NATURE-BASED INFRASTRUCTURE
GLOBAL RESOURCE CENTRE

Financing Solutions for Mangrove Restoration and Conservation in Senegal

Outcome-based financing for nature-based infrastructure projects

NBI REPORT

DRAFT

IISD International Institute for Sustainable Development

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Edoardo Carlucci

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About the Nature-Based Infrastructure Global Resource Centre

The **Nature-Based Infrastructure (NBI) Global Resource Centre** aims to improve the track record of NBI to deliver infrastructure services and adapt to climate change while delivering other environmental, social, and economic benefits. We provide data, training, and customized valuations of NBI projects, based on the latest innovations in systems thinking and financial modelling.

The Centre is an initiative led by IISD, with the financial support of the Global Environment Facility (GEF) and the MAVA Foundation, in partnership with UNIDO.

Financing Solutions for Mangrove Restoration and Conservation in Senegal: Outcome based financing for nature-based infrastructure projects

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Executive Summary

This report presents a practical financing approach to support long-term mangrove conservation under the Natur'ELLES project in Senegal. It uses the Sine-Saloum Delta as the main example, with the aim of developing a model that could later be adapted to other mangrove areas in Casamance.

The starting point is a common problem in conservation: funding is often available to begin restoration, but much harder to secure for the long-term protection, monitoring, and management needed afterwards. In Natur'ELLES, the initial restoration phase is already financed by a grant provided by Global Affairs Canada (GAC), but the longer-term conservation of mangroves across four protected areas (APAC Kolou Ndig, RNC Palmarin, AMP Sokone, and AMP Bamboung) will require substantial funding over many years.

This report explores how to fill that gap through an outcome-based financing approach. The basic idea is simple: raise money upfront to support conservation now, then repay that financing over time using revenues linked to the real benefits that healthy mangroves provide.

Mangroves generate a wide range of benefits for people and the economy. They can reduce flood damage, support fisheries and agriculture, improve local livelihoods, create jobs, and store carbon. These benefits have value, but they do not automatically produce cash that can pay for conservation. To become a source of funding, they must first be turned into clearly defined results that can be measured, independently verified, and paid for by buyers.

The proposed financing structure has three main parts:

- First, a loan would provide upfront capital so that conservation activities can continue in the early years, before revenues are fully established.
- Second, the project would receive outcome payments when agreed results are achieved and verified. These outcomes could include reduced infrastructure damage, stronger fishing and farming incomes, women's income from seafood harvesting, and job creation.
- Third, the project can also earn carbon revenues from the sale of carbon credits linked to mangrove restoration and conservation.

To manage these flows transparently, the report recommends creating a Special Purpose Vehicle (SPV). This would be a dedicated entity responsible for signing contracts, receiving revenues, paying conservation costs, and repaying the loan. In practice, the SPV would act as the financial vehicle of the project. The report also recommends that its governance include community representation so that local stakeholders have a formal role in decision making.

A key part of the report is also the analysis of who could pay for these outcomes. The project cannot rely on one single buyer. Instead, it would need a diversified group of buyers, with different actors supporting different types of outcomes according to their interests and ability to pay.

The analysis suggests that international outcome buyers would likely play an important role. These may include development agencies, international NGOs, climate and biodiversity funds, philanthropic foundations, and multilateral institutions. These actors can be considered as early buyers because they already finance climate adaptation, biodiversity protection, livelihoods, and community resilience, and they are very well placed to pay for outcomes that create broad public economic benefits.

The report also considers private companies, especially those operating in Senegal or with sustainability commitments linked to climate, nature, or social impact. These buyers may be interested in supporting specific outcomes that match their corporate priorities, such as resilience, livelihoods, or local development. Carbon credit buyers would form a separate group, purchasing verified carbon benefits rather than broader development outcomes.

Finally, the report considers a more limited role for local actors and communities. These groups are among the main beneficiaries of healthier mangroves, but in most cases they are unlikely to finance a large share of payments directly because of limited financial capacity. Their role is therefore more important in governance, implementation, and local ownership than as major funders. Over time, however, stronger local livelihoods and institutions could support greater participation.

The financial analysis shows that this model can work, but only if a large share of the benefits generated by mangroves can be converted into actual payment agreements. In other words, it is not enough for the project to create environmental and social value; that value must also be recognized by buyers, written into contracts, verified, and paid for. This makes buyer engagement, contract design, and credible monitoring especially important.

Under the main scenario tested in the report, revenues from outcome payments and carbon credits are sufficient to cover conservation costs, verification costs, and repayment of the loan. This suggests that the model could provide a realistic path toward long-term financial sustainability.

At the same time, the structure needs safeguards. As revenues depend on performance, the project must be protected in years when outcomes are lower than expected. The report therefore recommends minimum payment provisions, modest financial reserves, strong but efficient verification, and clear rules to ensure that essential conservation and monitoring activities continue even under weaker performance.

Overall, the report aims to show how mangrove conservation can move beyond short-term grant dependence toward a more durable funding model based on verified results. Its goal is not only to restore mangroves, but to build a financing structure that can keep them protected and well managed over time.

The next steps are practical: develop simple contract terms for lenders and buyers, engage potential buyers early, define clear indicators and verification methods, and establish the SPV with transparent governance and community participation.

This report shows how Natur'ELLES could turn the value of healthy mangroves into a more reliable source of long-term conservation finance.

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Glossary

Adaptation Benefits Mechanism (ABM)	A framework developed by the African Development Bank to certify and potentially monetize adaptation benefits through standardized methodologies, monitoring, verification, and the issuance of certified units that can be purchased by funders.
Baseline	The reference condition or "starting point" against which project performance is measured. Baselines are used to assess whether outcomes represent an improvement attributable to the project.
Carbon credits	Units issued under recognized carbon standards that represent verified greenhouse gas emission reductions or removals. Credits can be sold to generate carbon revenues.
Carbon revenues	Cash inflows generated from the issuance and sale of carbon credits linked to verified carbon sequestration outcomes.
Ring-fenced account	A bank account managed under defined rules where project revenues are received and managed separately from other organizational funds to ensure traceability and proper allocation.
Debt service	Periodic payments required to service the loan, typically including interest and any fees, and sometimes principal depending on the repayment profile.
Ecosystem services	The environmental, social, and economic benefits generated by ecosystems. In the report, they represent the broader value created by mangrove restoration and conservation, only part of which can be converted into monetized revenue streams.
Financial sustainability assessment	An assessment of whether expected revenues are sufficient to cover operation and maintenance costs, verification costs, and debt obligations over the project horizon, including under different performance scenarios.
Grace period	A period during which the borrower is not required to repay principal (and sometimes interest), used to match repayment obligations with the timing of revenue generation.
Key performance indicators (KPIs)	Measurable indicators used to monitor progress toward outcomes. KPIs are specified in contracts and form the basis for verification and payments.
Loan tenor	The length of time over which the loan is outstanding, from disbursement to final repayment.

Monitoring, reporting, and verification	The system used to track progress, document performance, and confirm outcomes through independent verification. MRV supports credibility and determines whether payments are triggered.
Outcome buyer	A public or private entity that agrees to pay for verified outcomes generated by the project. Outcome buyers can include development agencies, climate funds, philanthropic organizations, corporates, or others aligned with the outcomes.
Outcome payments	Payments made by contracted buyers when predefined outcomes are achieved and independently verified. Outcome payments represent the monetized cash flows used to finance conservation activities and support debt repayment.
Outcomes	Specific, measurable, and verifiable results derived from ecosystem services that can be contractually defined and used to trigger payments (for example, reduced flood-related infrastructure damage or improved livelihoods).
Payment waterfall	The predefined order in which the SPV allocates available revenues, typically prioritizing essential conservation operations and maintenance and verification costs, followed by debt service and principal repayment.
Performance bands/thresholds	Pre-agreed achievement ranges (e.g., full, substantial, partial, low) used to adjust the level of outcome payments depending on verified performance.
DAMP (Direction des Aires Marines Protégées)	The national authority responsible for the management and oversight of Senegal's Marine Protected Areas (AMP). (English: Directorate of Marine Protected Areas)
AMP (Aire Marine Protégée)	A designated Marine Protected Area established to conserve marine and coastal ecosystems and manage resources through defined protection and governance rules.
APAC (Aire du Patrimoine Autochtone et Communautaire)	An Indigenous and Community Heritage Area (often aligned with the concept of ICCAs), referring to areas conserved and managed by local communities through customary governance and stewardship.
Special Purpose Vehicle (SPV)	A legally distinct entity created to manage the financing arrangement, hold contracts, receive and ring-fence revenues, and allocate funds through the payment waterfall, with governance arrangements that can include community representation.
Independent verification	Independent assessment of whether outcomes have been achieved according to the agreed KPI definitions, measurement methods, and thresholds. Verification determines payment eligibility.

West African CFA franc (XOF)	The official currency used in Senegal and several other West African countries, issued by the Central Bank of West African States (BCEAO).

1.0 Introduction

1.1 Addressing Nature-Based Infrastructure Challenges Through Outcome-Based Financing

Nature-based infrastructure projects encounter fundamental financing challenges rooted in market failures. Ecosystem services, including clean air, water quality, and biodiversity, represent public goods generating broad societal benefits. Yet investors have not integrated these values into financial decision making, and natural protected areas provide these services without direct compensation. Simultaneously, agricultural conversion and resource extraction consistently generate faster financial returns than conservation, rendering ecosystem protection financially uncompetitive without external mechanisms that compensate for ecosystem services values (Credit Suisse, WWF & McKinsey, 2014).

Investment readiness. Even where revenue mechanisms can be identified, many NBI projects are not yet sufficiently bankable to attract institutional capital. Investors require clear legal structures, transparent ownership and benefit-sharing arrangements, credible counterparties, and reliable operational systems. While initiatives such as the TNFD guidance can improve market transparency, they do not resolve the core challenge: most nature-based projects lack predictable revenue streams. Their value often comes from public goods, avoided costs, or diffuse ecosystem benefits that must first be measured, verified, and converted into cash flows. The limited track record of comparable projects delivering both environmental outcomes and financial returns makes institutional investors cautious without de-risking, or concessional support (Sustainable Finance Geneva, n.d.; Credit Suisse, WWF & McKinsey, 2014; TNFD, 2024).

Measurement and outcome verification gaps. Environmental benefits remain economically invisible unless regulatory mechanisms mandate compensation through mechanisms such as carbon and biodiversity offsetting. Standardized measurement frameworks for validating conservation outcomes remain underdeveloped, creating outcome verification uncertainty. While mechanisms such as the Adaptation Benefits Mechanism (AfDB, 2019) represent progress toward standardized outcome verification and valuation, their recent introduction means widespread adoption and implementation remain limited (Climate Policy Initiative, n.d.).

Institutional capacity. Many NBI projects lack management teams combining conservation expertise with large-scale commercial finance experience. Local communities require enhanced financial capacity for effective project implementation. Additionally, political uncertainty, geographic isolation, and limited government support create location-specific constraints that resist standardized solutions and restrict market scaling pace (Credit Suisse, WWF & McKinsey, 2014).

Funding deficit and collaboration requirements. Annual nature conservation funding requirements reach USD 600 billion to USD 800 billion, yet current funding is less than USD 150 billion primarily coming from government and philanthropic sources. Bridging this

gap requires expanding nature finance by 4 to 5 times current levels (Sustainable Finance Geneva, n.d.). Addressing these interconnected barriers requires intentional collaboration: financial institutions capable of designing scalable investment mechanisms must work with conservation organizations capable of developing rigorous, bankable projects with verifiable environmental outcomes (Credit Suisse, WWF & McKinsey, 2014).

In light of these challenges, **outcome-based financing** can help address key barriers and narrow existing gaps by linking funding to verified performance and creating clearer, more investable structures for nature-based projects.

In general, outcome-based financing is an approach in which repayment of the financing provided is linked to the achievement of predefined, measurable outcomes. Under this model, investors finance implementation costs and project beneficiaries, either public or private entities, pay for the outcomes generated, creating the revenues to repay investors (Puzyreva et al., 2024).

A defining feature of the approach is that there is a facilitator or intermediary that coordinates the transaction by setting contractual and payment terms among parties and, where relevant, supporting overall project coordination. These models are typically underpinned by a clear framework describing how outcomes will be delivered and independently verified, strengthening accountability (Puzyreva et al., 2024).

Successful implementation ultimately depends on translating ecosystem services into bankable outcome payments, which requires credible measurement and effective engagement with beneficiaries. In practice, the intermediary can support the definition of outcomes, facilitate pricing discussions, and negotiate payment levels informed by beneficiaries' willingness to pay (Puzyreva et al., 2024).

Outcome-based financing can strengthen **investment readiness** by providing a more standardized and bankable structure for nature-based infrastructure projects, in which roles, performance metrics, verification arrangements, and payment terms are clearly defined. As uptake increases, these structures can help build a credible track record of nature-based investments where financial performance is explicitly linked to verified ecosystem service delivery. Over time, this contributes to stronger market confidence and improves the readiness of similar projects to attract institutional and private capital.

Environmental, social, and economic benefits from nature-based infrastructure often remain financially "invisible" unless specific compensation programmes are in place. Outcome-based financing can address this by making verified benefits the core of the financing model, transforming ecosystem service outcomes into contractual triggers for payment and, therefore, into a revenue stream that can mobilize capital to conservation over time. Wider uptake of this instrument would also create stronger incentives to improve the standardization, credibility, and comparability of outcome measurement and verification frameworks.

From an institutional capacity perspective, outcome-based financing requires specialized expertise and can be complex to implement, as it typically involves multiple parties (e.g., outcome buyers, implementers, financiers, and independent verifiers). It does not

automatically solve capacity constraints, but if well designed it can help mobilize and coordinate the necessary expertise through dedicated intermediaries, clearer role allocation, and structured performance management, thereby strengthening implementation capacity over time.

Finally, outcome-based financing can contribute to narrowing the **nature finance gap** by mobilizing upfront capital and ensuring that payments are tied to verified results. As adoption increases, it can also support more standardized and replicable approaches to defining and verifying outcomes, making the model easier to adapt across different types of nature-based infrastructure projects and contexts.

This analysis provides a practical contribution to the development of outcome-based financing mechanisms. Although these instruments are still relatively niche, they have strong potential to mobilize long-term capital for nature-based infrastructure and to scale conservation finance globally by linking revenues directly to verified environmental and socio-economic results. The following section outlines the key characteristics of outcome-based financing and explains how this approach is applied to the Natur'ELLES project.

1.2 Objective of This Report

This report is part of the Natur'ELLES project and forms one component of a broader series of analyses. These analyses include two Sustainable Asset Valuation (SAVi) assessments of mangrove restoration: one in Casamance and one in Sine-Saloum.

This report explores innovative financing approaches to support mangrove conservation in Senegal under the Natur'ELLES project. Using the Sine-Saloum delta as the primary demonstration site, it proposes a financing strategy designed to sustain the long-term conservation and maintenance of mangrove ecosystems. Although the assessment focuses on Sine-Saloum, the approach is intentionally structured to be transferable to other mangrove sites in Casamance in Senegal, illustrating how the model can be scaled and adapted across the region.

The main challenge is to identify a reliable, long-term funding mechanism to cover the operation and maintenance of mangrove ecosystems. Global Affairs Canada (GAC) provides an upfront grant of XOF 44 million to support the initial three-year implementation phase, but this represents only a small share of total financing needs. Over a 27-year horizon, recurring conservation activities such as monitoring, community engagement, ecological management, and protection are expected to require more than XOF 4.3 billion as operating costs. These expenditures are essential to ensure that mangroves survive, mature, and deliver the ecological and socio-economic benefits that justify their protection. The analysis therefore focuses on identifying mechanisms capable of mobilizing additional public and private capital to bridge this funding gap.

To develop a sustainable long-term revenue model, the report assesses the feasibility of an outcome-based financing structure that combines a loan with dedicated revenue streams from outcome payments made by contracted buyers and carbon credits. Figure 1 illustrates the proposed outcome-based financing structure for the Natur'ELLES. The structure is designed to address the long-term financing gap associated with the operation and

maintenance (O&M) of mangrove protected areas in Sine-Saloum, while building on the initial restoration activities financed through grant funding.

1. The process begins with the grant provided by Global Affairs Canada (GAC), which supports the initial restoration phase of the project. This grant enables the restoration intervention to take place within the broader AMP/APAC protected areas, where mangrove restoration is expected to generate a range of ecosystem service outcomes, including improved fisheries productivity, improved agricultural conditions, job creation, enhanced infrastructure resilience, and carbon sequestration.

2. Because the GAC grant is limited to the initial restoration phase, additional upfront capital is required to cover the early years of O&M before outcome-based revenues and carbon revenues are fully established. This upfront capital is provided by investors, such as multilateral development banks, institutional investors, or impact investors, in the form of a loan. The loan bridges the timing gap between immediate conservation costs and the gradual materialization of ecosystem service revenues.

3. As the restored mangroves mature, ecosystem service outcomes are monitored, reported, and independently verified through an MRV system. Verification is a critical step in the financing structure because ecosystem services only become revenue-generating assets once they are translated into measurable and verified outcomes. Verified carbon sequestration can generate carbon credits, while other verified ecosystem services can be formalized through outcome agreements with buyers.

4. Outcome buyers may include foundations, international NGOs, international organizations, development agencies, corporates, municipalities, government entities, and, where appropriate, local community organizations. These buyers purchase verified outcomes and carbon credits according to pre-agreed contractual terms.

5. Payments from buyers generate two main revenue streams: outcome-based revenue and carbon revenue. Both revenue streams are channelled into the Special Purpose Vehicle (SPV), which receives and ring-fences project revenues.

6. The SPV uses part of these revenues to repay investors, including principal, interest, and debt-related fees, according to the agreed repayment schedule.

7. The SPV also allocates revenues to finance the remaining O&M costs of the protected areas through 2050. This ensures that conservation, monitoring, enforcement, ecological management, and community-based stewardship activities can continue beyond the initial grant period.

8. Communities benefit directly from the ecosystem service outcomes generated by the project, including improved fisheries, agricultural productivity, seafood harvesting, employment, and reduced exposure to infrastructure damage.

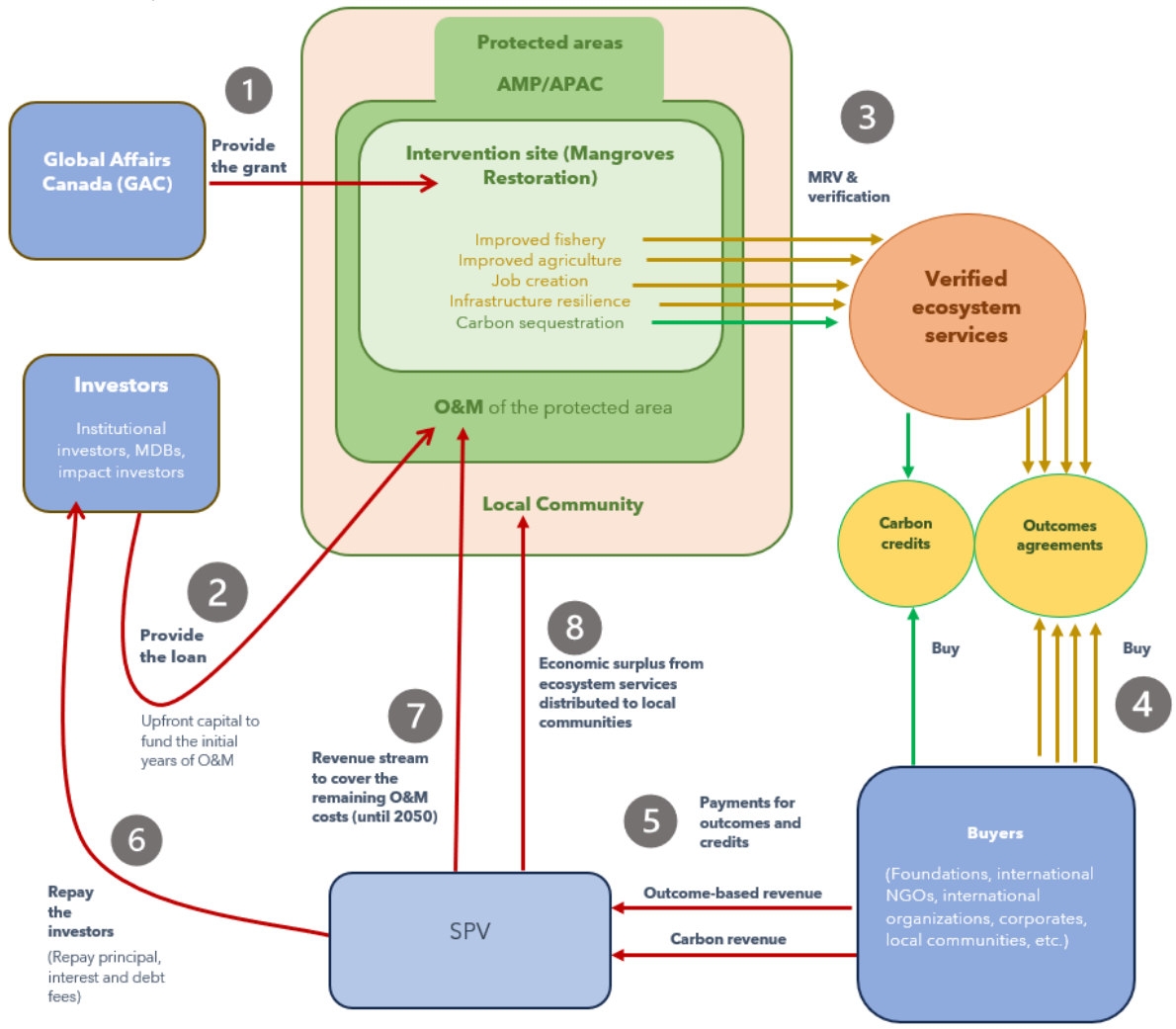
Overall, the Figure 1 shows how the project can convert the economic value of mangrove ecosystem services into financial flows. By combining grant funding, upfront loan financing, verified outcome payments, carbon revenues, and SPV-based governance, the proposed

structure provides a pathway to sustain mangrove conservation beyond the initial grant period and reduce dependence on repeated donor funding.

The ecosystem service value underpinning both outcome payments and carbon credits is quantified using the Sustainable Asset Valuation (SAVi) methodology, which captures economic, social, and environmental benefits in an integrated model. SAVi results for Sine-Saloum indicate significant value creation through avoided costs, notably reduced flood-related infrastructure damage and lower health and vulnerability burdens, as well as through direct economic gains including improved fisheries productivity, agricultural performance, and expanded livelihood opportunities linked to ecosystem-based activities. A detailed explanation of these monetized ecosystem services is provided in the SAVi evaluation report for Sine-Saloum.

Overall, this report serves as a practical guide for translating mangrove conservation objectives into a structured outcome-based financing approach. It clarifies the project's financing requirements, links them to measurable and independently verifiable outcomes, and provides a concrete basis for engaging potential outcome buyers. In particular, it supports negotiations on outcome pricing by grounding payment levels in the costs required to sustain long-term conservation, including operating expenditures, and in the estimated value of mangrove ecosystem services.

Figure 1. Outcome-based financing in the context of the Natur'ELLES project: red arrows indicate cash-flow directions



Source: Author.

1.3 Structure of This Report

Unlike many conventional financial analyses, where the revenue stream is already identified and can be projected directly from fees, sales, or budget allocations, this report applies a step-by-step approach as the revenue model must be designed. In this case, revenues are not automatically generated by the project; they depend on converting a portion of the ecosystem service value into contracted, measurable, and verifiable outcomes that can trigger payments. The analysis therefore starts from the financing needs and works backward to determine how much ecosystem service value must be converted into revenue streams through outcome payments, and under what KPIs, thresholds, and buyer commitments, in order to cover operating costs, debt service, and principal repayment.

The analysis proceeds through a structured sequence of components: (i) it begins by quantifying the project's financing gap, which is the long-term funding required beyond the initial implementation phase; (ii) it then presents the proposed transaction architecture, including the role of the SPV as the entity that ring-fences revenues, holds key contracts, and manages the payment waterfall; (iii) it assesses the ecosystem services generated by the restoration activities to estimate the project's potential economic value and the basis for future revenues; (iv) it presents the loan, including its structure and repayment logic; (v) it examines how ecosystem services can be translated into a concrete revenue stream by defining outcomes, setting KPIs and performance thresholds, identifying potential outcome buyers, and establishing an outcome pricing approach; (vi) it considers carbon credits as an additional and complementary revenue source; (vii) it concludes with a financial sustainability assessment that brings all components together and evaluates whether combined revenues are sufficient to cover operating and maintenance costs, debt service, and principal repayment over the project horizon; and (viii) it translates the results into practical recommendations and next steps to support implementation, including contract readiness, buyer and lender engagement, MRV and verification timing, liquidity buffers, and SPV operationalization with community governance.

2.0 Financing Structure

2.1 Financing Gap

This assessment focuses on the long-term financing requirements needed to sustain mangrove conservation across four protected areas in the Sine-Saloum region: APAC Kolou Ndig, RNC Palmarin, AMP Sokone, and AMP Bamboung.

An initial grant of XOF 44.1 million (USD 78,711) from Global Affairs Canada (GAC) funds mangrove restoration activities during the first three years of the project, supporting the establishment of 131 hectares of new mangroves. This upfront funding is essential to launch the restoration activities, build local implementation capacity, and generate early ecosystem benefits that underpin the project's long-term outcomes.

However, this grant-based support is limited to the restoration phase and does not address the project's most significant and enduring financial challenge: the long-term conservation of 26,762 hectares of existing mangrove ecosystems across the four protected areas. These ecosystems require continuous investment in monitoring, ecological management, enforcement, and community-based stewardship to prevent degradation and ensure that both restored and existing mangroves continue to deliver ecosystem services over time.

As a result, while restoration costs are limited and time-bound (2024 to 2026), conservation costs are recurrent, long-term, and structurally underfunded. Addressing this imbalance is central to the financial sustainability of mangrove protection in Senegal and motivates the exploration of financing mechanisms capable of supporting conservation well beyond the initial grant period.

Over the period 2024 to 2050, conservation-related operation and maintenance (O&M) requirements amount to approximately XOF 4.3 billion (USD 7.68 million), representing the bulk of total financing needs. In practice, long-term funding must support not only the newly restored area, but also the broader mangrove ecosystems within the four protected sites, all of which require sustained management to preserve their ecological functions and the services they provide (Table 1).

Table 1. Funding needs to cover O&M

	XOF	USD
Implementation costs (restoration of 131 hectares)	44,151,827	78,797
O&M costs (conservation of 26,762 hectares)	4,368,415,279	7,797,575
Grant GAC for restoration	44,151,827	78,797
Financing gap	**4,368,415,279**	**7,797,575**

Source: Author.

While the costs of mangrove restoration and long-term conservation are clearly identified, the restoration project does not generate conventional market revenues that can be directly matched to these costs. Instead, mangrove restoration creates value primarily through ecosystem services, whose benefits accrue broadly across society rather than through direct user fees or commercial sales.

The following sections therefore examine how the financing gap for the conservation of the mangrove protected area can be addressed by channeling outcomes and credit revenues through a dedicated SPV.

2.2 Special Purpose Vehicle

An SPV is a legally distinct entity created for a single, defined purpose, typically to implement and manage a specific financing arrangement. In the Natur'ELLES structure, the SPV is the central platform that holds the key contracts, receives and ring-fences outcome-linked revenues, and allocates funds under predesigned rules. This improves transparency for outcome buyers and financiers, and increases confidence that revenues generated through verified outcomes are used to sustain long-term conservation activities.

The rationale for an SPV in Natur'ELLES is directly linked to the nature of the revenue model. Outcome payments and carbon revenues are not immediate or automatic; they depend on outcome delivery, measurement, third-party verification, and the existence of binding purchase arrangements. An SPV provides a stable contractual counterparty and a clear operating framework in a context where multiple actors are involved (outcome buyers, carbon off-takers, implementers, lenders, and verifiers) and where revenues may fluctuate year to year depending on verified performance. By centralizing contracting and cash management, the SPV reduces fragmentation, clarifies responsibilities, and enables the financing structure to function as an integrated mechanism rather than a collection of parallel agreements.

In practical terms, the SPV would enter into the core agreements that underpin the financing architecture. This includes outcome purchase agreements with buyers, which define the outcomes to be achieved, the KPIs and thresholds, the verification process, and the payment formula. It can also sign carbon credit offtake agreements, where applicable. On the financing side, the SPV can be the borrower under the loan (or act as an on-lending entity), ensuring that repayment obligations are matched to the timing and profile of the project's performance-linked revenues.

A central function of the SPV is to manage a controlled revenue account into which all outcome payments and carbon revenues are deposited. From this account, funds are distributed through a transparent payment waterfall aligned with the priorities of long-term conservation and financial discipline. The waterfall can be designed to protect essential conservation O&M and the verification function that keeps revenues eligible, while also ensuring that debt service and principal repayment are addressed in a predictable sequence. Where relevant, the SPV can also manage reserve mechanisms (e.g., a modest debt service

reserve or O&M contingency buffer) to reduce the risk that conservation spending is cut in low-performance years, when additional field action is most needed.

A comparable nature-based finance example that illustrates the SPV role is the Forest Resilience Bond (FRB), which mobilizes private capital to fund forest restoration that reduces wildfire risk. In the FRB structure, a limited liability company (LLC) operates as an SPV and serves as the debt issuer, with the SPV passing proceeds to the implementation partner and repayment supported by contracted beneficiary payments once work is verified. (U.S. Environmental Protection Agency, Water Infrastructure and Resiliency Finance Center, 2021). This mirrors the governance logic proposed for Natur'ELLES: a dedicated vehicle coordinates contracts and ring-fences cash flows, while payment obligations are tied to verified delivery and shared among buyers/beneficiaries.

Applied to Natur'ELLES, the SPV therefore functions as the enabling layer that converts ecosystem service value into bankable cash flows. It provides the contractual and financial infrastructure required to: (i) translate verified outcomes into outcome payments, (ii) channel carbon revenues into the same controlled structure, and (iii) ensure that funds are allocated transparently to conservation delivery and debt obligations over the full project horizon.

2.2.1 SPV Governance and Community Ownership

This section outlines how the SPV can be governed to ensure meaningful community ownership and decision making across the APAC and AMP[1] sites, while remaining credible for outcome buyers and financiers.

A practical option is to set up the SPV as a shared governance entity where communities are not only beneficiaries, but also formal participants in oversight. In this model, community institutions representing the APAC[2] and the community-managed AMP sites hold an equity stake in the SPV and have reserved seats on the SPV board, alongside the implementing partner and, where appropriate, the competent public authority. This gives communities direct influence over key strategic decisions and strengthens legitimacy, while ensuring the SPV retains the fiduciary and technical capacity needed to manage contracts, reporting, and financial controls.

Because some protected areas fall under DAMP[3] oversight while others are independently managed and not formally recognized, community representation can be organized through

[1] AMP (Aire Marine Protégée): A designated Marine Protected Area established to conserve marine and coastal ecosystems and manage resources through defined protection and governance rules.

[2] APAC (Aire du Patrimoine Autochtone et Communautaire): An Indigenous and Community Heritage Area (often aligned with the concept of ICCAs), referring to areas conserved and managed by local communities.

[3] DAMP (Direction des Aires Marines Protégées): The national authority responsible for the management and oversight of Senegal's Marine Protected Areas (AMP). (English: Directorate of Marine Protected Areas.)

a simple constituency approach. Board seats can be reserved for DAMP-affiliated sites and for independently managed community sites, with representatives nominated through locally agreed processes. To protect community interests, the SPV statutes should also define a short list of "reserved decisions" that require community approval, such as changes to the payment waterfall, reallocation of conservation budgets, amendments to outcome contracts that affect local responsibilities, or replacement of the implementing entity.

Where legal recognition constraints prevent some community entities from holding shares directly, the same intent can be achieved by holding shares through a community trust or federation on behalf of local groups, combined with binding participation agreements that guarantee board representation and decision rights. This structure preserves community ownership and control in practice, while providing a stable governance framework that investors and outcome buyers can rely on.

2.3 Ecosystem Services, Outcome KPIs, and Outcome Payments: Concepts and definitions

Before explaining how revenue streams are generated, it is important to clearly define key terms used throughout this document. In this analysis, Payments for Ecosystem Services (PES) are considered the primary mechanism for generating revenue from mangrove ecosystem services following project implementation.

To assess PES as a viable revenue stream, it is necessary to clarify the main building blocks used to structure the PES scheme for this project, in particular the ecosystem services being targeted, the outcomes and related KPIs, and the outcome payments. Although these concepts are closely linked, they play distinct roles within the financing strategy and need to be defined clearly to ensure consistency and transparency:

- Ecosystem services refer to the full range of environmental, social, and economic benefits generated by mangrove ecosystems as a result of restoration activities. These services arise from ecological processes and include provisioning services such as food and fuelwood; regulating services such as flood protection, water and climate regulation; and supporting services, such as habitat provision and biodiversity maintenance. In this assessment, ecosystem services are quantified and monetized using the Sustainable Asset Valuation (SAVi) methodology. They represent the total social, environmental, and economic value generated by the project, but they do not, by themselves, constitute a revenue stream. Only a subset of ecosystem services can be converted into revenue generating outcomes, because not all benefits are sufficiently tangible, attributable, or easy to translate into clear KPIs and verification protocols that buyers can contractually pay for.
- Outcomes KPIs represent the specific, measurable results that are defined in contracts and used to trigger payments over time. They capture a portion of the broader ecosystem service value in a form that can be attributed to project interventions, monitored through agreed indicators, and independently verified. Only

ecosystem service benefits that can be measured reliably and linked clearly to the project can be converted into outcomes suitable for outcome-based financing. In the context of mangrove restoration, for example, an outcome that could trigger payments include a verified reduction in flood-related infrastructure damage compared to the baseline scenario.

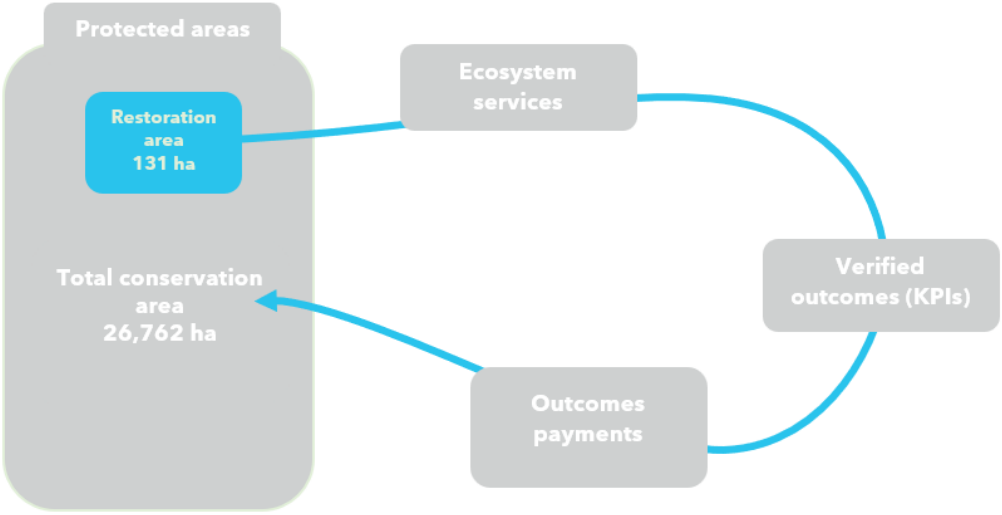
- Outcome payments refer to the financial transactions through which third-party buyers remunerate verified outcomes derived from ecosystem services. Outcome payments are therefore not the ecosystem services themselves, but the instrument that converts achieved outcomes into financial flows.

Within this strategy, ecosystem services generate value, outcomes define what is measured and verified, and outcome payments determine how and when payments are made. Outcome payments are conditional on the achievement of predefined criteria and are typically financed by public institutions, development partners, climate funds, or private actors seeking to achieve specific environmental or social objectives.

Please note that throughout this report, we refer to outcome payments rather than to Payments for Ecosystem Services (PES), as outcome payments represent the monetized cash flows generated once outcomes are achieved and independently verified.

Accordingly, the analysis examines whether the ecosystem services generated through the restoration of 131 hectares can be translated into verified outcomes that trigger outcome payments, thereby generating predictable revenues, and whether these revenues are sufficient to finance the long-term operation and maintenance of 26,762 hectares of mangroves across the four protected areas: AMP Sokone, AMP Bamboung, APAC Djilor Djidiack, and the Palmarin Community Natural Reserve.

Figure 2. Payments for ecosystem services under the Natur'ELLES framework



Source: Author.

It is important to note that PES schemes are traditionally designed as compensation mechanisms in which landowners or resource users are remunerated for adopting sustainable management practices or conserving natural areas. PES can, however, also be structured as outcome-based or performance-based mechanisms. In these schemes, payments are conditional on the delivery of measurable and verifiable ecosystem service outcomes, rather than solely on the implementation of prescribed activities. Payments are therefore contingent on interventions that demonstrably generate the expected ecosystem services and associated results (Kenter et al., 2025). This outcome-based PES approach is the model considered in this analysis. See Box 1 for an example on this type of PES.

Box 1. Case study: Mexico – Payments for Hydrological Environmental Services

Mexico's Payments for Hydrological Environmental Services (PSAH) program is an outcome-based PES scheme designed to secure hydrological ecosystem services through forest conservation in priority watersheds. Landowners and community forest managers receive payments only if predefined environmental outcomes are achieved, rather than for implementing specific land-use practices.

The key performance outcome triggering payment is the verified maintenance of forest cover, used as a measurable proxy for the continued provision of hydrological services such as water regulation and reduced sedimentation. Forest cover is monitored annually through satellite imagery and field verification. Payments are suspended or contracts terminated if deforestation is detected, ensuring strict ex-post conditionality.

By linking financial transfers directly to verified conservation outcomes, the PSAH program demonstrates how PES can operate as a results-based financing mechanism for nature-based solutions, where public funds are disbursed only upon delivery of measurable ecosystem service outcomes (Muñoz-Piña et al. 2008).

Source: Convention on Biological Diversity (CBD), Mexico: Payments for Hydrological Environmental Services (PSAH).

2.4 Assessing Monetized Ecosystem Services

The objective of this section is to assess the potential revenue that could be generated from the project's ecosystem services. While this initial assessment does not yet represent an actual cash flow, it provides the foundation for estimating the size of the ecosystem services value from which revenues could be generated. This, in turn, allows the analysis to determine how much of that value would need to be converted into contracted outcomes and payments to cover project costs and to begin structuring a viable revenue model. To facilitate the assessment, ecosystem services are grouped into two categories: (i) services that can generate revenue through contracted outcomes and outcome payments, and (ii) carbon sequestration, which is treated separately because it generates revenue through the issuance and sale of carbon credits.

According to the SAVi analysis, the restoration project generates an estimated XOF 7.9 billion in ecosystem service value over the period from 2024 to 2050 (Table 2).

Table 2. Monetized ecosystem services generated from the restoration project, cumulative values, excluding carbon sequestration (2024 to 2050)

Avoided costs to infrastructure damage	XOF	894,697,933
Avoided costs related to health problems	XOF	612,854,595
Fishing revenue	XOF	89,506,081
Agricultural revenue	XOF	1,240,599,056
Income from seafood harvesting	XOF	290,266,523
Drinking water supply	XOF	18,788,064
Food supply	XOF	1,359,037,560
Wood supply	XOF	1,000,774,359
Job creation	XOF	2,420,289,134
Total	**XOF**	**7,926,813,306**

Source: Author.

Although the restoration of mangroves generates a wide range of ecosystem services, not all of these benefits can be translated into payments for outcome buyers. Certain ecosystem services are inherently difficult to attribute, quantify, or verify on a regular basis, and therefore remain largely intangible societal benefits rather than contractable revenue streams.

For this reason, the present analysis adopts a selective and conservative approach, retaining only those ecosystem services with strong materialization potential that can be translated into measurable, attributable, and independently verifiable outcomes (Table 3). These selected outcomes can be reliably assessed over time and are well suited to outcome-based contracts, enabling external buyers to purchase verified results and thereby generate predictable revenues to support long-term mangrove conservation.

Table 3. Selected ecosystem services generated from the restoration project (excluding carbon sequestration), XOF cumulative values (2024 to 2050)

Avoided costs to infrastructure damage	1,342,046,899
Fishing revenue	89,506,081
Agricultural revenue	1,240,599,056
Revenue from seafood harvesting	290,266,523
Job creation	2,420,289,134
Total	**5,382,707,693**

Source: Author.

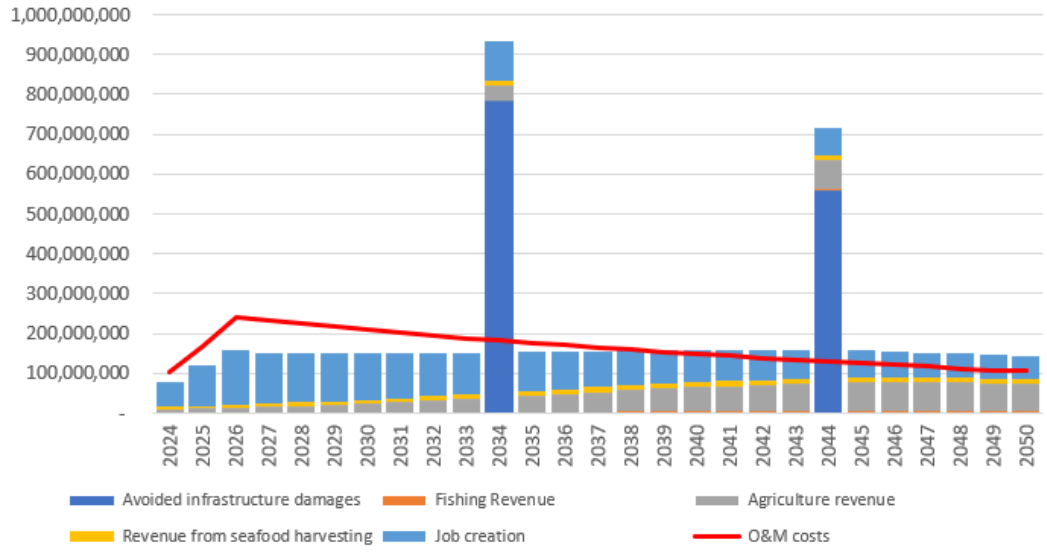
Accordingly, for the purposes of the financial analysis, only the ecosystem services presented in Table 4 are retained as potential revenue-generating outcomes. Avoided health-related costs are excluded from outcome payments, as they are difficult to verify in practice,

particularly in terms of attributing changes in health care demand or expenditure to improvements in environmental conditions resulting from mangrove restoration.

The same rationale applies to the provision of wood, water, and food. Although these ecosystem services generate important subsistence benefits for local populations, they are primarily linked to household-level self-provisioning and informal use. As such, they have limited potential to be translated into clearly defined annual targets or independently verifiable outcomes suitable for outcome-based contracts. These services are therefore excluded from the revenue structure and are retained in the analysis as broader socio-economic benefits rather than direct sources of project revenue (see the SAVi analysis for Sine-Saloum for additional information).

Based on the selected ecosystem services, the total potential value that can be converted into revenue streams amounts to approximately XOF 5.3 billion. Section 2.5 examines what portion of this value must be converted into outcome-based payments to generate a revenue stream sufficient to cover project costs and meet loan repayment obligations. It also outlines how this revenue stream can be operationalized through the definition of outcomes, KPIs, and performance thresholds, and through the contracting of outcome payments that allow revenues to materialize.

Figure 3. Costs and monetized ecosystem services excluding carbon sequestration[4]



Source: Author.

[4] The peaks observed in years 2034 and 2044 are driven by avoided costs associated with flood-related damage to infrastructure. These higher values reflect the projected occurrence of extreme flood events based on historical flood frequency and intensity data. As a result, the materialization of avoided infrastructure damages is not evenly distributed over time, but instead occurs in specific years when severe flooding is expected. This explains why avoided costs appear as pronounced peaks rather than as smooth annual values.

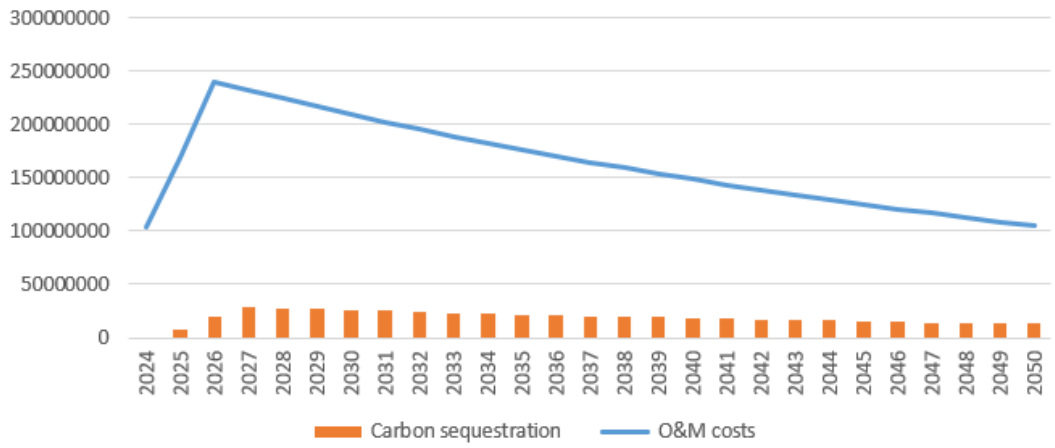
Figure 3 illustrates the timeline of the operation and maintenance (O&M) costs for conservation area and the value of ecosystem services generated by the restoration project over the period from 2024 to 2050. Restoration costs are not shown, as they are fully covered by the GAC grant during the initial project phase (from 2024 to 2026).

The figure highlights a key structural challenge: ecosystem services generated by the restoration project take time to materialize.[5] During the early years, operation and maintenance (O&M) costs exceed the value of ecosystem services generated. This temporal mismatch reflects ecological realities, as restored mangroves require time to mature.

Carbon Sequestration

In addition to ecosystem services that can generate revenue through outcome payments, the assessment also considers the potential revenue from carbon sequestration through the issuance and sale of carbon credits, generating a cumulative value of XOF 506 million. Figure 4 illustrates the estimated value that could be generated from carbon sequestration over the project horizon.

Figure 4. Costs and carbon sequestration alone



Source: Author.

However, carbon sequestration on its own is not sufficient to finance long-term mangrove conservation at scale. If carbon credits were treated as the only revenue source, the resulting cash flows would remain below the recurring operation and maintenance (O&M) costs required to manage and protect the mangroves over time. The analysis shows that carbon revenues can strengthen the overall financial performance of the proposed financing mechanism, but they cannot fully sustain the long-term management costs on a standalone basis.

[5] All values presented in Figure 3 and Table 4 are derived from the SAVi assessment for Sine-Saloum and are expressed in present-value terms using a 3.5% social discount rate.

Carbon finance therefore can play an additional and complementary role. It helps reduce the residual funding gap, increases the robustness of the financing structure, and provides financial additionality by supporting conservation outcomes that would be difficult to maintain in the absence of this revenue stream. Section 2.7 further details the carbon finance component, including the assumptions used for credit generation, certification and verification requirements, and how carbon revenues are integrated into the overall cash flow structure.

By contrast, when ecosystem service outcomes are combined with carbon sequestration revenues, the project has the potential to generate sufficient and more predictable cash flows to support long-term conservation and operation and maintenance (O&M) costs. While no single ecosystem service revenue stream is sufficient to cover O&M costs on its own, their combination can help close the financing gap and improve cash flow stability over the project lifetime. Figure 5 and Table 4 illustrate the cumulative value generated by the selected ecosystem services.

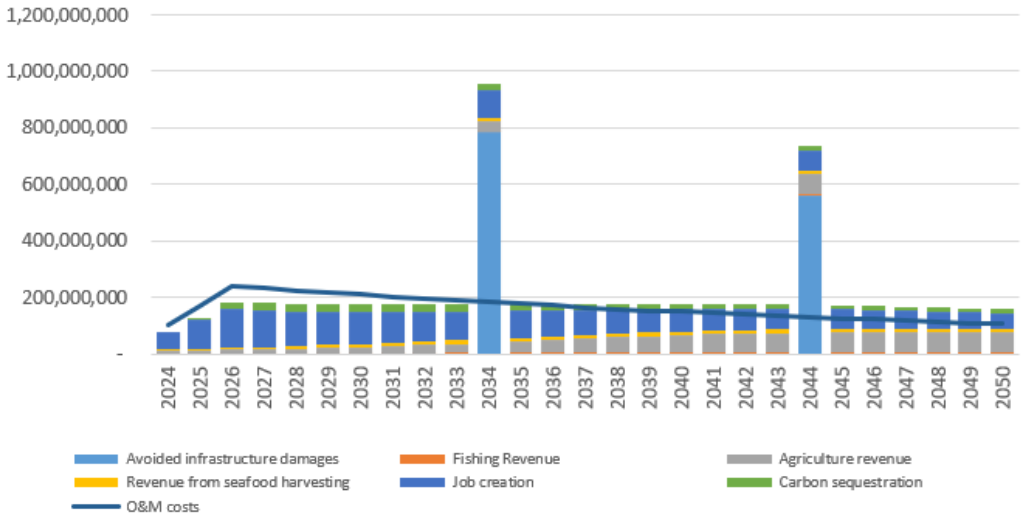
Table 4. Selected ecosystem services generated from the restoration project including carbon sequestration – cumulative values (2024 to 2050)

Avoided costs to infrastructure damage	XOF	1,342,046,899
Fishing revenue	XOF	89,506,081
Agricultural revenue	XOF	1,240,599,056
Income from seafood harvesting	XOF	290,266,523
Job creation	XOF	2,420,289,134
Carbon sequestration	XOF	506,252,635
Total	**XOF**	**5,888,960,328**

Source: Author.

These ecosystem services can ultimately generate revenue streams through two instruments: contracted outcome payments triggered by verified outcomes, and carbon revenues generated through the issuance and sale of carbon credits for verified carbon sequestration. Section 3 brings these revenue streams together to assess how they translate into project cash flows and whether, in combination, they are sufficient for the project to break even and sustain long-term conservation costs.

Figure 5. All ecosystem services including carbon sequestration & O&M (conservation)[6]



Source: Author.

The conversion of ecosystem services into revenue-generating outcomes and carbon credits involves inherent delays linked to ecosystem service maturation, outcome measurement, third party verification, buyer engagement, and the negotiation of contractual arrangements. As a result, revenues from these streams are expected to build progressively over time rather than materialize immediately.

Therefore, upfront capital is required to finance operation and maintenance (O&M) costs during the initial phase of the project, before ecosystem service outcomes are fully generated, verified, and monetized. This early-stage financing gap provides a clear rationale for the use of outcome-based financing mechanisms, including concessional lending, which can bridge the period between upfront conservation costs and delayed revenue streams.

For this reason, the next section examines the rationale and structure of the proposed loan before detailing how revenues from outcome payments and carbon credits are operationalized. This step helps determine the project's borrowing capacity based on the estimated pool of potential ecosystem service revenues, and it informs key loan parameters such as tenor, repayment profile, and financing costs. These debt related costs are then assessed alongside operation and maintenance requirements in the overall financial sustainability analysis.

[6] Spikes in avoided infrastructure damage costs are concentrated in two specific years, based on projected flood events. As a result, these avoided costs are not distributed evenly across the entire time horizon but instead materialize in those years when extreme flooding is expected to occur.

2.5 Loan Component

For this project, the outcome-based financing structure is implemented through a loan that provides upfront capital to cover the early phase of conservation and operation and maintenance activities, while revenues from ecosystem service outcomes and carbon revenue build up progressively over time. This choice reflects practical implementation considerations and the project's risk context, in which cash inflows depend on the gradual delivery and verification of outcomes rather than on immediate commercial returns.

It is important to distinguish this loan from a sustainability-linked loan as defined in the Sustainability Linked Loan Principles (Loan Market Association, 2019). Sustainability-linked loans typically include a direct incentive mechanism within the loan terms, such as a margin step up or step down, that adjusts the cost of borrowing depending on whether the borrower meets pre-agreed sustainability performance targets (Loan Market Association, 2019). In the Natur'ELLES structure, the loan's financial terms are not adjusted based on the borrower's performance. Instead, performance affects the level of external revenues generated through outcome payments and carbon credits, which then support repayment of the loan.

The loan is structured to align debt service with the ecological and financial timelines of mangrove restoration. It therefore includes features such as a grace period, a tailored amortisation profile, and a tenor appropriate for long-term conservation activities. While repayment remains the responsibility of the borrower (or the project vehicle, in this case), the structure is designed so that debt service is supported by the project's revenues. In particular, outcome payments from contracted buyers and carbon revenues from carbon credits contribute to servicing the loan, linking repayment capacity to the verified delivery of conservation and livelihood outcomes, as described in Section 3.

2.5.1 Loan Structure

We assume that the loan is provided by a multilateral development bank (MDB), structured according to international best practices for projects in developing countries (World Bank Group, 2024).

These institutions are well-positioned to finance long-term, high-risk nature-based projects that generate significant public and environmental benefits. MDBs can offer favourable terms, apply robust safeguards, and support complex financing structures, making them particularly suitable for the Natur'ELLES model.

The proposed debt structure is designed to align the timing of financing with both the ecological dynamics of mangrove restoration and the gradual materialization of ecosystem service revenues. The loan agreement is assumed to be negotiated and executed by 2027, following the completion of the restoration implementation phase (2024 to 2026), allowing the first loan disbursement to take place in that year.

Table 5. Loan structure, cumulative values (2026 to 2035)

	XOF	USD
Debt disbursements	472,599,390	843,510
Debt and interest charges	136,572,245	243,759
Debt repayment	472,599,390	843,510
Total debt repayment (debt repayment + interest charges)	**609,171,635**	**1,087,269**

Source: Author.

The loan foresees a total principal amount of XOF 472.6 million (USD 843,511), with disbursements concentrated over the period 2027 to 2028. This structure is designed to provide upfront liquidity during the initial years of operation and maintenance (O&M), when conservation costs are already incurred but ecosystem service revenues from outcome payments and carbon credits are still ramping up.

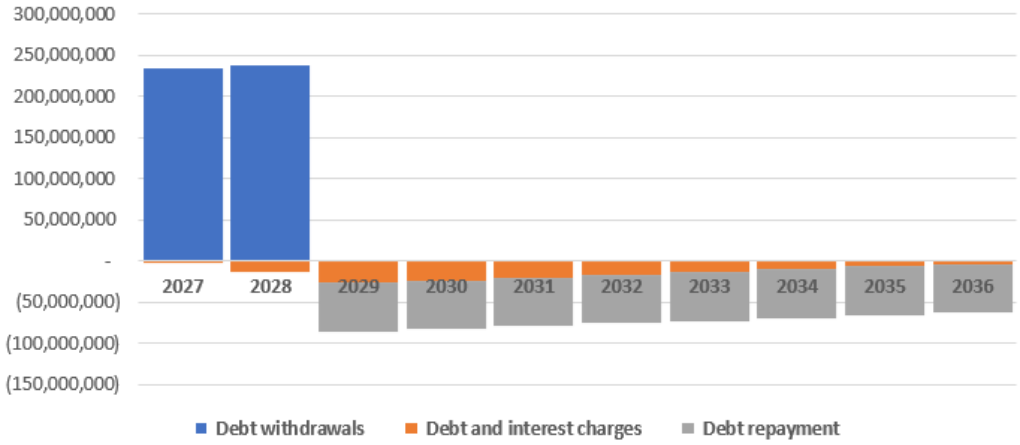
Following the disbursement phase, loan repayment begins in 2029 and continues through 2036, resulting in an eight-year repayment period. Taken together, the loan has a total maturity of 10 years, encompassing both the two-year disbursement period and the subsequent repayment phase. This maturity profile is well aligned with the long-term ecological dynamics of mangrove restoration and conservation, as well as with the project's capacity to service debt from outcome-based revenues that materialize progressively over time.

Such a maturity structure is consistent with prevailing market practices for loans financing nature-based solutions. For example, under the European Investment Bank's Natural Capital Financing Facility (NCFF) within the Urban Framework, a nature-based solutions project in Athens was financed through a loan with a ten-year maturity, including the possibility of extensions, covering approximately 75% of total project costs through debt financing (Cities Climate Finance Leadership Alliance, n.d.).

Loan repayment begins in 2029, following the two-year disbursement period in 2027 to 2028, and continues through 2036, resulting in an eight-year repayment period. Principal repayments are made in equal annual instalments of approximately XOF 59.1 million per year (USD 105,484), providing a predictable and evenly distributed debt service profile. Interest and debt-related charges accrue from the first disbursement year and decline progressively over time, with total interest costs amounting to approximately XOF 136.6 million (USD 243,809) over the full loan tenor.

The total amount repaid over the life of the loan, including principal, interest, and debt-related charges, amounts to XOF 609.1 million (USD 1.09 million).

Figure 6. Debt structure, 10 years maturity (debt withdrawal, interests, charges, and repayments)



Source: Author.

The loan is provided at relatively favourable pricing, extended tenor, and built-in risk-mitigation features enabling the financial viability of this nature-based infrastructure project. In particular, access to long-term capital from a multilateral development bank allows early-stage cash-flow constraints to be smoothed and aligns debt service obligations with the gradual maturation of ecosystem service outcomes. This alignment is essential in the context of mangrove restoration, where ecological benefits and associated revenues accrue progressively over time rather than immediately.

The interest rate comprises two components: a floating base rate derived from the Secured Overnight Financing Rate (SOFR), assumed at 4.2%, and a fixed lending margin of 1.44%, consistent with the IBRD Flexible Loan (IFL) pricing structure as of October 15, 2024. Together, these components result in a blended interest rate of 5.65%. Although the loan is denominated and serviced in USD, figures are also presented in West African CFA francs (XOF) to make the results easier to compare with project costs, outcomes, and credit revenues.

Exchange-rate risk should still be considered. The loan is in USD, while many project costs and some revenues are in West African CFA francs (XOF). If the CFA franc loses value against the US dollar, debt service becomes more expensive in local-currency terms.

However, this risk may be limited if international buyers, such as development agencies, climate funds, NGOs, or private companies, pay for verified outcomes in USD. In that case, USD revenues could be used directly to repay the USD loan, reducing the currency mismatch. The risk would be higher for revenues received in West African CFA francs (XOF), such as local payments or locally generated income.

The loan also includes an annual commitment fee of 0.25%, applied to the undisbursed loan balance during the five-year drawdown period (as of October 15, 2024, World Bank Group

IBRD's Flexible Loan pricing structure).[7] This fee compensates the lender for maintaining capital reserves and ensuring credit availability throughout implementation.

2.6 Structuring Outcome-Based Payments

Outcome-based payments constitute the central revenue mechanism through which the Natur'ELLES project mobilizes long-term financing for mangrove conservation. Outcome-based payments translate verified environmental and socio-economic performance into predictable financial flows, thereby enabling engagement from multilateral development banks and other impact-oriented capital providers.

As discussed in the previous analysis, four tangible ecosystem services have been selected, representing a total potential value of approximately XOF 5.3 billion. Building on this foundation, the present section examines how this value can be translated into outcome payments. In particular, the analysis focuses on:

- **revenue streams**: the share of ecosystem service value required to cover debt service and operation and maintenance (O&M) costs,
- **pricing**: the pricing approach applied to each selected ecosystem service,
- **outcomes**: the definition of outcome thresholds required to trigger payments,
- **buyers**: the identification of potential outcome buyers.

2.6.1 Revenue Stream Requirement and Break-Even Outcome Payment Level

The project does not need to monetize the full economic value of all ecosystem services, but only the portion required to meet its financial obligations. In this case, that required portion is relatively high due to the level of long-term operation and maintenance (O&M) costs and the structure of the loan component described in the previous section.

Based on our financial modelling, the project must convert approximately 92.1% of the value of the selected ecosystem services (excluding carbon sequestration) into revenue streams, corresponding to about XOF 4.1 billion in outcome payment revenue over the 27-year project lifespan. This revenue is required to service the loan and fully cover the remaining O&M costs, thereby ensuring the long-term financial sustainability of the conservation activities (Figure 7). This result is important as it shows that the project's financial viability is closely linked not only to the ecological value generated by the mangrove system, but also to the ability to translate that value into actual and predictable cash flows. In this respect, the required conversion rate is high, suggesting that the financing structure leaves relatively limited room for underperformance in the monetization process. While the analysis demonstrates that the project can be financially viable, it also highlights that viability

[7] Ibid.

depends on strong assumptions regarding the capacity to identify committed outcome buyers, negotiate payment levels that reflect ecosystem service value, and maintain these commitments over a long-term horizon.

This high internalization requirement should therefore be interpreted with caution. The result does not necessarily undermine the project rationale, but it points to a key implementation challenge: the financial model is only as strong as the contractual arrangements (contract payments) that underpin revenue collection. In other words, the model confirms that mangrove conservation can be structured as a financeable intervention, but its robustness remains sensitive to the practical feasibility of converting ecosystem service benefits into sustained payments at a very high rate.

In practical terms, this means the financing strategy depends on converting most of the project ecosystem services into outcome-based payments.

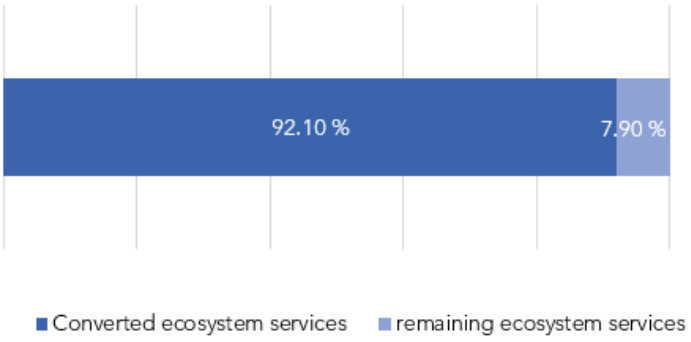
Table 6 summarizes the ecosystem service value estimated through the SAVi analysis and translates this value into financing terms by indicating the portion that would need to be monetized as outcome payments for the project to be financially viable. In other words, it shows how much of the broader ecosystem service value must be converted into contracted, verified outcomes that trigger outcome payments in order to cover the long-term operation and maintenance (O&M) costs and the loan related costs identified in the previous sections.

Table 6. Translation of ecosystem service economic values into outcome-based payments (27-year period), XOF

Ecosystem service	Economic value of the ecosystem service	Outcome-based payments (financial value)
Avoided costs to infrastructure damage	1,342,046,899	1,236,030,583
Fishing revenue	89,506,081	82,435,460
Agricultural revenue	1,240,599,056	1,142,596,712
Income from seafood harvesting	290,266,523	267,336,633
Job creation	2,420,289,134	2,229,096,011
Total	**5,382,707,694**	**4,957,495,399**

Source: Author.

Figure 7. Share of ecosystem services to be converted into outcome-based payments to generate revenue stream



Source: Author.

Based on the cash flow requirements of the proposed financing structure, the project would need to generate approximately XOF 4.9 billion (USD 8.75 million) in cumulative outcome payments over the project horizon to break-even and fully meet its cost and repayment obligations.

The next step will be to set out how annual ecosystem service outcomes can be priced in order to secure contracts with buyers and translate verified performance into outcome payments.

2.6.2 Outcome Pricing Approach

Once the level of revenue required for the project to reach financial break-even has been established, the next step in defining outcome-based payments is to structure contractual arrangements that directly link outcome buyers to the delivery and verification of ecosystem service outcomes.

Table 7 presents the indicative average annual outcome payments associated with each selected ecosystem service. These values are derived by applying the required monetization share to the SAVi valuation results and then allocating the resulting revenue requirement across the project lifetime to express it on an annual basis.[8] They provide a reference point for the approximate annual payment levels that contracted outcome buyers would be expected to contribute under the proposed outcome-based financing framework.

[8] The 92.10% share is applied to the annual ecosystem service value estimated by the SAVi evaluation, and the resulting amount is then expressed as an indicative annual average payment level for harmonization and comparison purposes.

Table 7. Indicative annual outcome-based payments (XOF)

Avoided infrastructure damage	45,778,910[9]
Fishing	3,053,165
Agriculture	42,318,397
Seafood harvesting	9,901,357
Job creation	82,559,112
Average annual payments per year	**183,610,941**

Source: Author.

The estimated average annual payments amount to approximately XOF 183.6 million (USD 327,713) per year, with the largest contributions associated with job creation, avoided infrastructure damage, and agricultural productivity, followed by fisheries and women's seafood harvesting activities. These figures are intended to serve as order-of-magnitude benchmarks for pricing ecosystem service outcomes, rather than fixed annual obligations.

In practice, actual outcome-based payments are expected to vary from year to year. Annual payments will depend on the timing and verification of ecosystem service outcomes, which are influenced by ecological dynamics, the maturation of restored mangroves, and the occurrence of episodic events such as extreme flooding. As a result, some ecosystem services, particularly avoided infrastructure damage, may generate higher payments in certain years and lower or zero payments in others, while other services tend to follow more gradual and stable trajectories.

Accordingly, these annual values should be interpreted as indicative reference levels over the project horizon. The payment mechanism is designed to accommodate year-to-year variability (based on the SAVi analysis), with payments triggered by the delivery and independent verification of agreed outcomes.

2.6.3 Outcome KPIs

Outcome key performance indicators (KPIs) are extrapolated from the SAVi analysis conducted for the Sine-Saloum mangrove restoration project, complemented by site-specific data and implementation parameters from the NATUR'ELLES project. Outcomes are identified by comparing the baseline trajectory with the intervention scenario, which includes mangrove restoration, enhanced protection measures, and community-based management activities. The scale and timing of improvements, such as increased fisheries productivity, reduced flood-related damage, enhanced agricultural yields, and job creation,

[9] For avoided infrastructure damages, a distinct pricing approach will be applied once the corresponding KPIs are defined in the following section.

are quantified using SAVi outputs and validated with data collected during project preparation and early implementation.

This section indicates the indicative annual amounts that buyers would be expected to pay, based on the verified achievement of annual outcomes:

Avoided infrastructure damage: Mangrove restoration generates coastal protection benefits by attenuating wave energy, stabilizing shorelines, and improving water retention. These effects translate into measurable reductions in expected flood damage to public buildings, residential buildings, and roads. The outcome can be defined as a verified annual reduction in flood damage costs relative to baseline conditions.

Under the intervention scenario, flood-related infrastructure damage are assumed to decline progressively as restored mangroves mature, reaching an average reduction of approximately 7.5% below baseline after a ten-year period. Given the inherent uncertainty in the timing and occurrence of extreme flood events, this outcome is defined as an event-triggered KPI rather than a fixed annual target.

Outcome payments are therefore triggered only in years in which extreme flood events occur and independently verified assessments confirm that realized infrastructure damage is lower than baseline projections by the agreed reduction rate. Based on historical flood frequency and SAVi modelling, two trigger events can be expected over the project horizon. A first payment is anticipated around 2033, when verified damage reductions reach approximately 7.4%, corresponding to an estimated payment of XOF 783.1 million. A second payment is expected around 2044, once the full 7.5% reduction level is achieved and verified following a subsequent extreme flood event, corresponding to an estimated payment of XOF 558.9 million.

Artisanal fisheries productivity: Mangrove ecosystems play a critical role as nursery habitats for fish species, supporting increased biomass and long-term productivity of artisanal fisheries. To ensure verifiability, the fisheries outcome is defined in terms of physical production volumes, rather than income. Baseline fish production volumes are established using regional artisanal fisheries data and survey information. The outcome is measured as a verified increase in annual fish landings, expressed in tonnes, in mangrove-influenced fishing areas. Under the SAVi intervention scenario, fisheries productivity is assumed to increase by approximately 3.0% over 25 years, corresponding to an average annual incremental improvement of about 0.14%. Annual payments of approximately XOF 3.0 million are triggered when verified landings exceed baseline projections.

Agricultural productivity: Mangrove restoration improves agricultural conditions by reducing salinity intrusion, enhancing soil moisture retention, and stabilizing hydrological regimes. To align with outcome-based financing standards, the agricultural outcome is defined as an increase in average crop yields per hectare. Baseline yields for major crops are derived from national and regional agricultural statistics. Under the intervention scenario, agricultural productivity increases gradually, reaching an estimated 2.3% improvement over a 30-year period. This corresponds to an average annual incremental improvement of

approximately 0.10% per year. Annual payments of approximately XOF 42.3 million are triggered when verified yield data show improvements relative to baseline conditions.

Women's seafood harvesting: Mangrove restoration enhances shellfish habitats and harvesting conditions, particularly benefiting women engaged in oyster and shellfish collection. The outcome is defined as an increase in the total volume of shellfish harvested and sold, measured in kilograms per year, rather than income gains. Baseline harvest volumes are established using participation rates, harvesting days, and productivity assumptions. Under the restoration scenario, women's shellfish productivity increases by approximately 10% over 15 years, corresponding to an average annual incremental improvement of about 0.45%. Annual payments of approximately XOF 9.9 million are triggered upon verification of increased harvested volumes relative to the total volume of shellfish harvested and sold.

Job creation: Employment generated through mangrove restoration and long-term conservation activities is treated as a direct and immediately verifiable outcome. Unlike other ecosystem services, employment is remunerated based on absolute delivery, not percentage improvements. The outcome is defined as the verified number of job-days created and wages paid to local workers for restoration, monitoring, patrolling, and ecosystem management activities. Payroll records and contracts provide the basis for verification. Annual payments of approximately XOF 82.5 million are triggered upon confirmation that the agreed employment targets have been met, for example through the recruitment of additional community members to support conservation activities each year.

These outcomes are generated by improvements in environmental conditions from mangrove restoration. For example, improved water quality and healthier nursery habitats can reduce juvenile fish mortality, which in turn supports higher fisheries productivity. Similarly, improved soil and hydrological conditions can enhance agricultural productivity in surrounding areas.

The SAVi analysis used to monetize ecosystem services is therefore grounded in changes in environmental conditions and their resulting economic effects. In principle, the KPIs and achievement thresholds that trigger outcome payments should be linked as closely as possible to these underlying biophysical improvements, since they represent the causal basis for the ecosystem services being delivered.

However, for this project, the proposed payment triggers are largely based on the economic valuation of ecosystem service outcomes rather than environmental indicators alone. This approach was chosen because the main objective of the financial analysis is to assess whether ecosystem services can be converted into revenue streams capable of attracting outcome buyers, including private sector actors. Economic indicators such as increased fisheries productivity, improved agricultural output, avoided infrastructure damage, and job creation are easier to communicate to buyers and can be directly linked to the project's financial sustainability requirements.

For further details on the methodology used to define and measure each outcome KPI, please refer to the SAVi report on mangrove restoration in the Sine-Saloum region.

Table 8. Summary of outcomes, triggers, and indicative payments

Ecosystem service	Outcome KPIs	Indicative outcome payments
Avoided infrastructure cost damage	Event-based KPI: Verified reduction in modelled flood-related infrastructure damage relative to baseline, reaching up to 7.5% below baseline as mangroves mature. Payments triggered only in years when extreme flood events occur and reductions are independently verified.	Event-triggered payments: approx. XOF 783.1 million (2033) at 7.4% verified reduction and XOF 558.9 million (2044) at full 7.5% reduction.
Fishing	Verified increase in annual fish landings (tonnes) relative to baseline. After restoration, productivity improves by approx. 3.0% over 25 years (0.14% average annual increase).	Approx. XOF 3.0 million per year, conditional on verified production increases above baseline.
Agriculture	Verified increase in average crop yields per hectare relative to baseline. Productivity improves by approx. 2.3% over 30 years (0.10% annual average increase).	Approx. XOF 42.3 million per year, triggered upon verification of yield improvements.
Women's seafood harvesting	Verified increase in total shellfish harvested and sold (kg/year) relative to baseline volumes. Productivity improves by approx. 10% over 15 years (0.45% annual average increase).	Approx. XOF 9.9 million per year, conditional on verified harvest increases.
Job creation	Verified delivery of agreed job-days and wages to local workers for restoration and ecosystem management activities.	Approx. XOF 82.5 million per year, conditional on meeting agreed employment targets.

Source: Author.

2.6.4 Outcome Thresholds and Performance Bands

As previously discussed, outcome payments form the financial backbone of the project. Their design must therefore ensure that verified environmental and socio-economic results are translated into reliable revenue streams. This requires a structure that remains anchored in performance, while providing the predictability and stability necessary to sustain debt obligations and long-term conservation activities.

Mangrove restoration is inherently dynamic and subject to ecological variability, climatic fluctuations, and external pressures. As a result, outcomes such as higher fisheries productivity, reduced flood-related damage, and strengthened livelihoods may materialize gradually and vary from year to year. To manage the risk that verified results fall below the

levels projected in the SAVi analysis and associated forecasts, the framework incorporates four performance thresholds. These thresholds translate verified achievement into proportionate outcome payments, ensuring that payments adjust transparently in line with measured delivery of expected outcomes.

Four performance bands are defined in the contractual structure:

- full achievement (≥100% of agreed targets)
- substantial achievement (75–99%)
- partial achievement (50–74%)
- low achievement (<50%)

Together, these thresholds establish a rules-based financial adjustment mechanism through which verified ecological performance is systematically translated into revenue flows. By predetermining how different levels of outcome delivery affect annual payments, the structure reduces cash-flow uncertainty, clarifies risk allocation among stakeholders, and enhances the predictability of debt service capacity.

Table 9 shows how annual outcome payments adjust when verified results fall short of the agreed targets. For each ecosystem service, it sets out the outcome level associated with each performance band (full, substantial, partial, and low) and the corresponding payment amount. In doing so, the four outcome thresholds make explicit the rules by which underachievement is translated into reduced revenues, allowing the financial viability assessment to test how different levels of verified performance affect total cash inflows and the project's ability to cover its financial obligations.

Section 4 will examine how underperformance in the delivery of ecosystem service outcomes would affect project cash flows. It also includes a guarantee mechanism embedded in the structure, which is designed to mitigate downside risk and protect investors by ensuring a minimum level of repayment even when verified outcomes fall below targets.

Table 9. Achievement thresholds linking ecosystem systems services and outcomes-based payments[10]

Ecosystem service	Threshold achievements	Outcome achieved	Payments (XOF million)
Avoided infrastructure damage (2033)	Full	7.5% reduction in flood-related infrastructure damages	783.1
	Substantial	6.5% reduction	681.3

[10] For scenario illustration, each performance band is represented by a single applied factor (100/87/62/45) used to proportionally scale both verified outcomes and the corresponding outcome payments. These factors are based on the midpoint assumption within each performance band (i.e., a representative level of achievement used to calculate indicative payment levels).

Ecosystem service	Threshold achievements	Outcome achieved	Payments (XOF million)
	Partial	4.7% reduction	485.5
	Low	3.4% reduction	352.4
Avoided infrastructure damage (2044)	100%	7.5% reduction in modelled flood-related infrastructure damage	558.9
	Substantial	6.5% reduction	486.2
	Partial	4.7% reduction	346.5
	Low	3.4% reduction	251.5
Fishing	Full	0.14% annual increase in verified fish landings (tonnes)	3.1
	Substantial	0.12% increase	2.7
	Partial	0.08% increase	1.9
	Low	0.06% increase	1.4
Agriculture	Full	0.10% annual increase in verified crop yields per hectare	42.3
	Substantial	0.08% increase	36.8
	Partial	0.06% increase	26.2
	Low	0.04% increase	19.0
Women's seafood harvesting	Full	0.45% annual increase in verified shellfish harvested volume (kg/year)	9.9
	Substantial	0.39% increase	8.6
	Partial	0.27% increase	6.1
	Low	0.20% increase	4.5
Job creation	Full	100% of agreed job-days delivered	73.7
	Substantial	87% of job-days delivered	64.1
	Partial	62% of job-days delivered	45.7
	Low	45% of job-days delivered	33.2

Source: Author.

Table 10 presents the cumulative total of outcome-based payments under each of the four performance thresholds. It illustrates, on an indicative basis, how the overall revenue stream would decline if the project were to perform consistently at the same achievement level every year. This simplified comparison is intended to reflect the degree of revenue uncertainty embedded in the framework and to highlight the sensitivity of long-term cash flows to sustained underperformance.

Table 10. Outcome thresholds and respective outcome-based payments in cumulative values (XOF – 27 years)

Threshold outcomes	Outcome-based payments
Full achievement (100%)	4,957,495,399
Substantial achievement (75% -99%)	4,313,020,997
Partial achievement (50%- 74%)	3,073,647,147
Low achievement (49 - 41%)	2,230,872,930

Source: Author.

2.6.5 Buyers

To assess the potential demand for these outcomes and the feasibility of securing sufficient contracted revenues, two buyer scenarios are considered, reflecting different levels of buyer participation and willingness to pay.

The first scenario assumes that ecosystem services are purchased exclusively by international outcome buyers. These include multilateral development banks, international organizations, international NGOs, and European development agencies with mandates related to climate adaptation, biodiversity conservation, and sustainable development in Senegal. Such actors are increasingly willing to participate in outcome-based financing mechanisms by acting as buyers of verified ecosystem service outcomes.

The second scenario adopts a more diversified buyer base. In addition to international buyers, it includes Senegalese and international companies operating in Senegal, whose assets or supply chains benefit from improved ecosystem services, as well as local communities, who are the primary beneficiaries of mangrove restoration and long-term conservation. Their participation as buyers, where feasible and affordable, reinforces local ownership while ensuring that the financial burden remains proportionate to their capacity to pay.

Scenario 1: International outcome Buyers as Sole Purchasers of outcomes

In this first scenario, it is assumed that international buyers constitute the exclusive category of outcome purchasers. Table 11 identifies potential outcome buyers and outcome from ecosystem services they are most likely to support, based on their institutional mandates, operational priorities, and exposure to environmental, climate, and development risks. It illustrates how different categories of buyers can be strategically matched with specific, verifiable outcomes generated by mangrove restoration and conservation.

Table 11. International outcomes buyers

Buyer category	Organization	Aligned outcome focus
Development agencies	GIZ	Verified improvements in local economic productivity, employment creation, and livelihood resilience, aligned with inclusive growth, decentralized development, and climate adaptation objectives.
	Agence Française de Développement (AFD)	Climate adaptation and coastal resilience outcomes, including reduced exposure to climate risks, strengthened local economies, and inclusive territorial development in vulnerable coastal regions.
Conservation foundations and NGOs	The Nature Conservancy	Verified mangrove restoration outcomes, ecosystem integrity, and biodiversity conservation, with a focus on scalable, science-based nature-based solutions delivering measurable ecological performance.
	World Wildlife Fund (WWF)	Species protection, habitat conservation, and long-term ecosystem health, linked to measurable conservation outcomes and reduced pressures on critical coastal ecosystems.
	Conservation International	Biodiversity conservation and sustained delivery of ecosystem services, including fisheries productivity, coastal protection, and climate resilience benefits for local communities.
Multilateral development banks	World Bank	Climate adaptation and resilience outcomes linked to avoided public expenditure, reduced disaster-related losses, and improved economic stability in climate-vulnerable coastal areas.
	African Development Bank	Climate resilience, ecosystem protection, and inclusive economic development outcomes, consistent with regional adaptation priorities and the Adaptation Benefits Mechanism framework.
Climate and adaptation funds	Green Climate Fund	Certified climate resilience outcomes, social co-benefits, and sustainable economic activities that enhance adaptive capacity and reduce vulnerability of coastal communities.
	Adaptation Fund	Coastal protection, livelihood resilience, and measurable adaptation outcomes that reduce climate risks for vulnerable populations.
	Global Environment Facility (GEF)	Biodiversity conservation, ecosystem restoration, and climate-resilient livelihoods, with a focus on global environmental benefits, ecosystem integrity, and sustainable use of coastal and marine resources.

Source: Author.

This scenario is deliberately conservative. It demonstrates that, even without relying on domestic buyers or local user payments, a diversified pool of international outcome buyers could realistically sustain annual outcome-based payments of approximately XOF 183 million, sufficient to service debt, cover financing costs, and ensure long-term conservation of the Sine-Saloum mangrove ecosystem. Over time, this international-only buyer model can be complemented by domestic buyers as institutional capacity and willingness to pay mature (see scenario 2).

Avoided infrastructure damage. Outcome payments for avoided flood-related infrastructure damage are primarily purchased by institutions with mandates in climate adaptation, disaster risk reduction, and avoided public expenditure. Key buyers include:

- The World Bank and the African Development Bank, complemented by climate funds such as the Green Climate Fund, the Adaptation Fund, and the Global Environment Facility. Insurance companies may participate selectively where verified risk reduction aligns with their exposure.
- Payments are structured as event-triggered: two payments are expected over the project horizon: approximately XOF 783 million around 2033 and XOF 559 million around 2044, corresponding to verified flood-damage reductions of about 7.5% following extreme flood events.

Fisheries, agriculture, and women's seafood harvesting. Annual outcome payments for mangrove-dependent economic activities are financed by development agencies and conservation organizations supporting inclusive growth and ecosystem-based livelihoods. The primary buyers are:

- GIZ and Agence Française de Développement, with additional support from Conservation International, The Nature Conservancy, and the Global Environment Facility, reflecting its mandate to finance biodiversity conservation with livelihood co-benefits.
- Together, these buyers could finance approximately XOF 55.2 million per year, covering verified increases in artisanal fish landings, agricultural yields, and women's shellfish harvesting volumes relative to baseline conditions.

Job creation. Employment outcomes generated through mangrove restoration and long-term conservation are financed by institutions with explicit mandates for job creation, social inclusion, and local economic development. Annual outcome-based payments of approximately XOF 82.5 million can be supported by:

- GIZ, Agence Française de Développement, and the World Bank, with complementary support from the Green Climate Fund and the Global Environment Facility for social and biodiversity-linked co-benefits.
- Payments are made annually upon verification of job-days and wages paid to local community members engaged in restoration, monitoring, and ecosystem management.

Scenario 2: Mixed outcome payments structure with international outcome buyers, corporates operating in Senegal, and local communities

Under Scenario 2, outcome-based payments are generated through a diversified buyer structure that combines international outcome buyers, private companies operating in Senegal, and local communities and producer associations. This mixed approach reflects the differentiated distribution of ecosystem services benefits and aligns payment responsibilities with the extent to which outcomes are attributable, independently verifiable, and suitable for monetization. International buyers are most likely to finance outcomes that deliver public good and climate adaptation benefits. Private companies tend to participate where outcomes reduce operational or supply chain risks or create potential business value. Local actors are more likely to contribute selectively when benefits translate into direct, measurable gains for livelihoods and local economic activity.

At the aggregate level, international outcome buyers can provide approximately XOF 119.4 million per year, representing 65.0% of total outcome-based payments. Corporates operating in Senegal can contribute around XOF 31.3 million annually (17.0%), while local communities and associations account for approximately XOF 33.0 million (18.0%). This allocation reflects a realistic distribution of payment responsibilities based on buyers' capacity to pay, their exposure to mangrove-related risks, and the nature of the benefits they derive from ecosystem services. (Table 12).

Table 12 expands this scenario by showing, for each selected ecosystem service outcome, an indicative allocation of expected contributions from international buyers, corporates, and local communities. For each outcome, it presents the corresponding annual outcome payment requirement. The following section will illustrate how the overall funding need could be shared across buyer types based on the nature of the benefit, the likely willingness to pay, and the degree to which the outcome represents a public good versus a direct, localized, or business relevant benefit.

Table 12. Annual payments – share per type of buyer, values in XOF

International outcome buyers	65.0%	119,351,353
Corporates	17.0%	31,264,950
Local communities, (including municipalities or government)	18.0%	32,994,639
Total annual payments	**100%**	**183,610,941**

Source: Author.

Table 13. Type of buyer per ecosystem service, annual payments in XOF

Ecosystem service	Share	Annual value
Avoided infrastructure damage		**45,778,910**
International outcome buyers	20%	9,155,782
Corporates	20%	9,155,782
Local communities (municipalities or government)	60%	27,467,346
Fishery		**3,053,165**
International outcome buyers	50%	1,526,583
Corporates	40%	1,221,266
Local communities	10%	305,317
Agriculture		**42,318,397**
International outcome buyers	50%	21,159,198
Corporates	40%	16,927,359
Local communities	10%	4,231,840
Seafood harvesting		**9,901,357**
International outcome buyers	50%	4,950,678
Corporates	40%	3,960,543
Local communities	10%	990,136
Job creation		**82,559,112**
International outcome buyers	100%	82,559,112
Corporates	-	-
Local communities	-	-
Total annual payments		**183,610,941**

Source: Author.

International Buyers As Outcome Buyers

International buyers are expected to play a major role in the outcome payment mechanism, as they are often best positioned to finance outcomes that deliver public good benefits. Many outcomes generated by mangrove restoration support broader sustainable development objectives, including climate adaptation, risk reduction, and livelihood resilience, with benefits extending beyond the immediate project area. For these reasons, development agencies, climate and adaptation funds, multilateral development banks, and conservation foundations are likely to be well suited to support a significant share of outcome payments, alongside other potential buyer groups.

On an annual basis, international outcome buyers contribute approximately XOF 119.4 million, representing the largest share of total outcome-based revenue. This includes XOF 9.2 million for avoided infrastructure damage, XOF 1.5 million for artisanal fisheries outcomes, XOF 21.2 million for agricultural productivity, XOF 5.0 million for women's seafood harvesting, and XOF 82.6 million for job creation outcomes (Table 13). These payments align closely with the mandates of international actors to finance climate adaptation, biodiversity conservation, employment generation, and inclusive economic development, while providing the predictable revenue streams required to support the loan and long-term mangrove management.

Participation of Corporates Operating in Senegal

Corporates operating in Senegal can participate as outcome buyers in ecosystem service categories where mangrove restoration generates outcomes that directly or indirectly reduce business risks, protect economic assets, or strengthen climate resilient supply chains. Based on the allocation in Table 13, corporates could finance approximately XOF 31.3 million per year in outcome payments.

Corporate contributions are concentrated in outcomes linked to avoided losses and enhanced productivity. This includes about XOF 9.2 million per year for outcomes related to avoided infrastructure damage, reflecting the risk reduction value of mangrove coastal protection. Corporates can also contribute approximately XOF 22.1 million per year toward outcomes associated with productive economic activities supported by mangrove ecosystems. Within this category, corporate payments are estimated at about XOF 1.22 million for fisheries-related outcomes, XOF 16.93 million for improved agricultural productivity, and XOF 3.96 million for women's seafood harvesting activities.

These payments reflect the role of mangrove ecosystems in reducing flood exposure, stabilizing production conditions, and enhancing the resilience of export-oriented and coastal value chains. Companies such as port and logistics operators, agro-industrial firms, insurers, and other coastal-zone operators can therefore be considered credible outcome buyers. For these actors, outcome-based payments function as targeted investments in risk reduction, asset protection, and long-term supply-chain resilience, rather than as philanthropic contributions.

Table 14 provides an overview of companies operating in Senegal that could credibly be identified as outcome buyers under this scenario.

Table 14. Corporates operating in Senegal in the context of outcome payments framework

Company	Ecosystem services	Rationale for payment
DP World (Senegal)	Avoided infrastructure damage	DP World operates port and logistics infrastructure exposed to coastal flooding and storm surges. Mangrove restoration reduces flood-related damage and disruption risks, lowering expected repair costs and enhancing the resilience of coastal logistics assets.
Africa Global Logistics (ex-Bolloré Africa Logistics)	Avoided infrastructure damage	Logistics assets and transport corridors depend on stable coastal and estuarine conditions. Reduced flood and erosion risks lower operational downtime and asset degradation, justifying outcome payments linked to avoided damage.
CMA CGM	Avoided infrastructure damage	As a major shipping operator using Senegalese ports, CMA CGM benefits from improved port reliability and reduced flood-related disruptions. Outcome payments allow the company to internalize climate-adaptation benefits generated by mangrove restoration.
Woodside Energy (Senegal)	Avoided infrastructure damage, fishery	Offshore oil and gas operations face exposure to coastal and marine risks. Mangroves reduce shoreline vulnerability while supporting fisheries that underpin local livelihoods in areas surrounding industrial operations. Woodside has previously supported mangrove restoration in Senegal, making outcome-based payments a credible extension of existing practices (Woodside Energy, 2025).
PETROSEN	Avoided infrastructure damage, fishery	As the national oil company, PETROSEN has an interest in mitigating coastal risks associated with offshore infrastructure while supporting economic activities affected by industrial development. Outcome payments align with environmental compensation and coastal resilience objectives.

Company	Ecosystem services	Rationale for payment
TotalEnergies (Senegal)	Avoided infrastructure damage, fishery	TotalEnergies operates in coastal and offshore environments that are directly exposed to climate-related risks, including flooding and coastal erosion. In parallel, the TotalEnergies Foundation in Senegal is actively engaged in initiatives related to environmental protection and sustainable development. Supporting mangrove restoration through outcome payments therefore aligns both with the company's operational risk-management priorities and with its broader corporate and philanthropic commitments in Senegal.
Nestlé (Senegal)	Seafood harvesting, agriculture, and fishery	Nestlé's supply chains depend on resilient fisheries and coastal food systems. Mangrove restoration enhances fish stocks and supports seafood harvesting activities, making these outcomes relevant for sustainable sourcing and nature-positive commitments.
SONAM Assurances	Avoided infrastructure damage	Reduced flood damage to buildings, ports, and commercial assets lowers expected insurance claims. Outcome payments represent a preventive investment in risk reduction linked to verified avoided damage.
NSIA Assurances (Senegal)	Avoided infrastructure damage	As a regional insurer, NSIA benefits from lower exposure to climate-related losses. Mangrove outcomes provide measurable avoided-cost indicators directly relevant to insurance risk portfolios.
Ecobank (Senegal)	Agriculture and fishery	Improved agricultural and fisheries revenues strengthen local economic activity and borrower solvency. Outcome payments align with Ecobank's sustainable finance strategy while indirectly reducing credit risk in climate-exposed sectors.

Source: Author.

Participation in this outcome-based financing project in Sine-Saloum can also represent a strategic opportunity for corporates operating in Senegal. As a pilot initiative, the project allows companies to assess the tangible impacts generated by mangrove restoration and to engage in the purchase of verified outcomes, even where there is no immediate or direct link to their existing supply chains. By participating in the mechanism, corporates can observe how ecosystem-based outcomes translate into measurable risk reduction, productivity gains, and resilience benefits, and use this evidence to inform future investments. Once the pilot has demonstrated its expected results, the approach could be scaled up to areas closer to

corporate supply chains, where the relevance and value of ecosystem services are even more direct.

Role of Local Communities and Associations

Local communities and community-based organizations participate as outcome buyers in a strategically important manner, contributing approximately XOF 33.0 million per year in outcome-based payments. Their participation is focused on ecosystem services that generate direct, measurable livelihood benefits, as well as infrastructure-related outcomes where they are direct beneficiaries.

Community contributions include income-generating activities, such as artisanal fisheries, agricultural productivity, and women's seafood harvesting, as well as avoided infrastructure damage. For income-generating activities, contributions include artisanal fisheries (approximately XOF 0.3 million), agricultural productivity (approximately XOF 4.2 million), and women's seafood harvesting (approximately XOF 1.0 million). These payments are assumed to be collective and proportional, channelled through cooperatives, producer organizations, or community associations, and directly linked to incremental income gains generated by healthier mangrove ecosystems.

For avoided infrastructure damage, local communities are the direct beneficiaries, as they benefit from reduced flood-related damage to public assets, private buildings, roads, and other local infrastructure. Under this scenario, their contribution could represent 60% of the buyer share, equivalent to approximately XOF 27.5 million in annual outcome payments.

However, in practice, municipalities and/or local government authorities may be more appropriate buyers than households or community groups themselves. This is because local public authorities are generally responsible for financing, maintaining, or coordinating repairs to public infrastructure and may also bear part of the costs associated with damage to community assets. Their participation as outcome buyers would therefore better reflect the avoided public expenditure generated by mangrove restoration and conservation.

This approach ensures that local communities can participate financially in outcome-based payments in a way that reinforces ownership and long-term stewardship, while avoiding excessive financial burdens on households. Community contributions therefore play a complementary role, strengthening incentives for sustainable ecosystem management without substituting for the primary financing role of international buyers and corporates.

The SAVi analysis makes it possible to quantify the incremental revenues generated by mangrove restoration. This allows cooperatives and community-based associations to allocate a limited share of these additional revenues to support mangrove conservation activities, thereby reinvesting in the ecosystems that directly sustain and enhance their economic activities.

However, it is essential to emphasize that the financial participation of local communities should not represent a burden. Their contribution should be framed as a small, proportional

reinvestment of realized gains, designed to avoid undermining household incomes while strengthening long-term incentives for stewardship and the sustainable management of mangrove ecosystems.

Table 15 provides an overview of potential cooperatives and community-based associations that could collectively participate as buyers within the outcome-based payments, reflecting their role as local beneficiaries and stewards of mangrove ecosystems.

Table 15. Cooperative and community-based associations in the context of outcome payments

Nébéday	Agriculture, fisheries, ecosystem restoration	Nébéday works closely with rural communities on sustainable land and ecosystem management. Payment contributions reflect the reinvestment of incremental agricultural and fisheries benefits generated by healthier mangrove ecosystems into continued restoration, monitoring, and conservation activities that directly sustain local livelihoods.
REFEPAS (Réseau des Femmes de la Pêche Artisanale du Sénégal)	Women's seafood harvesting, fisheries	REFEPAS represents women engaged in oyster and shellfish harvesting who directly benefit from improved mangrove habitats. Payments are channelled collectively through women's associations and reflect a small, proportional contribution from increased harvesting volumes, reinforcing women's economic empowerment and long-term stewardship of mangrove ecosystems.
CAREM (Coordination des Actions pour la Restauration des Écosystèmes Mangroves)	Mangrove restoration, fisheries, ecosystem services	CAREM coordinates community-led mangrove restoration and protection activities in Sine-Saloum. Participation with outcome payments reflects the reinvestment of locally generated livelihood gains into sustained restoration, monitoring, and protection efforts that underpin fisheries productivity and ecosystem resilience.
CASADES	Agriculture, food security, ecosystem services	CASADES supports local development initiatives linked to natural resource management. Outcome payment contributions are structured as collective, proportional payments derived from incremental agricultural and livelihood benefits associated with improved hydrological conditions and ecosystem health resulting from mangrove restoration.

URSY	Agriculture, food security, ecosystem services	URSY represents rural producers whose agricultural productivity benefits from improved hydrological conditions created by mangrove restoration. Outcome payments are structured as collective, proportional contributions from incremental yield gains, supporting continued conservation while avoiding undue financial pressure on member households.

Source: Author.

While this analysis develops a project specific approach to structuring outcome payments, including rules for triggering payments, the use of SAVi to value ecosystem services, and a sizing of payments based on the project's financing needs (O&M and debt service), it also identifies an existing external framework that Natur'ELLES could potentially leverage to strengthen credibility and uptake.

In particular, the project's adaptation-related outcomes could be aligned with the Adaptation Benefits Mechanism (ABM) framework developed by the African Development Bank, which is designed to certify and operationalize adaptation benefits and facilitate their purchase by interested funders.

The following section therefore describes this framework and highlights the potential advantages of applying it to Natur'ELLES, including stronger standardization of outcomes, improved verification credibility, and enhanced prospects for mobilizing buyers for adaptation-related outcome payments.

2.7 Adaptation Benefits Mechanism Framework

While the outcome-based payments constitute the core revenue mechanism explored in this guidance document, structuring outcome-based payments through bilateral agreements can be complex and time-consuming, particularly when it requires the negotiation of bespoke outcome definitions, verification protocols, and payment terms with multiple buyers. In this context, the availability of an established framework with predefined methodologies, standardized verification approaches, and institutional backing from development partners such as African Development Bank can significantly reduce transaction costs, accelerate implementation, and improve the credibility and scalability of the outcome-based financing.

Within this context, the Adaptation Benefits Mechanism (ABM) represents a credible alternative and additional option to support long-term operation and maintenance (O&M) and conservation in Sine-Saloum.

The Adaptation Benefits Mechanism (ABM) represents the first non-market approach formally registered on the United Nations Framework Convention on Climate Change's Non-Market Approaches Platform (United Nations Climate Change, 2025). This recognition is particularly relevant for nature-based infrastructure projects, including mangrove

restoration, where benefits such as reduced flood damage and improved ecosystem integrity are difficult to monetize through conventional markets. By providing a standardized and UN-aligned approach to certifying adaptation benefits, the ABM facilitates outcome-based payments from development banks, climate funds, corporates, and donors, thereby strengthening the credibility and bankability of Payments for Ecosystem Services and blended-finance structures.

This outcome-based financing instrument enables the monetization of adaptation benefits within climate and development initiatives. According to the Interim ABM Executive Committee (2022, p. 1), the "ABM will create an incentive for private sector investment in adaptation projects by facilitating payments upon delivery of certified adaptation benefits, thereby generating a new and additional source of revenue for adaptation.

Under this framework, project developers establish Adaptation Benefits Supply Agreements, commonly referred to as off-take agreements, with purchasing organizations, which typically include development partners, impact investors, or corporations pursuing climate or corporate responsibility objectives. These buyers commit to compensating project developers for quantified adaptation benefits that are valued through approved methodologies, subject to independent verification, and certified as "Certified Adaptation Benefits" (African Development Bank, 2025). Revenues generated from these payments can be used to strengthen project cash flows, secure financing, and compensate investors that provide upfront capital, thereby enabling adaptation projects that would otherwise struggle to attract private investment (Afrik 21, 2023).

Since 2019, the ABM has been piloted across Africa under the coordination of the African Development Bank, which hosts the interim ABM Secretariat. By 2023, eight demonstration projects were operational, including climate-resilient cocoa production in Côte d'Ivoire and flood-mitigation infrastructure in Lagos, Nigeria. Approved methodologies also include cold-storage facilities for seed potatoes in Kenya and mobile flood-barrier systems in Madagascar (Naydenova, 2023).

The Natur'ELLES project is particularly well positioned to serve as a pilot under the African Development Bank's Adaptation Benefits Mechanism, establishing a precedent for ecosystem-based adaptation financing in West Africa. The project's capacity to quantify and verify reductions in flood risk, improvements in livelihoods, and enhanced resilience of coastal infrastructure aligns closely with the ABM's objectives.

Entry into the Adaptation Benefits Mechanism (ABM) would require the Natur'ELLES to follow the ABM activity cycle and documentation requirements. In practical terms, this would include: selecting an approved ABM methodology (or developing a new methodology for review and approval); preparing an activity design document/project design document that sets out the baseline, the adaptation benefits to be delivered, and the monitoring plan; securing any required host-country endorsement; completing validation through an independent validator (from the ABM system); and obtaining registration in the ABM registry. After implementation, the project would need to conduct ongoing monitoring and

reporting, undergo third-party verification, and then request certification and issuance of Certified Adaptation Benefits (CABs) into the registry. Finally, to monetize these benefits, the project would need to formalize engagement with outcome buyers through purchase or offtake arrangements for the CABs (African Development Bank, n.d.-2).

Box 2. Case study: Adaptation Benefits Mechanism in Côte d'Ivoire

Côte d'Ivoire dominates global cocoa production, accounting for 40% of worldwide output and generating 15% of national GDP (World Agroforestry, n.d.). However, the sector faces critical sustainability challenges including depleted soil fertility, cocoa swollen shoot disease, aging plantations, and inadequate agricultural practices, exacerbated by climate change impacts that increasingly threaten smallholder livelihoods (World Agroforestry, n.d.).

The Cocoa Livelihoods Resilience project, implemented by the World Agroforestry Centre (ICRAF), aims to enhance climate resilience among cocoa smallholder farmers in southwestern Côte d'Ivoire and three additional West African countries: Ghana, Togo, and Cameroon (World Agroforestry, n.d.). The project promotes sustainable, climate-resilient cocoa farming through agroforestry systems targeting zero-deforestation production (World Agroforestry, n.d.).

The project is designated as the first demonstration project in the African Development Bank's Adaptation Benefits Mechanism pilot phase, which enables valuation of agroforestry benefits for climate adaptation through transparent measurement, reporting, and verification methodologies (World Agroforestry, n.d.). The initiative includes national consultations and workshops with stakeholders, public and private sectors, NGOs, smallholder farmers, women's associations, and youth to raise awareness, strengthen climate adaptation capacities, and identify, monitor, and evaluate environmental, social, and economic benefits of agroforestry (World Agroforestry, n.d.).

The Cocoa Livelihoods Resilience project establishes a replicable model integrating nature-based infrastructure with rigorous benefit valuation and climate finance mechanisms, offering a transformative approach to farmers' resilience and agricultural adaptation across West Africa (World Agroforestry, n.d.).

2.8 Carbon Credits

To generate carbon credits, the Natur'ELLES project activities would need to be registered as a carbon project. Carbon projects exist within both the voluntary carbon market and compliance markets. Blue carbon (i.e., referring to carbon in marine and/or intertidal vegetation) projects can involve either conservation, afforestation/reforestation/revegetation (ARR), or improved resource management activities. Conservation projects target forests that are under significant threat of deforestation and/or degradation and aims to reduce these threats and the associated loss of carbon in the ecosystem. ARR projects target areas that either have been converted from forest to non-forest or are degraded, with project activities aiming to increase the carbon stocks of the landscape. Improved resource management projects target working or managed forests, meaning that legally recognized forestry activities occur within these forests. These projects aim to improve the forestry practices within these working forests and may achieve either emissions reductions and/or removals depending on the activities enacted.

To register a carbon project, a specific carbon standard and methodology must be selected. Each carbon standard and methodology contain rules and requirements for projects to follow, such as ensuring stakeholder engagement, legal and ownership requirements, rules on verifiable and conservative measurements, additionality (i.e., that the project activities would not occur without the financing provided by carbon credits), that benefits remain throughout and beyond the project lifetime, and that project boundaries, processes, and quantification methods and results are transparent. There are five different carbon standards (i.e., Verified Carbon Standard [VCS], the Gold Standard, Plan Vivo, Climate Action Reserve [CAR], and OxCarbon) and seven different methodologies that can be used to register a blue carbon project.

Carbon projects must go through a series of stages before becoming registered and generating carbon credits, a process that can take several years to complete. First a pre-feasibility assessment will be conducted to assess what the intended project activities are, whether there is a seemingly eligible area of interest (AOI), and if there are any insurmountable obstacles to developing a project. This assessment will result in a project idea note (PIN) concluding whether the project seems viable at this early stage. If it appears to be viable, the project can move on to the feasibility stage. A feasibility assessment involves a more in-depth analysis into all the components assessed at pre-feasibility. Key criteria include the specific standard and methodology applied, defining project activities, characterizing and investigating the potential AOI(s), assessing the baseline scenario (i.e., what would happen without a project), ensuring no major issues to additionality, assessing risks to the project's success, analyzing partner capacity and providing solutions to identified gaps, and conducting a financial viability analysis. If a project is deemed feasible it can move into project development. The goals of this stage are to work toward getting the actual project activities underway, get the project prepared for validation, and set the stage for monitoring, reporting, and eventual verification. Both validation and verification involve assessments of the project by approved third-party reviewers—or Validation and Verification Bodies (VVBs). At validation, VVBs assess that the project conforms to all the rules and requirements set out in the carbon standard and applied methodology. At verification, the VVB will assess whether the project activities and their associated benefits have been implemented and properly measured. Finally, to continue to earn carbon credits and to assess the other impacts (e.g., community- and biodiversity-related, and reversal events such as fires), projects must be continuously monitored by the project proponent. The impact measurements are evaluated at monitoring events by a VVB (similar to verification) to ensure the measurements were conducted properly, conservatively, transparently, and are in line with how they were proposed (at validation and verification).

Based on the proposed conservation and reforestation activities in the management units of the Natur'ELLES project, a high-level feasibility study was conducted by Tayo Climate Partners. Results of a spatial analysis and literature review indicate that dynamics in both Sine-Saloum and Casamance show historical net loss of mangroves pre-2000s—predominantly due to drought and hydrological changes—and net gains post-2000s, predominantly due to a recovery of precipitation levels. With existing blue carbon projects in Senegal all being focused on ARR activities, and the dynamics of mangroves over the past 50

years, the most viable pathway toward a blue carbon project is an ARR project, with the potential to include conservation activities in addition. Assessments of removals and reductions of carbon due to the proposed activities indicate a carbon project may be viable. Nonetheless, a more rigorous and complete feasibility assessment is required before being able to assess whether a new blue carbon project could begin moving into project development. Please refer to the High-Level Feasibility Report Activity 1223.2 by Tayo Climate Partners for more information on blue carbon projects and the feasibility of a project based on the Natur'ELLES activities.

As shown in Table 4, carbon credits are projected to generate a cumulative revenue stream of XOF 506.2 million over the 27-year project period, representing a complementary funding source for sustained operation and maintenance (O&M) activities. The carbon credit valuation is based on the quantification of carbon sequestration from the Sine-Saloum restoration sites, using key assumptions of 14.60 tonnes of CO_2 sequestered per hectare annually across 131 hectares of restored mangroves. These carbon sequestration figures reflect the substantial climate mitigation potential of mangrove ecosystems, which are among the most carbon-dense terrestrial ecosystems globally.

A carbon price of USD 30 per tonne of CO_2 (equivalent to XOF 557.29) was applied to calculate the total value of carbon credits generated through the restoration activities. This valuation reflects current market conditions for carbon credits in voluntary carbon markets, though market prices remain subject to fluctuation based on broader climate policy developments and international carbon trading dynamics. By monetizing the carbon sequestration benefits alongside payments for ecosystem services, the project establishes a diversified revenue structure capable of sustaining long-term project operations while simultaneously incentivizing private investment in mangroves conservation.

3.0 Cash Flow Analysis and Financial Sustainability Assessment

This section consolidates the project's costs (O&M and verification), revenue streams (outcome payments and carbon credits), and the loan component to assess the overall financial viability of the mangrove conservation project. Building on the outcome-performance thresholds introduced in the previous section, the analysis first presents the cash-flow profile under full achievement, and then tests resilience under the substantial, partial, and low achievement cases by scaling outcome-payment inflows accordingly.

The cash-flow analysis confirms that the project is financially viable under the proposed structure when outcomes are achieved at the level assumed in the SAVi-based projections. Under the full achievement case, the project generates an internal rate of return (IRR) of 7.44% per annum in real terms, driven by the combined contribution of outcome payments and carbon credits. This return level is consistent with the expectations of impact-oriented investors and development finance institutions, while remaining below purely commercial benchmarks. For reference, the Global Impact Investing Network reported that diversified impact fund portfolios achieved a net IRR of approximately 6.9%, indicating that returns in this range are consistent with impact investment performance (Global Impact Investing Network, 2015). Table 16 summarizes cumulative cash-flow results over the 27-year period under full achievement.

Over the project horizon, outcome payments (approximately XOF 4.9 billion) and carbon revenues (approximately XOF 506 million) together provide sufficient inflows to cover cumulative operating expenditures (approximately XOF 4.37 billion), verification costs, and all financing costs. The resulting cumulative net positive cash flow of approximately XOF 866 million indicates that the financing structure is able to support long-term conservation activities without relying on repeated grant replenishment.

Verification is a necessary condition for disbursement of outcome payments and therefore must be explicitly integrated into the financial plan. A World Bank note on Independent Verification in Results-Based Financing reports that the contract value for Independent Verification Agents in Global Partnership on Output-Based Aid projects typically ranges between 2% and 5% of total project funding (World Bank, 2012). Consistent with this evidence and to remain conservative, the analysis applies a flat 2% annual verification fee to the value of verified outcomes, resulting in total verification costs of XOF 92 million over the project period.

Table 16. Net cash flow after financing (discount rate 3.5%), full achievement

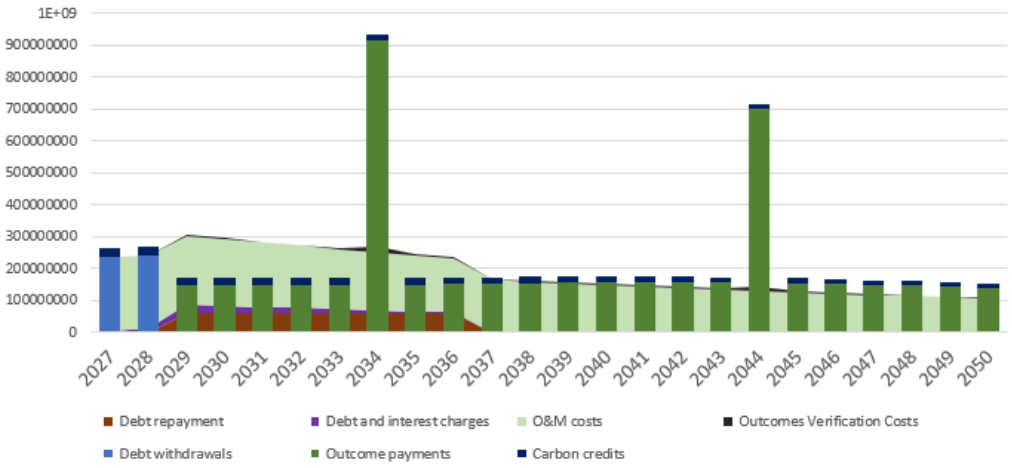
Expenditures	
O&M	4,368,415,279
Outcomes verification costs	92,194,453
Revenue streams	
Outcome payments (full)	4,957,495,399
Carbon credits	506,252,635
Debt financing	
Debt withdrawals	472,599,390
Debt fees and interest charges	136,572,245
Debt repayment	472,599,390
Net financial position	**866,566,057**

Source: Author.

Figures 8 and 9 present the projected cash-flow components from 2027 to 2050. The profile highlights early-year deficits driven by front-loaded O&M and the time required for restored mangroves to mature and generate measurable outcomes. These temporary deficits are covered through debt disbursements, allowing continuity of conservation operations while the outcome-payment framework is established (indicator definition, verification arrangements, and contracting with outcome buyers).

As outcomes increase over time and revenues stabilize, net cash flows turn positive, enabling the project to service principal and interest while maintaining annual O&M funding. Extending the disbursement period beyond the initial implementation phase is not considered feasible, as higher upfront borrowing would increase debt service beyond the project's repayment capacity and weaken overall financial viability.

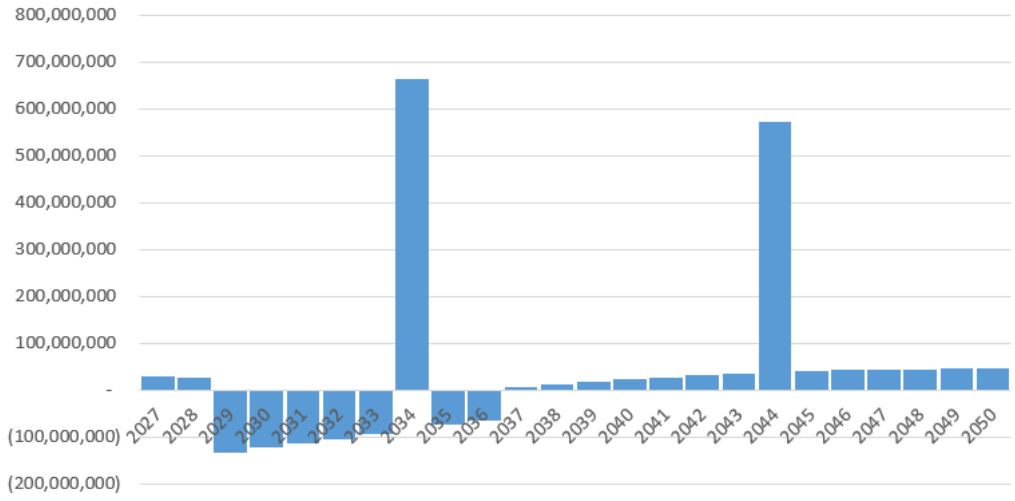
Figure 8. Cash flow analysis with outcome-based payments (full achievement) and carbon credits



Source: Author.

Figure 9 presents the project's total net cash flow over the period from 2027 to 2050, based on all projected inflows and outflows. Inflows include revenues from outcome-based payments and carbon credits, while outflows include debt repayments (principal), interest and related charges, verification costs, and annual operation and maintenance (O&M) expenditures.

Figure 9. Net cash flow after implementation and financing



Source: Author.

3.1 Deviations From Full Achievement

This section evaluates the resilience of the financing structure under partial underperformance, i.e., when verified ecosystem service outcomes fall short of the agreed

targets and annual outcome-based payments are reduced accordingly. The analysis tests whether the project can continue to meet its core financial commitments under different performance levels and quantifies the implications for cash-flow availability. In particular, it examines how reduced outcome revenues affect the project's ability to cover debt-related obligations (principal, interest, and financing fees), third-party verification costs, and annual O&M expenditures required to sustain conservation and ecosystem management activities. Importantly, underperformance is expected to be episodic, driven by climatic variability, implementation delays, or verification constraints, and is therefore more likely to affect specific years rather than persist at the same level throughout the project life.

Substantial achievement (75% to 99% of agreed targets)

When verified performance reaches between 75% and 99% of targets, annual outcome payments are scaled down proportionally. In most cases, revenues in this band remain sufficient to cover scheduled principal repayments and a large share of debt service costs, meaning overall repayment capacity remains broadly intact. However, depending on the exact shortfall and the timing of debt service peaks, some expenditure lines, typically O&M activities and, in some cases, verification-related costs, may face temporary funding gaps. Under this scenario, the model generally indicates that the project can remain financially functional without jeopardizing the repayment schedule, but may require short-term operational adjustments (such as rescheduling non-critical activities, drawing on reserves if available, or prioritizing core field interventions) to preserve outcome delivery in subsequent years. This band therefore represents moderate deviation from the expected performance pathway while maintaining a high likelihood that key financial obligations are met.

Partial achievement (50% to 74% of agreed targets)

When verified performance falls within the 50% to 74% range, outcome payments decline further and cash-flow pressure becomes more pronounced. In this band, the structure continues to protect scheduled principal repayment through the embedded minimum-payment logic, but the coverage of interest payments, financing fees, verification costs, and O&M becomes less certain and may only be partial in years of deeper underachievement. This is the range in which trade-offs become explicit: the project may need to prioritize debt repayment and essential conservation actions while temporarily reducing discretionary O&M expenditures or delaying certain activities. As a result, this band represents a meaningful stress case for the financial viability assessment, as it highlights where cost coverage begins to tighten and which budget lines are most exposed to performance-related revenue reductions.

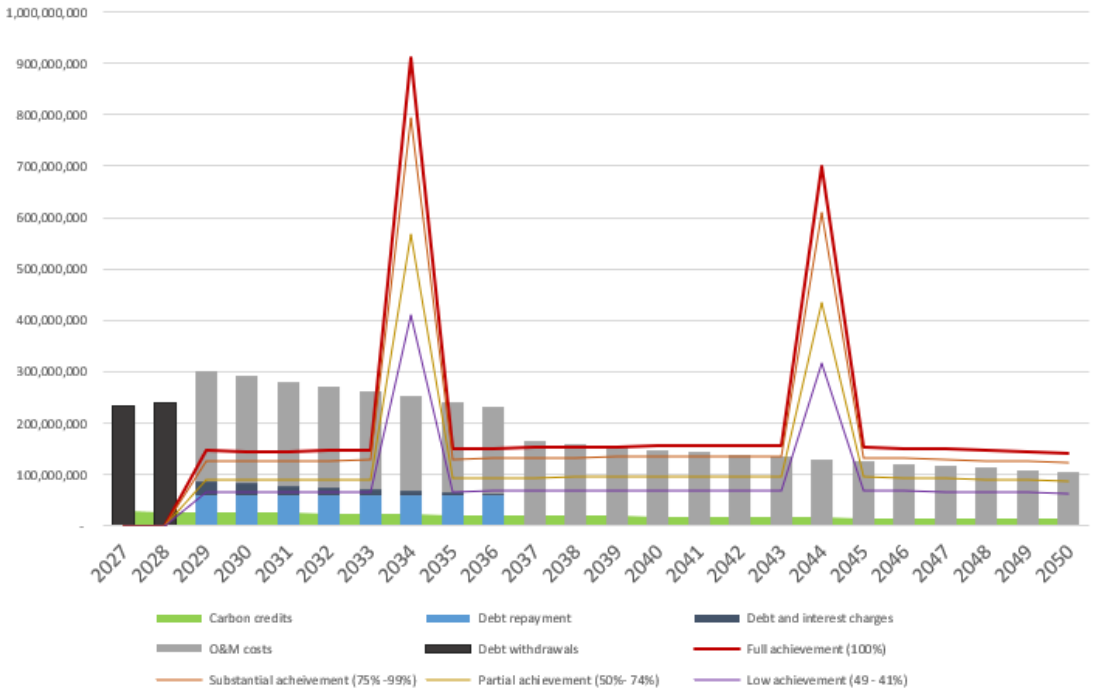
Low achievement (<50% of agreed targets) and minimum guarantee (41%)

If verified performance falls below 50%, outcome payments drop sharply and would normally be reduced to the lowest payment band. To safeguard investor capital and preserve the credit integrity of the instrument, the structure therefore includes a minimum payment commitment calibrated specifically to secure principal repayment during the debt amortization period. The minimum payment floor is set at 41% of the contracted annual

outcome payment, based on the most constrained repayment year. In practical terms, this means that even if verified ecosystem service performance is below the level that would typically trigger the "low achievement" payment, outcome buyers are still required to pay at least the floor amount. Payments therefore cannot fall below this guaranteed level during the repayment period, ensuring that principal repayment remains protected even in a severe underperformance year.

At the minimum floor, principal repayment remains fully secured; however, interest payments, financing fees, verification costs, and O&M expenditures remain contingent on performance above the floor and may not be fully covered in that year. This creates a clear and balanced risk allocation: investor principal is protected through the guarantee mechanism, while the full funding of operating costs and debt service beyond principal depends on verified delivery of ecosystem outcomes. In doing so, the structure preserves the incentive nature of the performance-based mechanism while strengthening investor confidence and reducing the risk of default driven by short-term ecological or operational shocks.

Figure 10. Outcome-based payments thresholds assessed against debt repayments, debt and interest charges and O&M



Source: Author.

Figure 10 shows how verified outcomes translate into available outcome payments and how these compare with the project's main cost components: principal repayments, interest charges, and annual O&M expenditures. The figure highlights that, under the low-achievement threshold, outcome payments remain sufficient to cover principal, ensuring investors recover their capital. However, interest and associated charges are not covered at

this level and remain payable only when higher performance thresholds are achieved. The low-achievement line (purple line) is set slightly above the principal requirement to also accommodate verification costs and a small margin for minor additional expenses.

3.2 Conditions for Viability

This analysis shows that the financing structure can remain viable over the long term if a few practical measures are put in place to protect cash flows and avoid interruptions in conservation activities during low-performance years.

- First, outcome payment contracts should be secured with buyers and designed to minimize payment delays. In practice, this means using clear KPI definitions, fixed verification and disbursement timelines, and, where possible, simple mechanisms such as pre-agreed payment windows so that payments arrive when debt service and operating costs are due.
- Second, the analysis indicates that principal repayment is safeguarded by the 41% minimum payment floor, but that interest, verification costs, and O&M expenditures become vulnerable under partial and low achievement scenarios. To manage this risk, the project should establish a modest liquidity buffer to cover these costs when outcome payments fall short. This could take the form of a debt service reserve and or an O&M contingency fund. The objective is to avoid reducing essential conservation spending in precisely the years when stronger field action is needed to restore performance.
- Third, verification should be credible but also efficient. Since verification costs and delays can worsen cash-flow stress under underperformance, the MRV system should be designed to reduce administrative burden while maintaining independence, for example, by combining periodic third-party audits with routine monitoring using standardized field protocols.
- Finally, the project should agree in advance on “priority spending rules” for low-performance years. These rules should specify which expenses are protected first (e.g., core conservation activities, minimum staffing, enforcement, and monitoring) and which can be postponed without undermining long-term outcomes. This makes financial management predictable and helps maintain ecosystem performance over time.

Overall, the analysis confirms that the structure is resilient in protecting principal repayment, but long-term sustainability, especially under Partial and Low achievement, depends on practical safeguards that keep operations running: outcome contracts, a modest contingency buffer, efficient verification, and clear budgeting rules for weaker years.

Box 3. Environmental impact bond (EIB) - Wildlife Conservation Bond (Rhino Bond)

This example illustrates an existing outcome-based mechanism in the conservation sector. While the Rhino Bond is structured as a bond issuance, rather than a loan as in the Natur'ELLEs project, it still provides a clear demonstration of how performance-linked outcome payments can create a predictable revenue stream for a project. In both cases, payments are tied to independently verified results, showing how outcome-based finance can mobilize upfront capital and repay financiers based on delivered conservation outcomes.

In March 2022, the World Bank issued the Wildlife Conservation Bond (Rhino Bond), a USD 150 million outcome-based bond designed to conserve endangered black rhinos in South Africa (World Bank, 2022). This instrument redirects investor capital toward biodiversity protection by linking financial returns to measurable conservation results rather than conventional coupon payments (World Bank, 2022).

The Rhino Bond diverges fundamentally from conventional bond structures. Bondholders do not receive periodic interest earnings; rather, the issuing institution (World Bank/IBRD) directs financial resources toward implementing rhino conservation projects across both protected areas. The bondholder compensation model operates on performance verification: if black rhino populations achieve targeted growth levels, as independently assessed by Conservation Alpha and third-party verified by the Zoological Society of London, investors receive an outcome-based performance payment at bond maturity alongside their principal repatriation. This payment originates from the World Bank (IBRD) utilizing grant funding from the Global Environment Facility (GEF). This financing architecture represents an innovative solution that reallocates conservation execution risk from traditional grant funders to market-based investment participants, enabling a transition from activity-based financing to results-based compensation mechanisms. Credit Suisse and Citibank jointly managed the structuring and placement of the bond offering. (World Bank, 2022).

Black rhino populations improved dramatically, with growth rates shifting from -3.70% in 2021 to +7.65% by 2023, exceeding the 4% target (Norad, 2025). Beyond population gains, the bond strengthened ecosystem management planning and environmental monitoring protocols across both parks (Norad, 2025).

The transaction generated local employment through expanded park workers, with increases in female conservation workers, and allocated approximately USD 150,000 for direct community interventions (Norad, 2025). Strengthened rhino habitats enhanced ecosystem services including water provision and pollinator habitat maintenance, supporting the local citrus industry (World Bank, 2022).

The Rhino Bond demonstrates that private sector capital can finance conservation outcomes at scale through robust measurement frameworks (independent calculation and third-party verification). This model has already inspired other projects, including a proposed Chimp Bond for Rwanda, establishing a replicable template for outcome-based biodiversity financing globally (Norad, 2025; World Bank, 2022).

4.0 Conclusions and Recommendations

This financial analysis indicates that mangrove conservation in Senegal can achieve long-term viability through an outcome-based financing instrument in which outcome payments and carbon credits serve as the primary revenue streams. Overall, the project shows that a structured financing mechanism can support debt repayment, debt service, and long-term conservation costs, but only under certain conditions. Its main strength lies in the significant economic value generated by a set of tangible mangrove ecosystem services, which creates a credible basis for future revenue generation and demonstrates that conservation can be linked to measurable financial outcomes.

The proposed structure also benefits from diversified revenues, combining outcome payments with carbon credits, which improves resilience compared with reliance on a single source of income. In addition, the loan helps address the timing mismatch between early financing needs and the slower materialization of ecosystem benefits. However, the project's viability remains limited in certain respects. Most importantly, it depends on a very high internalization rate of ecosystem service value into actual cash revenues, meaning that a large share of the benefits estimated in the analysis must be successfully converted into contractable, verified, and paid outcomes. This is a significant challenge in practice, given the complexity of securing committed buyers, establishing robust verification systems, and maintaining payment flows over time. The model is therefore viable, but not without material implementation risk: its success depends less on the existence of ecosystem value alone than on the strength of the institutional, contractual, and governance arrangements needed to monetize that value reliably over the long term.

Therefore, this section summarizes the main recommendations and practical next steps required to operationalize the financing structure and move toward implementation:

1. **Use this financial analysis to prepare lender and buyer documentation.** Translate the financial analysis into two short documents: a lender-facing term document (loan amount, tenor, grace, repayment schedule, pricing, reserve requirements, covenants) and a buyer-facing outcome contract term documents (KPIs by ecosystem service, targets, performance bands, payment levels, verification timelines, dispute process, and the minimum-payment floor logic). The goal is to move to negotiable terms that directly reflect the cash-flow and underperformance results already modelled.
2. **Engage lenders on the repayment profile and risk package (before final pricing).** Hold consultations with potential lenders (MDBs/DFIs and impact lenders) using the repayment schedule and thresholds outcomes (full, substantial/partial/low achievement). The discussion should focus on what lenders will require to be comfortable: minimum floor design, reserve accounts, disbursement conditions, and verification timing.
3. **Engage with outcome buyers on a portfolio of ecosystem services.** Apply the outcome-based payments values and bands to structure buyer discussions around

"what they are paying for" in simple terms (avoided damage, fisheries, agriculture, women's harvesting, job-days) and how payments adjust if outcomes are lower. Buyers can select outcomes aligned to their mandates, but the project should avoid relying on one buyer and one outcome stream. Diversification stabilizes revenues and reduces the risk that one weak KPI year destabilizes overall cash flow.

4. **Convert performance bands into contract-ready KPI clauses.** For each ecosystem service, the contract should clearly define: baseline, annual target, measurement method, verification frequency, and the exact threshold values for full/substantial/partial/low achievement. Where outcomes are influenced by external factors, include practical adjustment provisions (e.g., control sites, attribution rules, or force majeure clauses) so that the payment logic remains credible and enforceable.
5. **Add an operational continuity mechanism for O&M and verification in low-performance years.** Because the analysis shows O&M and MRV costs are most exposed under partial/low achievement, establish a practical buffer. This can be a small liquidity reserve funded upfront that is only used when performance drops below a threshold. This prevents the project from cutting essential conservation activities in the same years it needs them most to recover outcomes.
6. **Establish MRV mechanism and verification timelines that match cash-flow needs.** This analysis assumes payments arrive in time to meet debt service and operating costs. The next step is to agree a verification calendar and a maximum payment-disbursement window (e.g., payment within X days after verification). This is a contract detail, but it has major financial consequences. Where possible, align verification cycles with debt service due dates or build a short timing buffer through reserves.
7. **Create a policy enabling framework for an SPV with community governance and public oversight.** To operationalize the financing structure, a clear legal and institutional basis is needed for the SPV to receive outcome payments and carbon revenues, hold contracts, manage ring-fenced accounts, and apply the payment system transparently. Policy-makers should support the establishment of an SPV model that formally recognizes community participation across APAC and AMP sites through board representation and defined decision rights, while also providing an interface with the competent public authorities (including DAMP where applicable). Where some community-managed sites lack formal legal recognition, a practical solution is to enable representation through recognized umbrella entities, cooperatives, or a community trust structure that can hold rights and sign participation agreements on behalf of local groups. This policy step is essential to strengthen legitimacy, reduce fiduciary risk, and give outcome buyers and lenders confidence in long-term governance and cash-flow management.

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Appendix A. Further Results

Table A1. Summary table of integrated cost benefit analysis based on SSP scenarios, figures in billion discounted at 3.5%

Reduction in damage to infrastructure	Reduction in damage, 10%		Reduction in damage, 7.5%		Reduction in damage, 5%		Reduction in damage, 2.5%	
SSP scenario	**SSP5-8.5**	**SSP3-7.0**	**SSP5-8.5**	**SSP3-7.0**	**SSP5-8.5**	**SSP3-7.0**	**SSP5-8.5**	**SSP3-7.0**
Direct costs								
Construction costs	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Operational and maintenance costs	4.37	4.37	4.37	4.37	4.37	4.37	4.37	4.37
Total costs	**4.41**	**4.41**	**4.41**	**4.41**	**4.41**	**4.41**	**4.41**	**4.41**
Avoided costs								
Avoided damage to infrastructure	6.14	9.66	4.61	7.24	3.07	4.83	1.54	2.41
Avoided health related costs	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Added benefits								
Fishery revenue	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Agricultural revenue	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Seafood harvest revenue	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Drinking water supply	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Food supply	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
Water supply	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Job creation	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Carbon sequestration	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Total benefits & avoided costs	**14.02**	**17.53**	**12.48**	**15.12**	**10.95**	**12.71**	**9.41**	**10.29**

Reduction in damage to infrastructure	Reduction in damage, 10%		Reduction in damage, 7.5%		Reduction in damage, 5%		Reduction in damage, 2.5%	
KPIs								
Net present value (NPV)	**9.61**	**13.12**	**8.07**	**10.71**	**6.53**	**8.29**	**5.00**	**5.88**
Benefit-to-cost ratio (BCR)	**3.18**	**3.97**	**2.83**	**3.43**	**2.48**	**2.88**	**2.13**	**2.33**
Internal rate of return	**152%**	**199%**	**134%**	**170%**	**113%**	**139%**	**90%**	**104%**

Source: Author.

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