steps: • Identify key areas of technical assistance needed by MSMEs (audits/accounting, business plan development, market studies, ESG requirements, certification, etc). • Identify sources of funding for TA (domestic public finance, donors, etc) and organisations to deliver that TA • Provide incentives and other forms of de-risking for investment funds focused on climate in Madagascar (tax incentives, first loss, TA grants) • Explore opportunities to provide guarantees to investment funds in Madagascar through Solidis, Fonds de Garantie Malgache SA, and other providers. *Considerations of note: TA needs to be provided via grants and investment funds will need risk-transfer instruments to be bankable in Madagascar.*
Driving finance need: Large-scale infrastructure investments		
Sovereign Issued Sustainability Bond	Bond issuance allows Madagascar to broaden its investor base and access longer-term financing at a more affordable rate.	Next steps: • Assess market readiness and financial sustainability of potential bond issuance, including analysis of non-concessional financing costs, refinancing risks, and issuance capacity. • Explore linking bond issuance to Madagascar's support from the World Bank's Debt Management Facility III TA and Training Programs. • Identify appropriate credit enhancement. • Develop pipeline—with project revenues and project stage. • Create a green, social and sustainability (GSS) taxonomy for investments. Identify countries with taxonomies to use as starting point (Côte D'Ivoire, Botswana). *Considerations of note: Sustainability bonds are more readily available in the medium term than green/blue bonds, as the latter have more stringent requirements for tracking the use of proceeds. At present, Madagascar may face relatively high non-concessional borrowing costs, significant refinancing risks, and complex issuance procedures that could generate substantial indirect transaction costs, which may limit the near-term feasibility of sovereign sustainability bond issuance. Bond issuance in Madagascar would require support from World Bank Treasury and an MDB/DFI credit enhancement.*
Privately Issued		Next steps:

Instrument/ Approach	Rationale	Next Steps to Scale & Notable Considerations
Sustainability Bond		• Explore working with IFC to develop a Roadmap for Capital Markets Development, building on the IFC Country Private Sector Diagnostic from 2021. • Encourage private sector actors, such as BRED BP and Solidis, to further issue bonds, either by supporting pipeline development, providing credit enhancement, or encouraging stakeholders to subscribe to their issuance. *Considerations of note: This is a key potential growth area, as there is current momentum following the recent issuance of a local currency sustainability bond by BRED BP (formerly SocGen).*
Public Private Partnerships	Key approach to involve private actors in financing and delivering on infrastructure, through build-own-operate transfer, and other models that encourage private investment.	Next steps: • Strengthen legal and institutional frameworks and streamline PPP procurement processes. Opportunity to learn from Bangladesh's reforms. Align with AfDB support to strengthen the PPP-enabling environment in Madagascar, including legislative and regulatory reforms. • Work with key sectors to develop projects that are attractive to private investors for Build-Own-Operate transfer, Build-Own-transfer, and other types of PPP concessions. *Considerations of note: Some sectors that may be more appropriate for PPPs in Madagascar include ports, railways, airport infrastructure, early warning systems, toll roads, water system, energy. PPPs require guarantees—likely from MIGA or the AfDB — to mitigate political risk.*
Project preparation facilities (PPF)	PPFs can help to develop bankable infrastructure projects in key adaptation sectors in Madagascar	Next steps: • Identify sources of grant funding for a PPF • Create clear eligibility criteria for project selection and communicate with project sponsors about applying for support • Develop project sourcing strategy tailored to the types of eligible projects and sponsors • Map and develop relationships with financiers who will finance projects after they are prepared • Create a management team which can issue RFPs, assess tenders, and procure technical consultants for projects *Considerations of note: PPFs require grant finance and strong relationships with project sponsors, financiers, and technical experts. This needs to be matched on the financing side with strong relationships with project sponsors, financiers, and technical experts*
Driving finance need: Nature projects.		
Carbon credits	Carbon credits, generated through compliance and voluntary markets	Next steps: • Identify set of incentives needed to encourage carbon project developers to establish new projects in Madagascar

Instrument/ Approach	Rationale	Next Steps to Scale & Notable Considerations
	as well as mechanisms such as REDD+, represent a potential source of cash flows for mitigation and carbon sequestration projects in Madagascar. Beyond forests and mangroves, opportunities also exist in sectors such as agriculture, energy, waste, and nature-based solutions.	• Establish clear approval authority: MEDD leads project registration, MEF manages CAS account transfers, with streamlined 90-day maximum approval timelines. • Define government counterpart contribution, building on existing financing mechanisms and regulatory frameworks. *Considerations of note: Reforestation and other forestry projects may take 5+ years to generate revenue and credits. Likely need for political risk insurance for these projects.*
Debt for Nature/ Climate Swaps	Les échanges dette-nature peuvent être utilisés pour dégager une marge de manœuvre budgétaire en faveur d'investissements de conservation ou liés au climat, grâce à la conversion volontaire d'une partie ciblée de la dette extérieure.	Next steps: • Explore the potential for targeted bilateral debt-conversion operations with interested creditors and multilateral banks, ensuring that any mechanism is implemented independently of global public debt restructuring processes. • Identify debt with Paris Club countries that may be appropriate for a bilateral debt for nature swap *Considerations of note: Debt-for-Nature swaps have high transaction costs, which may outweigh the costs of debt relief for Madagascar. This is particularly true, as only ~8% of Madagascar's debt is commercial, totalling USD 83 million. Would likely only amount to 10-15 million in savings over 10 years, with high transaction costs.*

3. Instrument Deep Dives

The remainder of the annex includes deep dives on:

- Guarantees
- Sovereign Issued Sustainability-Linked Bonds
- Privately Issued Sustainability-Linked Bonds
- PPPs
- Project Preparation Facilities
- Carbon Credits

These deep dives cover a portion of the instruments in the table above that we assessed through desk research to be potentially of interest to the Malagasy government. We have outlined key considerations, however further consultation and validation would be needed to further contextualize these next steps.

Deep Dive: Guarantees

Context and Rationale: Guarantees are a key instrument to de-risk private sector investment into a range of investments, including MSMEs, funds, and infrastructure investments. Guarantees are a good tool to leverage public finance (whether domestic or international) to mobilize private investment, as it transfers a portion of the risk from the private financial institution's balance sheet. In Madagascar, Solidis reported having a 1:4 mobilization ratio, meaning that for every 1 dollar of guarantee, 4 dollars of investment can be mobilized.

Table 14: Barriers to Adaptation Finance via Guarantees

Barrier Category	Description	Impact on Adaptation Finance
Reliance on donor funding	Guarantees in Madagascar to date have been donor funded, whether through the World Bank or EU SUNREF program. Guarantees through Solidis are "silent guarantees" meaning that the client is not aware that their loan is guaranteed to reduce moral hazard, however this means that they do not bear the cost of the guarantee.	Guarantees are reliant on donor interest in creating guarantee windows, as clients do not pay the guarantee fee, limiting the commercial sustainability of guarantees. Fees are covered by donors.
Funded guarantees more expensive than unfunded guarantees	Currently, guarantees provided in Madagascar through Solidis, the Malagasy Guarantee Fund (FDGM), or other providers are financed, meaning that a portion of the guarantee is held in escrow. This increases the cost of the guarantee, especially since Solidis currently provides a portfolio guarantee of 50% to 70%.	Guarantees are more expensive, requiring more donor/public finance support for the guarantees.

Barrier Category	Description	Impact on Adaptation Finance
Lack of complementary investment funds/facilities for patient/concessional capital	MSMEs in Madagascar need funding and support that is in additional to commercial bank loans, as commercial bank loans have high interest rates (~18%), are often short-term working capital vs longer-term capex, and commercial banks do not always cover the full financing need.	Lack of patient capital or long-term financing means that not all MSME financing needs can be met by commercial banks, particularly for earlier-stage businesses.
Need for TA to build pipeline of bankable MSMEs	MSMEs in Madagascar need TA to become ready for investment from commercial banks—with key support needed in business model development, audits/financial accounting, ESG management, etc. TA support is important, as even with guarantees, commercial banks still may see MSME investments as highly risky. For instance, SUNREF program was initially supposed to be a higher value, but fewer banks participated than anticipated due to risks.	Businesses that may have strong adaptation finance potential may struggle to be eligible for certain types of financing due to support needs.

Key considerations to scale up guarantees include:

In the short-term:

1. Evaluate potential with Solidis and donors to scale up guarantees through the existing platform.
   Key questions: Is Solidis currently structured in such a way that guarantees could be scaled? What is Solidis' interest and appetite for scaled up guarantees?
2. Identify donors and funders that might be interested in supporting guarantees in Madagascar.
   Key questions: Which donors have invested in guarantee funds in the past, whether in Madagascar or elsewhere? Are there current donor-funded programs where a guarantee element could be added to the overall support?
3. Identify key sectors and business models which are ready for investment and develop pipeline.
   Key questions: Which sectors align with the climate adaptation priorities in Madagascar's NAP and NDC? Which sectors have the most robust potential sources of cashflows? Are there sectors which have a strong potential for export or foreign currency earnings? Which sectors in Madagascar are most likely to secure offtake agreements?

4. Identify sources of funding for TA facilities and existing TA facilities/providers in Madagascar.
   Key questions: What are the existing TA facilities for MSMEs in Madagascar?
5. Identify and cost the amount of guarantees needed (Solidis estimates USD 50 million for climate).
   Key questions: What are the potential leverage ratios of the guarantees? What is the amount of capital that could feasibly be mobilized from commercial banks?

In the medium-term:

1. Work with Solidis to understand potential for unfunded guarantees in the future and establish set of preconditions that would need to be met to begin providing unfunded guarantees to certain businesses.
   Key questions: What changes in the fee structure would be needed to move from funded to unfunded guarantees? What would the impact of unfunded guarantees be on the cost of capital for MSMEs?
2. Provide incentives and other forms of de-risking for investment funds focused on climate in Madagascar (tax incentives, first loss, TA grants).
   Key questions: What is the current policy environment for investment funds in Madagascar? What are the key barriers and ways that the government could best engage with these funds?

Deep Dive: Sovereign Issued Sustainability-Linked Bonds

Context and Rationale:
Sovereign issued sustainability-linked bonds are bonds issued by a country's government where the financial or structural characteristics of the bond (i.e. the interest rate, etc.) are linked to whether the issuer meets predetermined key performance indicators (KPIs), as opposed to green/blue bonds where use-of-proceeds must be closely monitored. Given the large capital needs for adaptation investment in Madagascar, bond issuance is one avenue for the country to pursue to scale up finance for a range of projects. Sovereign-issued sustainability-linked bonds can mobilize long-term capital at favorable rates to finance adaptation measures and signal Madagascar's commitment to climate resilience. The ability to issue a bond is dependent on a variety of factors, including Madagascar's creditworthiness and overall sovereign debt management plan.

Table 15: Barriers to Adaptation Finance via Sovereign Bonds

Barrier Category	Description	Impact on Adaptation Finance
Institutional Capacity	The Ministry of Finance in Madagascar has historically focused on conventional Treasury bond issuances. Staff lack experience in drafting sustainability-linked bond frameworks, defining eligible adaptation activities, and engaging with second-party opinion providers. As a result, each bond issuance requires substantial technical assistance -often from the IMF, IFC, or World Bank- to develop documentation (e.g., use-of-proceeds frameworks, impact metrics) and train personnel on ongoing reporting obligations.	Delays in bond issuance; suboptimal bond frameworks; higher transaction costs.
Governance & Regulatory	Madagascar does not yet have a government-endorsed green, social and sustainability (GSS) taxonomy. As a result, bond issuers must adopt various international taxonomies (e.g., the EU Green Taxonomy, ICMA Principles, Climate Bonds Initiative standard) on a case-by-case basis, which leads to divergent project definitions, elevated advisory expenses, and issuance delays due to repeated negotiations with investors and second-party opinion providers.	Investor uncertainty; potential greenwashing concerns; discount on bond pricing.
Financial Viability	Madagascar's budget deficit has exceeded 4% of GDP in recent years, with the IMF projecting 4.3 percent for 2025. Such persistent deficits limit the government's capacity to earmark revenue streams or collateral for adaptation bonds without exacerbating fiscal risks. Consequently, adaptation issuances often lack dedicated repayment sources, making them less attractive to conservative institutional investors concerned about sovereign creditworthiness and contingent liabilities *(S&P Global Ratings)*. Furthermore, issuing conventional bonds—potentially including ESG bonds—on international markets generally requires a minimum amount of around USD 500 million, with a lump-sum repayment. Such a single repayment could represent a major constraint on the government's cash flow and present sustainability challenges. Moreover, these instruments generally offer shorter maturities than traditional concessional financing, at higher interest rates. Sustainable bonds, although labeled, are not concessional and therefore entail a significant financial cost.	Smaller issuance sizes; difficulty to allocate proceeds strictly to adaptation.

Barrier Category	Description	Impact on Adaptation Finance
Market Development	Sovereign sustainability bonds in Madagascar have struggled to engage domestic investors. Consequently, the government relies heavily on international investors, which increases borrowing costs through higher premiums on foreign-denominated debt.	Limited investor base; reliance on international investors imposes currency risk.
Currency risk	Sovereign bonds are issued predominantly in U.S. dollars or euros, exposing holders to Malagasy ariary exchange-rate fluctuations. Without a liquid local-currency bond market or effective hedging instruments, investors factor in additional risk premiums. Recognizing this, authorities are collaborating with the IMF's Technical Assistance Center to establish a domestic-currency issuance platform, aiming to deepen liquidity and reduce foreign-exchange costs for adaptation financing *(IMF Domestic Market Report)*	

Next steps to scale up sovereign sustainability bonds include:

In the short-term:

1. Determine strategic additionality of sovereign bond issuance in Madagascar, compared to drawing down on existing WBG facilities, etc.
   Key questions: How does bond issuance fit into Madagascar's debt management/debt sustainability plan? Will the additional work to issue a bond, as compared to receive loans, accomplish other goals in Madagascar, such as building creditworthiness, etc.?
2. Link sovereign bond issuance to Madagascar's support from the World Bank's Debt Management Facility III TA and Training Programs.
   Key questions: How can Madagascar tap into existing sources of support for TA to support bond issuance
3. Develop National Green, Social, and Sustainability (GSS) Taxonomy. Collaborate with AfDB and UNEP to define adaptation-specific criteria and eligible expenditure categories. Identify countries with taxonomies to use as starting point (Côte D'Ivoire, Botswana).
   Key questions: Which countries have relevant frameworks that Madagascar might be able to adapt? What actors need to be consulted in developing this taxonomy? What are the goals for end use by the government of Madagascar?
4. Establish framework document – design a sovereign green/sustainability bond framework aligned with ICMA Sustainability Bond Guidelines and ICMA Climate Transition Finance Handbook.

Key questions: What is the appropriate timeline for sovereign bond issuance in Madagascar? What needs to occur to prepare the market and banks for the issuance?

5. Capacity Building – train Ministry of Finance staff in bond structuring, investor engagement, and impact reporting through World Bank–led workshops.
   Key questions: What is the current existing capacity of the Malagasy government to support a sustainability-linked bond issuance. Which ministries and offices would be responsible, and which would need to be involved and consulted?

6. Align interest and support for Lemur Bond from GEF with development of capacity and frameworks for additional sustainability-linked bond issuance. This could include using TA support to develop the GSS taxonomy, capacity building on bond issuance, etc.
   Key questions: What is the stage of development of the Lemur bond? To what extent could GEF TA be aligned with activities around enabling environment for bond issuance?

In the medium-term:

1. Develop strategy for pilot adaptation bond issuance: Design a pilot for a large-scale sovereign sustainability bond, earmarking proceeds for priority projects, such as cyclone-resilient coastal embankments or watershed management. Key Considerations:
   a. Identify pipeline of projects with cashflows that could be financed through this bond.
   b. Identify bond issuer – i.e. would the bond need to be issued through the World Bank Treasury?
   c. Identify appropriate de-risking mechanisms, including guarantees and credit enhancements through the World Bank, African Development Bank, etc.
2. Establish MRV framework: Develop robust monitoring, reporting, and verification systems for tracking use of proceeds and impact metrics, moving towards alignment with ICMA reporting requirements and international best practices. Key considerations:
   a. Develop Use of Proceeds Tracking System: Create a dedicated Green Bond Register or sub-account to track allocation of bond proceeds to eligible adaptation projects, with ringfencing mechanisms and periodic reconciliation processes. While initial sustainability-linked bond issuances will not need such a rigorous use of proceeds tracking systems, development of the systems for further bond issuances could help to build investor confidence.
   b. Design Impact Measurement Methodology: Define standardized KPIs for climate adaptation outcomes (beneficiaries, hectares protected, climate losses reduced) aligned with ICMA's Harmonized Framework and establish baseline measurements and annual reporting templates.

c. Establish Third-Party Verification Process: Engage independent verifiers for pre-issuance and post-issuance verification of framework compliance with ICMA Green Bond Principles, project eligibility, and reported impact metrics.

Deep Dive: Privately Issued Sustainability-Linked Bonds

Context and Rationale: Privately issued sustainability bonds present a strategic opportunity to mobilize long-term capital from domestic and international investors, supporting climate adaptation projects at more favorable financial terms. The recent successful issuance of a local-currency sustainability bond by BRED BP (formerly SocGen) raised approximately USD 38 million and has created momentum in the market. This indicates a growing private-sector commitment to sustainable finance and offers a pathway for other private entities to participate in green capital markets. Smaller issuances by Solidis have also emerged (5.7 billion ariary in 2021 and 4.9 billion ariary in 2022), further diversifying the private sustainability-linked bond landscape.
Private bond issuance must be linked to efforts to develop domestic capital markets in Madagascar. Collaborations with international financial institutions such as the IFC to develop a roadmap for capital markets will be necessary to enable this growth.

Table 16: Barriers to Adaptation Finance via Private Sustainability Bonds

Barrier Category	Description	Impact on Adaptation Finance
Institutional Capacity	Regulatory delays are a key hurdle for private sustainability-linked bond issuance in Madagascar. Lack of clear rules slows approval by months. There are no standard definitions for sustainable/green projects, no set reporting templates, and no fast-track process. Training regulators on sustainability-linked bonds, creating standards for approval, and more transparency in the process could build investor comfort for further private bond issuance in Madagascar.	Delays in bond issuance, inconsistent frameworks, and higher advisory costs.
Governance & Regulatory	There is currently no government-endorsed GSS taxonomy that is operable for private issuers, leading to reliance on multiple international standards with varying definitions and requirements.	Investor uncertainty, risk of greenwashing, and increased issuance complexity.
Financial Viability	Private firms may face challenges in creditworthiness or collateral availability, limiting the size and attractiveness of bond issuances without credit enhancements or guarantees.	Smaller issuance sizes, higher perceived risk among investors, and limited market access.

Barrier Category	Description	Impact on Adaptation Finance
Market Development	The local fixed-income market remains shallow with limited private sector bond issuance history; investor appetite is still being cultivated, especially for ESG-related products.	Narrow investor base, need for market education, and difficulties in attracting subscriptions.
Currency Risk	Issuances in foreign currencies expose private issuers and investors to exchange rate volatility, while local currency bond markets and hedging solutions remain underdeveloped.	Increased risk premiums and potential deterrent for some investors. Requires risk transfer tools (such as an IDA private sector window guarantee, TCX hedging products, etc)

Considerations to scale up private sustainability bonds include:

In the short-term:

1. Strengthen Regulatory Frameworks:
   Key questions: How can the government work with the IFC and local authorities to establish clear listing rules for sustainability-linked bonds, standardize disclosure requirements, and adopt ICMA Green Bond Principles into national regulations.

Develop National GSS Taxonomy for Private Sector:
   Key questions: How can the government and private sector collaborate with IFC, AfDB, and UNEP to define adaptation-specific criteria tailored for private enterprises and banks? What is needed so that the taxonomy is operational for the public and private sectors?

3. Capacity Building and Technical Assistance: Provide training and advisory support for private issuers on bond structuring, investor relations, and impact reporting via IFC and World Bank–led programs.
   Key questions: What is the current existing capacity in Madagascar private sectors for bond issuance? What skills are most in need of strengthening?

In the medium-term:

1. Support pipeline development and credit enhancement: Partner with private banks and project developers to assemble a pipeline of bankable climate adaptation projects and provide partial credit guarantees or risk-sharing instruments to enhance bond credit quality.
   Key questions: How can pipeline development activities be synergized across the public and private sectors?

2. Encourage issuance by private banks: Offer fee waivers or tax incentives for issuers, and streamline documentation and approval procedures.
   Key questions: What is the current tax burden on corporate bond issuances in Madagascar? What incentives would be most effective to increase corporate and commercial banks to engage in bond issuances?
3. Improve market infrastructure: Developing a central securities depository will establish a single electronic registry for all bond issues, enabling faster, more secure settlements and reducing paperwork. Alongside this, introducing standardized pricing indices will give investors clear, comparable data on market performance.
   Key questions: What government ministry and office would be best equipped to operate this?
4. Enhance data transparency: Mandate public reporting of bond performance and impact results in a centralized online portal, enabling real-time monitoring by investors and regulators.
   Key questions: What information would corporates and commercial banks be willing to share?

Deep Dive: Public Private Partnerships (PPPs)

Context and Rationale: Public-Private Partnerships (PPPs) involve the private sector delivering infrastructure or services that traditionally fall under government responsibility, with contractual arrangements that allocate risks, revenues, and operational control between parties. In Madagascar, PPPs are governed by Law 2015-039 and supporting decrees, with projects subject to appraisal by the PPP Unit and approval by the Council of Ministers. For adaptation finance, PPPs could mobilize private capital and technical expertise for climate-resilient water systems, coastal protection, agricultural value chains, and renewable energy infrastructure. There are various structures for PPPs including Build-own-transfer and build-own-operate transfer. More information on PPP types can be found on the World Bank Public-Private Partnership Resource Center.

Table 17: Barriers to Adaptation Finance via PPPs

Barrier Category	Description	Impact on Adaptation Finance
Institutional Capacity	Madagascar's PPP Unit and sector ministries, such as the Ministère de l'Eau et de l'Assainissement and Ministère des Travaux Publics, face significant challenges due to limited technical skills, insufficient resources, and understaffing. These constraints slow down critical tasks like project planning, financial structuring, due diligence, and contract management. The lack of specialized expertise hinders effective oversight and delays project implementation, often increasing costs and risks. To improve outcomes, focused capacity-building programs and additional resource allocation are essential to strengthen institutional capabilities and ensure better project delivery.	Delays in project preparation and due diligence, often adding 4-6 months, raising transaction costs and discouraging private-sector participation.
Governance & Regulatory Uncertainty	Madagascar's governance frameworks for PPP projects face challenges due to slow and non-transparent procurement processes. The existing legal framework, particularly Law n°2015-039 on Public-Private Partnerships, does not provide clear guidelines on key operational details such as the timeline for setting tariffs on flood-defense services. This lack of regulatory clarity and procedural transparency leads to delays and uncertainty, increasing the perceived risks for private partners and reducing competition. Strengthening governance through clearer regulations and faster, transparent procurement is critical to improving trust and participation in these projects.	Heightened perceived risk among bidders; bid evaluation and contract award timelines extend beyond 90 days, deterring qualified private partners.

Barrier Category	Description	Impact on Adaptation Finance
Financial Viability	Financial viability challenges stem primarily from the scarcity of adaptation projects that can generate reliable cashflows, rather than solely from non-revenue models. Only a handful of initiatives -such as small-scale water systems with tariff structures or toll-based coastal defenses- produce steady income streams, while most high-impact interventions (mangrove restoration, wetland rehabilitation, ecosystem conservation) deliver public goods without direct revenue. Commercial lenders therefore view adaptation projects as higher risk and charge premium interest rates, given the limited opportunities to recover costs through tariffs or availability payments. The lack of bankable, revenue-generating adaptation projects restricts private investment in both nature-based and engineered adaptation solutions.	Few bankable projects; commercial lenders charge 15-20 percent higher interest rates above standard project finance rates such as conventional infrastructure projects generating revenue ; inability to recover costs through tariffs or availability payments.
Political & Corruption Risk	Political instability in Madagascar often leads to elite capture of PPP contracts, as new officials renegotiate terms to favor connected firms. This behavior, common after elections, increases costs and reduces accountability. To prevent this, clear anti-corruption rules, transparent procurement processes, and independent oversight are essential.	Increased risk premiums or outright withdrawals by private financiers; project cancellations or renegotiations undermine long-term commitments increased costs due to need for political risk insurance
Maintenance & Performance Incentives	Contracts often lack clear, long-term maintenance obligations or resilience KPIs (e.g., maximum allowable inundation after storms).	Infrastructure deteriorates faster under climate stress and culverts clog within 2 years of cyclones, reducing resilience benefits and investor confidence.

Next steps to scale up PPPs include:

In the short-term:

1. Strengthen the enabling environment. Key reforms to consider:
    a. Streamline PPP procurement to ensure bid evaluations within 60 days. *Key questions: What processes and staffing would be needed to ensure faster bid evaluation?*

   b. Clarify regulations under Law 2015-039 via a ministerial decree specifying tariff-setting and procurement timelines.
      Key questions: What ministries and offices would need to be engage for improvements to the policy and regulatory framework?

2. Establish a dedicated Climate-PPP Cell within priority Ministries: The Climate-PPP Cell in each ministry could formally report project pipelines and technical assessments to the President's PPP Unit, which provides policy oversight and final approvals. A joint steering committee, co-chaired by ministry and PPP Unit officials, would synchronize sectoral preparation with national PPP policies and expedite decision-making.
   Key questions: What stakeholders would be needed to engage on a Climate-PPP cell in priority ministries? Is there buy-in/interest from key ministries? How could coordinate between climate-PPP cells and the PPP unit be streamlined?

3. Strengthen capacity around PPPs through:
   a. Training: Conduct World Bank–led workshops build staff skills on climate-risk screening, financial structuring, and bankability analysis.
   Key questions: Which departments or ministries would be best suited to participate in a training? What percentage of staff would need to be trained?

   b. Development of tools: Publish a "PPP Adaptation Feasibility Toolkit" with templated checklists for hydrological and geotechnical studies, parametric insurance structuring, and life-cycle cost models.
   Key questions: What tools or resources already exist that could be adapted for the Malagasy context? What information would need to be incorporated? What ministry or department would own the creation of these tools?

In the medium-term:

1. Develop bankable projects: Complete end-to-end feasibility for a cyclone-resilient regional road, including traffic forecasts, storm surge projections, and life-cycle cost analysis. Design availability-payment schemes for coastal embankment PPPs: the government pays operators monthly fees tied to resilience KPIs (e.g., opening time of sluice gates).
2. Consider innovative risk-mitigation instruments for PPPs: Consider embedding a Catastrophe Deferred Drawdown Option (Cat-DDO) for cyclone risks to unlock immediate liquidity post-event. Then consider scaling political risk guarantees through MIGA and AfDB and introducing performance-based contracting with fee adjustments linked to maintenance logs and resilience outcomes.

In the long-term:

1. Establish a Viability-Gap Fund within the Ministry of Finance to subsidize the difference between project costs and expected revenues or fiscal payments.
   Key questions: How can the viability gap fund be design effectively with strong monitoring, given that they are off-budget subsidies (i.e. hidden liabilities)? What selection criteria processes would be needed?

2. Explore novel approaches to project bundling and aggregation:

Key questions: How can multiple smaller transactions be pooled into a single large-scale PPP to reduce transaction and attract international investors? What would an appropriate ticket size look like for bundling these projects (USD 20-35 million ticket size)? How can tender documents be standardized, including design, procurement, and contracting?

3. Integrate community engagement and benefit sharing:
   Key questions: How can PPP development engage participatory workshops to participate in co-design? How can PPPs be designed to share revenue or benefits with communities?

Deep Dive: Project Preparation Facilities (PPFs)

Context and Rationale: Project Preparation Facilities are a mechanism to link pipelines of potential projects with potential sources of financing. Cost of PPF likely to be 5-10% of the value of the projects that Madagascar wants to prepare.

Table 18: Barriers to Adaptation Finance via PPFs

Barrier Category	Description	Impact on Adaptation Finance
Need for identified list of priority projects and project pipeline	PPFs require well defined lists of potential projects and their stage of development (pre-feasibility, etc.) that have viable sources of cashflows.	Without a prioritized pipeline, PPFs cannot efficiently allocate resources, delaying critical adaptation initiatives like coastal defenses, water systems, and ecosystem restoration.
Institutional and technical capacity	Current government ministries may not have the capacity to run a PPF or provide the technical support needed for projects.	Weak capacity leads to inadequate feasibility studies and poor project documentation, reducing investor confidence and the bankability of adaptation projects.
Connections to financing sources and de-risking mechanisms	Projects in Madagascar will need linkages to financing sources and de-risking mechanisms, including MIGA political risk guarantees. These	Absence of risk mitigation increases perceived investment risk, raises financing costs, and deters private capital from adaptation PPFs and green bonds.
High upfront preparation costs	PPF fees typically amount to 5–10% of total project value, requiring significant upfront funding before projects become bankable.	High preparation costs consume scarce public and donor budgets, limiting the number of adaptation projects that can be developed and causing pipeline bottlenecks.

Barrier Category	Description	Impact on Adaptation Finance
Long preparation timelines	PPFs often take 18–36 months to advance projects from concept to investment-ready status.	Extended timelines cause projects to miss funding windows, lose political momentum, and fail to address urgent climate vulnerabilities.

Next steps to scale up PPFs include:

In the short-term:

1. Develop national infrastructure pipeline based on prioritization of capital investment projects linked to the annual national budget process.
   Key questions: Who are the appropriate project sponsors and what are the project priorities based on the NDC, NAP, and National Development Plan? Resources to consult: Australia New Zealand Infrastructure Pipeline.
2. Identify existing sources of finance for infrastructure projects in Madagascar, including public and private finance.
   Key questions: What have been key sources of finance for infrastructure projects in Madagascar to date? To what extent have domestic commercial banks been involved? How much FDI investment has there been into infrastructure projects?
3. Identify appropriate funding sources, such as a grant for a PPF as part of a larger World Bank package.
   Key questions: What donors may be interested in setting up a PPF?
4. Identify preliminary list of projects.
   Key questions: What ministries already have priority project pipelines? What are other key sources of potential pipeline?
5. Identify appropriate institutional set-up for a PPF through a design study.
   Key questions: What would be the benefits and tradeoffs of a fully independent PPF structure housed in a SPV? What type of structure would donors be most inclined to support? If the PPF were to be held inside a government ministry, which ministries would be best placed to house a PPF? What institutional capacity would be needed for ministries to house PPFs?

In the medium-term:

1. Establish the PPF governance framework.
   Key questions: What is the proper composition of the steering committee, including government, donor, and private-sector representatives? What are the correct roles and responsibilities, decision-making protocols, and accountability structures?
2. Build in-house technical capacity. Map existing capacity and skills externally in financial analysis, environment and social analysis, and legal advisory. Identify which skills can be developed internally and which will need to be bolstered by

external support for key functions, including project appraisal, feasibility studies, and tender preparation.

Key questions: What resources would be needed to build an integrated digital project management platform to streamline application intake, document sharing, and monitoring of outputs and outcomes across all PPF-supported projects.

Deep Dive: Carbon Credits

Madagascar has a growing carbon credit market mainly focused on forest conservation and reforestation projects, with support from international initiatives like REDD+ and the World Bank's Forest Carbon Partnership Facility. The country received $8.8 million in 2023 for verified forest carbon reductions (World Bank, 2023), demonstrating its active participation in results-based climate finance. Carbon credit projects help protect biodiversity, support local communities, and contribute to Madagascar's climate goals. Major efforts include mangrove reforestation projects backed by private and public partnerships aiming to generate significant blue carbon credits over long-term periods.

Table 19: Barriers to Adaptation Finance via Carbon Credits

Barrier Category	Description	Impact on Adaptation Finance
Regulatory & Institutional	Overlapping mandates between Ministry of Environment (BNCCREDD+), Ministry of Economy and Finance (CAS account management), and Ministry of Agriculture (forest conversion policies); incomplete implementation of Decree 2025-626 due to pending complementary regulations; limited capacity at commune and regional levels to integrate carbon revenues into local adaptation planning	Delays in project approval and revenue allocation; weak integration of carbon revenues into adaptation planning
MRV Constraints	High costs for LOFM satellite monitoring and ground verification (estimated 15-20% of project budgets); technical complexity requiring international consultants due to limited domestic VCS/CCBA expertise; insufficient historical baseline data from 1990-2005 period, particularly for mangrove carbon stocks	Erodes margins for adaptation co-benefits; slows disbursement of funds for resilience measures
Market & Financial	Voluntary market price volatility (USD 3-15 per tCO_2e); limited buyer pool concentrated in European compliance markets; mitigation-focused funding through FCPF (USD 50 million) separate from adaptation finance needs	Creates revenue uncertainty; adaptation measures require separate financing, complicating integrated design

Barrier Category	Description	Impact on Adaptation Finance
Project Scale & Aggregation	VCS registration thresholds favor projects >10,000 ha, excluding smallholder agroforestry; coordination costs for village-level aggregation estimated at 25-30% of revenues; complex community governance structures in rural areas	Excludes small-scale adaptation efforts; slows formation of adaptation portfolios
Social & Governance	Inequitable benefit-sharing between coastal and highland communities; inadequate consultation with Malagasy traditional authorities (dina system); weak grievance mechanisms in remote areas	Reduces community incentives for adaptation; misalignment with local resilience needs
Adaptation-Specific	No monetization framework for adaptation co-benefits (flood control, drought resilience); absence of standardized metrics for ecosystem-based adaptation in VCS methodologies; limited integration with National Adaptation Programme of Action (NAPA)	No additional credits for resilience outcomes; limits funding for non-mitigation adaptation measures

Next steps to scale up carbon credits include:

In the short-term:

1. Finalize complementary regulations to Decree 2025-626, specifically benefit-sharing rules and community consultation procedures.
   Key questions: How will this align with MEDD's priorities? How can buy-in for this be built at the political level?
2. Establish clear approval authority.
   Key questions: What is the correct distribution of roles across ministries, for instance: Ministry of Environment leads project registration, Ministry of Economy and Finance manages CAS account transfers, with streamlined 90-day maximum approval timeline?
3. Define government guarantee mechanisms.
   Key questions: Is there a role for ministries to provide guarantees to project developers and investors, i.e., Ministry of Economy and Finance provides MRV cost guarantees up to USD 100,000 per project through existing development finance facilities?

In the medium-term:

1. Strengthen MRV capacity in Madagascar.
   Key questions: How can the Laboratoire d'Observation des Forêts de Madagascar's (LOFM) technical capacity be augmented for faster project

processing? How can partnerships with national MRV Develop national MRV expertise be strengthened through partnerships with international certification bodies to reduce dependence on foreign consultants?

2. Implement aggregation mechanisms and blended finance structures.
   Key questions: What are the right models to aggregate carbon projects in Madagascar? Options to consider: Following the UNDP Carbon Credit Aggregator Platform model, the Madagascar Carbon Alliance could function as a Special Purpose Vehicle (SPV) that aggregates carbon rights from at least 20 village Community Forest Management projects -each with 100+ hectares- into a single VCS Grouped Project. This could enable pooled annual volumes of 50,000+ tCO_2e and cutting per-credit MRV costs from USD 3–5 to USD 1–2 through shared LOFM satellite monitoring and standardized verification templates. Private companies then contract with the SPV to pre-finance community forest activities, with capital repaid from credit sales under multi-year offtake agreements (USD 8–12 per tCO_2e) to corporate and compliance buyers, while communities receive 60% of revenues (25% for MRV, 15% for SPV operations) via the CAS Crédit Carbone REDD+ escrow. This will ensure efficient private-sector engagement and direct funding for adaptation-linked forest conservation.

3. Establish corporate offtake agreements and technical assistance partnerships.
   Key questions: Which corporates operating in Madagascar may have an appetite to purchase carbon credits? Are there particular sectors where there are large multinational corporations, such as food and beverage, mining, and tourism, may be more willing to support these projects? For example: Pre-purchase agreements with companies like Air France (already engaged in PHCF project) provide 5-year price guarantees at USD 8-12 per tCO_2e, enabling project financing through commercial banks.

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