

Biodiversity financing and sustainable development in Morocco: Institutional frameworks, policy instruments, and pathways toward ecological sustainability

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ABSTRACT

Morocco has progressively integrated biodiversity conservation into its sustainable development agenda, recognizing natural capital as a strategic foundation for economic resilience and social stability. However, the country faces a persistent biodiversity finance gap that reflects a structural misalignment between policy commitments and effective resource mobilization. While global biodiversity financing needs are estimated at USD 722-967 billion annually, current global flows amount to only USD 124-143 billion, illustrating the scale of underinvestment. In Morocco, biodiversity-related expenditures remain fragmented, weakly traceable, and heavily reliant on international funding, limiting long-term planning capacity. This study provides a systemic analysis of the institutional, legal, and financial architecture governing biodiversity financing in Morocco. Using the biodiversity finance initiative methodology, it assesses existing financial flows, identifies structural bottlenecks, and examines policy instruments adapted to the national context, including biodiversity budget tagging, payments for ecosystem services, access and benefit-sharing mechanisms governing benefits derived from the utilization of genetic resources, and natural capital accounting under the SESA-EA framework. The findings highlight the need for improved budgetary transparency, ecological fiscal reform, strengthened inter-institutional coordination, and enhanced private-sector engagement. By positioning biodiversity finance as a macroeconomic and governance rather than as an environmental externality, the article proposes a pathway toward institutionalizing nature-positive public finance in Morocco.

Keywords: biodiversity financing, sustainable development, environmental governance, natural capital accounting, ecosystem services, environmental policy

INTRODUCTION

Biodiversity constitutes a strategic foundation of Morocco's development model, extending far beyond ecological preservation to sustain macroeconomic stability and sectoral productivity. Natural capital underpins agriculture, fisheries, forestry, tourism, and the blue economy while ensuring essential ecosystem services such as soil fertility, water regulation, pollination, and climate resilience (Brondizio et al., 2019; Reid, 2005). In 2022, the blue economy

represented approximately 3.8% of national gross domestic product (GDP) (MAD 46.2 billion), with coastal-based activities generating nearly 59% of total GDP (Haut-Commissariat au Plan [HCP], 2022). These figures illustrate that biodiversity degradation is not merely an environmental concern but a macroeconomic vulnerability affecting employment, food security, territorial cohesion, and long-term growth trajectories.

Despite this structural dependence, biodiversity financing in Morocco remains limited and insufficiently integrated into fiscal planning processes. National frameworks including the

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national biodiversity strategy and action plan (NBSAP) 2016–2020, the national strategy for sustainable development (NSSD), and the national charter for environment and sustainable development formally recognize biodiversity as a policy priority. However, implementation is constrained by weak budgetary traceability, fragmented institutional mandates, limited intersectoral coordination, and the absence of a comprehensive financing architecture (African Development Bank [AfDB], 2024; United Nations Development Programme [UNDP], 2023). The resulting disconnect between policy ambition and financial structuring reveals deeper governance shortcomings.

At the global level, the biodiversity finance gap has emerged as a central barrier to achieving conservation targets. Annual financial flows directed toward biodiversity are estimated at USD 124–143 billion, while projected needs range between USD 722–967 billion (Organisation for Economic Co-operation and Development [OECD], 2023a; Paulson Institute, 2020). The Kunming-Montreal global biodiversity framework, adopted at COP15 in 2022, explicitly recognizes this imbalance and calls for mobilizing at least USD 200 billion annually by 2030, with stronger emphasis on domestic resource mobilization and private sector participation (Convention on Biological Diversity [CBD], 2024). Although Morocco's precise financing needs remain to be fully quantified, the structural gap between national biodiversity commitments and traceable financial allocations reflects a similar pattern of underinvestment in natural capital.

Importantly, this gap cannot be understood solely as a shortfall in financial volume. In the Moroccan context, it reflects a systemic misalignment between institutional architecture, policy design, and financial flow structures. Institutional fragmentation reduces expenditure visibility and weakens accountability mechanisms; policy incoherence prevents biodiversity objectives from being embedded into sectoral investment planning; and the predominance of project-based and externally driven funding limits long-term predictability. These interacting dimensions reinforce one another, transforming what appears to be a funding deficit into a structural governance configuration problem.

Several domestic bottlenecks further constrain effective biodiversity financing. Public expenditures related to biodiversity are dispersed across sectoral ministries particularly water, agriculture, and fisheries and often embedded within broader environmental or rural development programs, limiting transparency and evaluability. Environmentally harmful subsidies persist in key sectors, potentially offsetting conservation gains (Landry et al., 2024; OECD, 2019). Governance arrangements remain fragmented across national, regional, and local levels, weakening coherence and accountability. Although international partners such as the Global Environment Facility (GEF), World Bank, and GIZ provide important support, reliance on external funding reduces financial sustainability and domestic ownership.

Meanwhile, innovative financial instruments including payments for ecosystem services (PES), green bonds, ecological taxation, and trust funds—are expanding globally but remain underdeveloped in Morocco due to regulatory gaps, limited impact measurement systems, and insufficient

institutional guarantees (Flammer et al., 2023; Karolyi & Tobin-de la Puente, 2023). International experience demonstrates that integrating biodiversity into macroeconomic planning through natural capital accounting (SEEA-EA), green budgeting reforms, and multi-stakeholder financing mechanisms can reorient fiscal priorities and enhance accountability (UNDP, 2025; Zabel et al., 2025). Biodiversity finance thus emerges as fundamentally an issue of public financial management and economic governance rather than a pure environmental policy domain.

Against this background, the core challenge is to determine how Morocco can overcome institutional, legal, political, and financial barriers that hinder the sustainable financing of biodiversity and enable its systematic integration into national economic planning frameworks.

This article advances the biodiversity finance literature by moving beyond descriptive diagnostics toward a systemic governance-centered analysis. First, it provides the first Morocco-focused, system-level assessment that integrates biodiversity expenditure tagging over a full budget cycle (2014–2024), institutional stakeholder mapping, and structured financial flow analysis within a unified analytical framework. Second, it reconceptualizes the biodiversity finance gap not merely as a quantitative shortfall between needs and resources, but as a governance configuration problem resulting from institutional fragmentation, policy incoherence, and misaligned financial incentives. Third, it develops and applies a comparative prioritization matrix that translates qualitative institutional evidence into a sequenced and operational reform pathway grounded in feasibility, political economy considerations, and macroeconomic integration. While several biodiversity finance initiative (BIOFIN) country reports have provided descriptive expenditure mappings, few studies have proposed a governance-centered reform sequencing framework anchored in institutional feasibility and fiscal architecture. By embedding biodiversity finance within macroeconomic governance and public financial management reform, this study addresses that gap and contributes an applied yet conceptually structured model for systemic transformation.

Methodologically, the study adopts the BIOFIN framework developed by the UNDP, combining systematic document review, qualitative stakeholder consultations, and quantitative expenditure tagging. Drawing on national budget data for the period 2014–2024, institutional diagnostics, and multi-criteria prioritization tools, the article develops an integrated assessment of Morocco's biodiversity finance architecture and proposes sequenced reforms aimed at strengthening transparency, coherence, and financial sustainability.

By positioning biodiversity finance within the broader domain of macroeconomic governance and fiscal modernization, the study contributes to ongoing debates on sustainable development finance in emerging economies and advances the understanding of biodiversity financing as a systemic institutional reform challenge rather than a sectoral spending issue.

MATERIALS AND METHODS

General Methodological Framework

This study adopts an integrated methodological approach combining systematic document review, qualitative field investigations, and quantitative assessment of financial flows, in line with the methodological standards of the BIOFIN (2024) developed by the UNDP.

This mixed-methods design (Creswell & Plano Clark, 2018) enables a holistic understanding of the institutional and political dimensions of biodiversity financing, linking them to their fiscal and economic translation.

The central objective is to diagnose the drivers of Morocco's biodiversity finance gap, evaluate existing mechanisms, and propose innovative solutions to enhance financial sustainability.

The analytical process followed four sequential and interconnected steps, inspired by the BIOFIN reference framework:

1. Analysis of the legal, political, and institutional frameworks
2. Assessment of public and private financial flows
3. Prioritization of innovative financing mechanisms
4. Validation and triangulation of results

This iterative process ensures analytical robustness, consistency, and transferability of findings.

Analysis of Legal, Political, and Institutional Frameworks

The first step was to identify the legal, strategic, and organizational foundations of biodiversity financing in Morocco.

A systematic review of legal and regulatory texts (Booth et al., 2016) was conducted using documents from the official bulletin and institutional portals. The review included

- law 29-05 on protected areas,
- law 81-12 on the coastal zone,
- law 99-12 on the environment and sustainable development,
- law 36-15 on water,
- law 28-00 on waste management, and
- law 12-03 on environmental impact assessments.

These laws were analyzed based on their integration of economic and financial instruments such as taxes, fees, dedicated funds, and ecological incentives (OECD, 2019; World Bank, 2021).

Additionally, Morocco's international commitments were reviewed, particularly its alignment with the Kunming-Montreal global biodiversity framework adopted under the CBD, as well as with the strategic guidance stemming from decision 16/34, through which the conference of the parties adopted the resource mobilization strategy for the period 2025-2030. The implementation of the CBD and Morocco's nationally determined contributions (NDCs) under the Paris agreement were also examined. This international positioning highlights Morocco's engagement within global sustainable

finance agendas, in line with the work of OECD (2023a) and Paulson Institute (2020).

The institutional governance analysis relied on a functional stakeholder mapping (Freeman, 2010; UNDP, 2023) across four categories:

1. Strategic planning and coordination
2. Sectoral implementation
3. Budget management and financing
4. Technical and scientific support

This mapping enabled identification of overlapping mandates, coordination gaps, and governance bottlenecks affecting biodiversity finance.

Data Collection and Financial Flow Analysis

The second phase involved quantifying and evaluating biodiversity-related financial flows between 2014 and 2024.

The period 2014-2024 was selected for several complementary reasons. From a methodological perspective, it corresponds to the timeframe during which budgetary documentation and finance laws are most coherent and accessible, allowing for systematic coding of expenditures and reliable comparisons across ministries and programs. It also encompasses the implementation of the NBSAP 2016-2020 and subsequent political cycles, providing an opportunity to assess how biodiversity objectives have been translated into concrete budget allocations. The final year, 2024, represents the most recent cycle for which consolidated fiscal and institutional information could be analyzed, while offering sufficient temporal depth to identify structural trends rather than short-term fluctuations. This period additionally aligns with key international milestones, including the implementation of the aichi biodiversity targets (2011-2020), the adoption of the sustainable development goals in 2015, the Paris agreement on climate change, and the global biodiversity framework, while also encompassing significant national reforms, particularly Morocco's 2015 financial constitution and the progressive reform of the organic law on finance, which have strengthened the quality, traceability, and governance of public finances in the country.

Primary data were gathered through

- (1) semi-structured interviews with 34 key stakeholders (ministries, financial institutions, local authorities, and NGOs), following the theoretical saturation method (Guest et al., 2020) and
- (2) structured bilateral consultations using validated interview guides reviewed by a scientific advisory board

Secondary data were sourced from annual finance laws and sectoral budget reports (HCP, 2022; Ministry of Economy and Finance of Morocco [MEF], 2023).

A budget tagging analysis based on BIOFIN (2024) methodology identified direct and indirect public expenditures related to biodiversity.

Budget lines were classified into direct biodiversity expenditures, indirect biodiversity-relevant expenditures, and enabling/governance expenditures following BIOFIN tagging principles.

When budget lines covered multi-purpose programs (e.g., water and rural development), a conservative attribution coefficient was applied based on program objectives, activity descriptions, and interview validation, to avoid overestimation.

Where detailed disaggregation was unavailable, estimates were triangulated using finance law annexes, sectoral reports, and stakeholder interviews, and cross-checked for consistency.

To reflect classification uncertainty, results were consolidated using a bounded approach (minimum-maximum) for lines requiring partial attribution, and the narrative focuses on robust structural patterns observed across bounds.

International funding flows were documented when traceable through official project/portfolio sources and interviews; when not traceable, they were reported qualitatively as a dependence factor rather than merged into national expenditure totals.

Special focus was placed on environmentally harmful subsidies and environmental revenues to assess alignment between public spending and conservation goals (OECD, 2019; World Bank, 2021).

Identification and Prioritization of Innovative Financial Mechanisms

The third phase focused on identifying and prioritizing innovative financial instruments capable of addressing Morocco's biodiversity finance gap.

The process leveraged the global BIOFIN catalogue of financial solutions (BIOFIN, 2024; UNDP, 2023). Over 40 instruments were reviewed, including

- PES (Cortés et al., 2021; Wunder, 2015),
- earmarked ecological taxation,
- biodiversity trust funds,
- regulatory ecological compensation, and
- sovereign green bonds (Flammer et al., 2023)

Each mechanism was assessed using a multi-criteria matrix adapted from BIOFIN and OECD (2023b) guidance, with the following criteria:

1. Strategic alignment with national policies (NBSAP, NSSD, NDC)
2. Potential to mobilize new financial resources
3. Legal and institutional feasibility
4. Political and social acceptability
5. Financial viability and sustainability

This comparative evaluation led to the prioritization of six core mechanisms for Morocco, including PES, earmarked ecological taxes, and a multi-stakeholder biodiversity trust fund.

Validation and Triangulation

The final phase applied data triangulation techniques to ensure internal validity of results (Denzin, 2012).

Insights from the document review, expert consultations, and financial analysis were systematically cross-verified to

(1) confirm coherence between institutional perceptions and budget realities and

(2) Validate financial flow estimates.

Strengthen the reliability of policy recommendations.

RESULTS

Divergence in GDP Trajectories: A Signal of Structural Vulnerability and a Constraint on Growth

A diachronic analysis of Morocco's economic aggregates reveals significant heterogeneity in sectoral performance, underscoring a structural vulnerability that this article aims to highlight.

During the study period (2014–2023), overall GDP followed a robust growth trajectory, driven largely by industrialization and expansion in the services sector. However, sectors inherently dependent on natural capital such as agriculture, forestry, and fisheries exhibited a markedly different pattern, characterized by sluggish or stagnant growth.

For instance, the GDP of the agriculture and forestry sector fluctuated between 100 and 130 billion MAD, without displaying the linear upward trend observed in the national GDP. This divergence is not incidental; it directly reflects unmitigated anthropogenic pressures and increasing sensitivity to exogenous shocks, particularly recurrent droughts exacerbated by climate change.

This economic decoupling demonstrates that biodiversity loss is not a marginal external cost, but rather an endogenous constraint on macroeconomic performance. It calls for a reorientation of investment policies, recognizing the preservation of natural capital as a cornerstone of long-term economic resilience and security. **Figure 1** provides empirical support for this argument, offering quantitative justification for urgent reform in financial allocation.

The observed divergence suggests that biodiversity- and climate-sensitive sectors face a structural productivity constraint. This supports the argument that biodiversity financing is not a peripheral environmental expense but a macroeconomic resilience investment. In fiscal terms, underinvestment in ecosystem maintenance increases vulnerability costs (e.g., drought-related output volatility), thereby strengthening the case for reorienting public allocations toward natural capital preservation. In this study, **Figure 1** is used as an empirical signal of exposure: it highlights that the sectors most dependent on ecosystem services display weaker and more volatile trajectories over the period, consistent with the macroeconomic transmission channel of environmental degradation through climate shock sensitivity.

Integration of Biodiversity into National Policies and Strategies and the Budget Allocation Imbalance of NBSAP

A review of Morocco's key strategic documents reveals a genuine awareness of biodiversity issues; however, this awareness remains insufficiently operationalized. In general, high-level strategies focused on sustainable development (e.g., NSSD) or sector-specific acknowledge the importance of

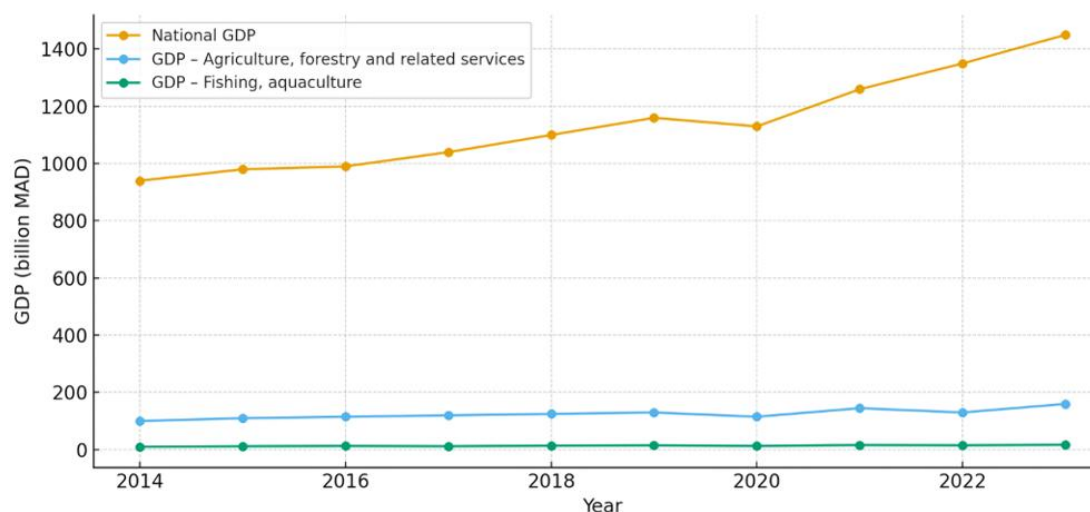


Figure 1. Evolution of the national GDP, agricultural GDP, and fisheries sector GDP between 2014 and 2023 (Source: Authors' own elaboration, based on data from Haut-Commissariat au Plan (HCP, 2022-2024))

preserving ecosystems and sustainably managing natural resources. Nevertheless, these environmental considerations are often mentioned in broad terms and are not accompanied by quantified targets or clearly defined financing mechanisms for biodiversity.

For instance, the NSSD 2030 and the New Development Model (2021) emphasize the need to integrate natural capital into growth strategies, yet neither establishes a dedicated budget for biodiversity. As a result, biodiversity concerns are dispersed across multiple strategic axes (e.g., sustainable agriculture, water management, and climate action), without any substantial or earmarked financial allocation. This fragmented integration directly leads to limited effective funding for biodiversity within the implementation of these plans and programs.

Our analysis thus underscores the need to make biodiversity-related objectives more explicit in public policies, for example, by defining clear targets (e.g., hectares restored and species protected) supported by monitoring indicators in order to secure resource mobilization that reflects the scale of the challenges. A striking case is the NBSAP (2016-2020), which served as Morocco's national roadmap for biodiversity over the past decade.

The evaluation of its implementation, conducted as part of this study, reveals several key insights. Qualitatively, the NBSAP was instrumental in identifying national biodiversity priorities and in raising awareness among sectoral stakeholders. However, from a financial standpoint, the NBSAP suffered from a significant imbalance in resource allocation across its strategic axes. Approximately 74% of the total NBSAP budget was allocated to ecosystem and species conservation actions, while essential cross-cutting components were underfunded: only 1.9% of the budget went to governance (institutional strengthening), 3.2% to scientific knowledge management, and 5.1% to environmental education and awareness.

This underfunding of cross-cutting actions constrained the long-term effectiveness of the plan, since successful conservation efforts also rely on a supportive institutional environment, enhanced technical capacities, and informed

public engagement. Moreover, the NBSAP was initially designed with a five-year horizon, which proved too short to initiate and consolidate deep and lasting changes. Several projects were unable to be completed or have their impacts sustained within such a limited timeframe.

Given these findings, it is strongly recommended that the forthcoming national biodiversity strategy adopt a longer-term framework (at least 10 years) and rebalance budget allocations across strategic axes. Concretely, this entails increasing the share of resources dedicated to cross-cutting areas (governance, knowledge, awareness), while maintaining significant investment in direct conservation. This financial imbalance reflects a fragmented vision of biodiversity challenges, where conservation is treated in isolation rather than as a cross-cutting objective requiring a conducive institutional, legal, and societal framework. Reforming the future strategy must necessarily involve adopting a more holistic and balanced investment model, as illustrated by the reallocation proposed in [Figure 2](#).

The recommended adjustment in [Figure 2](#) was derived using a normative correction approach combining the observed NBSAP baseline allocation and functional requirements for implementation effectiveness. Cross-cutting enabling functions (governance, knowledge, awareness) were identified as binding constraints based on BIOFIN/OECD guidance and corroborated by stakeholder consultations, while maintaining a strong allocation to core conservation actions. The proposed shares therefore represent a structured rebalancing scenario aimed at improving implementation continuity and accountability rather than an arbitrary redistribution.

The NBSAP allocation pattern indicates that Morocco's biodiversity policy has prioritized field conservation actions while structurally underinvesting in enabling conditions (governance, knowledge, awareness). This creates a recurrent implementation trap: projects may start, but system capacity to coordinate, learn, and sustain results remains weak. [Figure 2](#) therefore does not merely propose a technical reallocation; it operationalizes a shift toward systemic effectiveness.

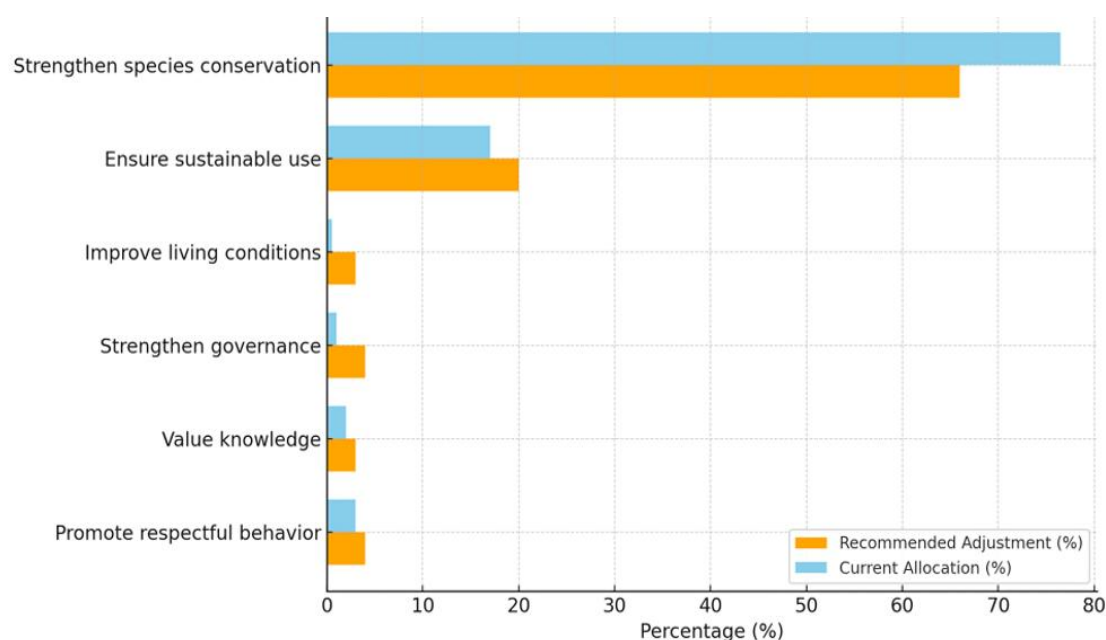


Figure 2. Comparison between the current budget allocation of NBSAP and the recommended adjustments by strategic axis (Source: Authors' own elaboration, based on NBSAP (2016-2020) implementation assessment data)

Institutional Fragmentation, Budgetary Opacity, and the Effectiveness of Public Spending

The institutional analysis reveals a fragmented governance framework for biodiversity in Morocco, which undermines the overall efficiency of mobilized financial resources. Several institutions hold partially overlapping mandates concerning the conservation and use of natural resources. For instance, forest and wildlife management fall under the responsibility of the National Agency for Water and Forests, while the department of sustainable development (DSD) is tasked with drafting biodiversity strategy, and the Ministry of Agriculture concurrently leads agro-environmental programs. Similarly, marine biodiversity is managed by the department of fisheries, whereas agrobiodiversity falls under the remit of the Ministry of Agriculture.

This multiplicity of actors leads to fragmented responsibilities and, at times, duplication or inconsistency in the actions taken. For example, biodiversity monitoring and inventory activities suffer from a lack of coordination: multiple entities including observatories, research institutes, and NGOs collect biodiversity data, but these datasets are rarely shared, preventing the development of a comprehensive overview that could guide financing toward the most critical needs.

Structurally, there is indeed a national commission on sustainable development, chaired by the head of government, and a national sub-commission on biodiversity, led by the DSD. However, these inter-ministerial bodies remain largely inactive and have not fully fulfilled their intended roles of strategic oversight and coordination.

This institutional fragmentation translates directly into the financial sphere, creating a problem of budgetary opacity. National funding is distributed across sectoral programs (e.g., dam management and locust control) without being traceable through a dedicated "biodiversity" budget line.

The absence of budget tagging makes it impossible for policymakers or researchers to assess the actual amounts allocated to biodiversity conservation.

This inability to quantify the national financial effort has two major academic and policy implications:

1. It hinders the ability to demonstrate the need for increased biodiversity budgets due to the lack of solid reference data.
2. It impedes public accountability and the effective monitoring of biodiversity-related expenditure.

Addressing this issue requires not only strengthening inter-agency coordination through the operationalization of the biodiversity sub-commission (as referenced in [Table 1](#)) but also institutionalizing green budgeting practices within the MEF. Introducing such mechanisms is essential to enhance transparency, track biodiversity spending, and align resource flows with strategic conservation priorities.

[Table 1](#) highlights that fragmentation is not only an institutional issue but a financial transmission problem. Overlapping mandates and weak coordination reduce the visibility of biodiversity expenditures, which in turn weakens the ability to plan, justify, and scale financing. This creates a self-reinforcing cycle: opacity limits accountability, accountability limits reform, and reform delays keep financing dependent on externally driven projects rather than domestically structured budget programs.

Dual Financial Vulnerability: Non-Permanent International Funds and Absence of Incentive Framework for the Private Sector

An analysis of Morocco's biodiversity finance landscape reveals a dual structural vulnerability that undermines the long-term sustainability of national action.

Table 1. Institutional actors in biodiversity governance and financing in Morocco: Mandates and potential roles in conservation and biodiversity funding

Actors	Mandates	Comments on links to biodiversity financing
Actors involved in strategic planning, policy steering, and budget programming		
DSD	Coordinates national environmental policies. Serves as the national CBD focal point and leads the NBSAP.	Responsible for the national biodiversity strategy but lacks direct control over financial resources. Has potential to strengthen its key coordination role in resource mobilization.
National biodiversity sub-commission	Multi-sectoral body established by decree. Responsible for monitoring the implementation of the NBSAP. Its functioning remains irregular and operationally weak.	Has potential to serve as a coordination mechanism for intersectoral biodiversity budgeting, provided its mandate and capacity are strengthened.
MEF	Leads budgetary, fiscal, and public expenditure policy.	Strategic actor for integrating biodiversity into budget frameworks and implementing green budgeting practices. Its role in this area remains underutilized.
Actors responsible for sectoral implementation		
Ministry of Agriculture, Maritime Fisheries, Rural Development, and Water and Forests (including NAWF, ADA, ANDA, department of fisheries)	Leads agricultural, forestry, rural, fisheries, and aquaculture development policies. Manages sectoral programs and subsidies.	Manages significant public budgets with direct impacts on ecosystems. Currently, biodiversity-related expenditures lack clear traceability.
Ministry of the Interior/Directorate General for Local Authorities	Oversees local governments and territorial governance.	Has the potential to direct investment programs and intergovernmental transfers towards biodiversity-related actions.
Local governments/territorial collectivities	Manage local development programs (e.g., regional development plans and territorial action plans) and have competencies in environmental management.	Their financial resources are limited. Require technical support and adapted co-financing mechanisms. There is a need to localize the NBSAP and ensure alignment with other sectoral actions at the territorial level.
Financial actors (banks and regulators)		
BAM	Supervises the banking sector. Has initiated a policy dialogue on green finance.	Can play a structuring role in integrating biodiversity-related risks into banking portfolios. Its emerging role needs to be formalized and strengthened.
Commercial and investment banks (e.g., Attijariwafa Bank and CDG Capital)	Provide private financing, loans, and responsible investment services.	Can develop green financial products (loans, investment funds, and PPS) focused on biodiversity.
AMMC	Regulates capital markets, bonds, and sustainable financial instruments.	Supports the issuance of green, social, and sustainable bonds that can be aligned with biodiversity objectives.
Support actors (research institutions, NGOs, and non-financial private sector)		
Civil society organizations/environmental NGOs	Implement local projects in awareness-raising, conservation, and ecosystem restoration. Key advocacy actors. Also lead funded community-based initiatives.	Mobilize international funding but have limited access to domestic financing mechanisms.
Research institutes (INRA, INRH, IAV, INRS, and universities)	Produce scientific knowledge to inform public policies and sustainable practices, especially concerning biodiversity assessment and conservation.	Indirect contributors to financing through the provision of strategic data. Very limited involvement in budget allocation processes.
Non-financial private sector (industry, tourism, energy, etc.)	Can invest through CSR or voluntary environmental compensation schemes.	Emerging role in project co-financing and PPPs for biodiversity impact.

Firstly, international financing which constitutes a major resource for biodiversity conservation and restoration initiatives in Morocco remains sporadic and non-permanent. It serves as a partial substitute for insufficient national funding. Morocco's international biodiversity finance landscape is primarily composed of resources mobilized through multilateral institutions, global environmental funds, and bilateral cooperation. Key external financial actors include the GEF, Green Climate Fund, World Bank, AfDB, European Union, European Investment Bank (EIB), and bilateral partners such as Germany (GIZ and KfW) and France (AFD).

Although these resources are valuable for launching pilot projects such as integrated water resource management, forest and coastal ecosystem restoration, or support for regional resilience initiatives against desertification there is an inherent risk that they may abruptly cease after the funding

period ends, leading to the discontinuation of initiatives due to a lack of national follow-up. Additionally, the multiplicity of donors, each with its own agenda, introduces a risk of fragmentation and misalignment with Morocco's national priorities. This strong dependency underscores the urgent need for stronger national planning particularly through the future NBSAP 2025-2035 to ensure that external funds complement, rather than substitute, domestic resources.

Secondly, this fragility is worsened by the critical under-mobilization of the national private sector. Moroccan companies still poorly integrate biodiversity into their corporate social responsibility (CSR) strategies, largely due to the absence of a strong regulatory and incentive framework (e.g., binding green finance labels or mandatory ecological compensation mechanisms). The lack of functioning market instruments (e.g., PES) or effective public-private partnerships

(PPPs) hampers private capital engagement. While some promising signals have emerged such as Bank Al-Maghrib's (BAM) directive no. 5/W/21, encouraging banks to disclose environmental and climate-related risks (aligned with TCFD), and a slow integration of ESG criteria in credit risk assessments these remain limited cases.

As a result, the financial burden of biodiversity conservation falls almost entirely on public funding, reinforcing the imperative to create a conducive regulatory and incentive environment to redirect private capital toward natural capital protection and enhancement.

This dual vulnerability indicates that Morocco's priority is to stabilize domestic financial architecture (budget coding/tagging, coordination, incentive reform) before expecting durable private mobilization. This logic directly informs the sequencing proposed later in the prioritization matrix (phase I governance tools and phase II mobilization instruments).

Green Finance and Emerging Financial Innovations

In recent years, Morocco has launched several initiatives to develop green and sustainable finance, primarily within its climate and energy agenda. However, until recently, these efforts have been largely focused on climate change mitigation (emission reductions and energy transition), to the detriment of biodiversity.

For instance, Morocco inaugurated its green bond market in 2016 with a 1.15 billion MAD issuance by MASEN to finance solar farms, followed by similar issuances by commercial banks. However, these funds primarily supported renewable energy projects. Similarly, concessional credit lines established with international institutions (EIB, AFD, and EBRD) have been largely allocated to energy efficiency and industrial decarbonization, with very few projects explicitly focused on biodiversity or ecosystem conservation.

The upcoming Moroccan carbon market, currently in development, also remains focused on CO₂ emission compensation and does not yet integrate ecosystem service valuation mechanisms such as carbon credits for biological sequestration in forests or soils.

This climate-centric allocation creates a financial lock-in that restricts the effectiveness of nature-based solutions and increases dependency on public budgets. Despite this, there are emerging signals of progress. Morocco's financial regulators particularly BAM and the Moroccan Capital Market Authority (AMMC) have begun to incorporate broader environmental risk frameworks, potentially including biodiversity.

For example, BAM's 2021 directive no. 5/W/21 requires banks to assess and disclose environmental and climate-related risks in their portfolios. While currently aligned with climate-focused frameworks like TCFD, it creates a precedent for the future integration of nature-related risks (e.g., via the taskforce on nature-related financial disclosures [TNFD]). Such a framework could encourage banks to account for biodiversity impacts when evaluating projects e.g., avoiding loans for destructive developments in sensitive areas or requiring compensatory measures.

In 2022, BAM co-organized a national conference on biodiversity finance, demonstrating growing interest within the financial sector. Furthermore, the MEF included in its climate finance strategy 2030 the goal of promoting innovative financial instruments that could potentially include nature-positive investments.

Prioritization of Biodiversity Financing Mechanisms

This section constitutes the prescriptive core of the study. It presents a selection of financing mechanisms that have been assessed using a multi-criteria evaluation, including market-based instruments (e.g., carbon credits and green bonds), institutional reforms (e.g., budget coding and natural capital accounting), and fiscal tools (e.g., removal of harmful subsidies and ecological taxation).

The objective is not to provide an exhaustive list, but to prioritize mechanisms that are relevant, realistic, and strategically aligned with national circumstances. The prioritization is based on five core structural criteria, consistent with BIOFIN methodological guidelines, complemented by implementation timeframe as a sequencing variable used for comparative visualization:

1. **Strategic alignment:** The mechanism should directly support national priorities outlined in key strategic documents (e.g., NSSD, NBSAP, forest strategy 2020-2030, generation green strategy, national adaptation plan, and updated NDC).
2. **Value added to the current finance landscape:** It should address a clear financial gap such as lack of incentives, underfunding, poor access to funds, or low traceability of financial flows.
3. **Capacity to mobilize additional resources:** The mechanism must demonstrate the ability to generate new funding, attract international finance, or leverage private co-financing.
4. **Institutional feasibility:** It should build on existing institutions, legal frameworks, and technical capacities that are currently available or can be strengthened in the short to medium term.
5. **Political and social acceptability:** The mechanism must be acceptable to key stakeholders, aligned with territorial equity, and compatible with local capacities and operational realities.

While these five criteria capture the structural dimensions of relevance, feasibility, and impact, implementation timeframe is treated as an additional operational variable. It reflects the expected temporal complexity and reform horizon of each mechanism and is incorporated in the radar visualization ([Figure 3](#)) to support sequencing logic rather than to redefine the core evaluative framework.

Applying these criteria has allowed the identification of high-potential mechanisms, based on environmental, social, and financial viability.

The following section provides a comparative grid positioning each mechanism against these five dimensions. This aims to support evidence-based decision-making and the development of a coherent and prioritized portfolio of innovative biodiversity finance instruments for Morocco.



Figure 3. Comparative radar chart of five biodiversity financing mechanisms in Morocco, evaluated across six strategic criteria: strategic alignment, financial response, resource mobilization potential, institutional feasibility, political and social acceptability, and implementation timeframe (Source: Authors' own elaboration, based on BIOFIN methodology and stakeholder consultation results)

This is not a final prioritization, but rather a comparative reading framework intended to guide upcoming multi-stakeholder consultations. A formal national validation process may follow.

To construct the comparative matrix (Table 2), instruments were assessed against the five core structural criteria using an ordinal scoring scale applied consistently across dimensions. For the radar chart (Figure 3), implementation timeframe was incorporated as an additional sequencing variable to reflect temporal feasibility alongside structural performance.

Scores were assigned through document-based evaluation (legal and policy readiness, institutional mandates, and fiscal feasibility) and then cross-checked through stakeholder consultations to reduce single-source bias. The resulting scores were normalized to enable graphical comparison; the purpose is structured prioritization and sequencing rather than predictive measurement precision.

The matrix and radar chart are designed to translate qualitative findings into an actionable portfolio. They should be read as a sequencing tool: first to fix traceability and incentives (governance reforms), then to scale resource mobilization (market and blended instruments).

The interpretation of the prioritization matrix highlights a two-step approach: initially prioritizing governance and transparency mechanisms, followed by the activation of high-potential financial mobilization levers.

Biodiversity financing in Morocco cannot rely on a single instrument. Priority must be given to the structuring of the budgetary and regulatory framework (phase I) before the full deployment of market-based instruments (phase II). This progressive and realistic strategy aims to maximize the return on reform investments by strengthening governance and transparency, while laying the foundation for broader and more sustainable private sector resource mobilization.

This entire prioritization process must be embedded within a national biodiversity finance roadmap, aligned with the upcoming NBSAP, and led through an institutional and participatory process.

DISCUSSION

The evaluation of Morocco's biodiversity finance system presented in this study provides findings with strong analytical and policy relevance. Discussing these results allows them to be placed in a broader perspective of environmental governance, budgetary efficiency, and economic transformation. By intersecting the lessons from the Moroccan case with international practices and reference frameworks, this section aims to clarify the structural implications and priority reform levers. The objective is to show that the empirical findings established do not represent a static

Table 2. Assessment of financial mechanisms according to BIOFIN criteria–Preliminary evaluation

Mechanism analyzed	Strategic alignment	Response to financial need	Potential for resource mobilization	Institutional feasibility	Political and social acceptability	Implementation timeline/effects
Benefit-sharing from genetic resources (ABS)	High (international commitments)	Medium (new revenue streams)	Medium (depends on private sector engagement)	Low to medium (requires finalized legal framework)	Medium (must ensure equity for communities)	Medium to long term
TNFD	Medium (sustainable finance/green taxonomy)	Low (indirect: risk mitigation)	Low (indirect: secures investments)	Medium (depends on financial sector and regulators)	Medium	Medium term (voluntary)/long term (regulatory)
Reform of harmful biodiversity subsidies	High (policy coherence)	High (reallocates existing public expenditure)	High (large subsidy volumes)	Medium (requires strong inter-ministerial coordination)	Low (politically sensitive)	Medium to long term
Creation of a “biodiversity” budget code	High (traceability and efficiency)	Low (monitoring tool, not a revenue generator)	Low (indirect: improves budget allocation)	High (linked to ongoing green budgeting)	High (transparency)	Short term
Natural capital accounting integration	High (long-term economic vision)	Low (measurement tool, not revenue-generating)	Low (indirect: supports investment justification)	Medium (requires coordination between HCP and technical ministries)	Medium	Long term
PES	High	High	Medium	Medium	Medium	Medium term
Biodiversity trust fund	High	High	High	Low	Medium	Long term
Green bonds with biodiversity components	Medium	Medium	High	Medium	Medium	Medium to long term
Earmarked ecological taxation	High	High	High	Medium	Low to medium	Long term
Carbon credits/NbS	High	High	High	Medium	Medium	Medium term
Regulatory ecological compensation	High	High	Medium	Medium	Medium	Short to medium term
Ecotourism fees/protected area revenues	Medium	Medium	Low to medium	High	High	Short term

Note. (1) High-feasibility governance instruments (biodiversity budget code: green budgeting) are immediate enablers of transparency and inter-ministerial accountability; (2) Subsidy reform and earmarked ecological taxation have the highest fiscal leverage but require strong political management; (3) resource-mobilization instruments (trust fund, green bonds with biodiversity components, NbS credits) become more credible once traceability, MRV, and institutional coordination are established

snapshot but call for a systemic overhaul of the financial and institutional architecture dedicated to biodiversity.

Systemic Implications of the Results

The empirical findings presented before reveal three interrelated systemic implications that extend beyond descriptive diagnostics and call for structural transformation of Morocco’s biodiversity finance architecture.

First, a macroeconomic implication emerges from the divergence patterns identified in **Figure 1**. The slowdown observed in climate- and ecosystem-dependent sectors compared to aggregate GDP growth suggests that biodiversity degradation functions as an endogenous constraint on economic resilience. Rather than being an external environmental issue, biodiversity loss translates into productivity volatility, increased vulnerability to climate shocks, and long-term fiscal pressure. **Figure 1** therefore supports the interpretation that biodiversity finance should be framed as a resilience-enhancing macroeconomic investment, not merely as environmental expenditure. Underinvestment in ecosystem maintenance risks amplifying structural

imbalances in agriculture, water, fisheries, and coastal development.

Second, a governance implication is evidenced by the structural asymmetries highlighted in **Table 1** and **Figure 2**. The fragmentation of institutional mandates (**Table 1**) and the underallocation to enabling functions such as coordination, knowledge systems, and awareness (**Figure 2**) indicate that Morocco’s biodiversity finance challenge is less a question of isolated budget volumes than of systemic misalignment. Field conservation activities receive comparatively greater attention, while governance, monitoring, and capacity-building remain marginal. This imbalance weakens implementation continuity and reduces policy learning capacity. **Figure 2** thus illustrates not only a budgetary distribution issue but a structural governance deficit that constrains long-term effectiveness.

Third, a portfolio and sequencing implication arises from the prioritization matrix and radar analysis (**Table 2** and **Figure 3**). The instruments evaluated demonstrate that reforms cannot be implemented simultaneously without risking institutional overload. **Table 2** shows that high-

feasibility governance tools (budget tagging, coordination mechanisms, reporting frameworks) present immediate leverage effects, while **Figure 3** illustrates that more transformative instruments (subsidy reform, blended finance structures, green bonds) require stronger regulatory maturity and coordination capacity. The findings therefore support a phased reform strategy: phase I should consolidate traceability and interministerial alignment and phase II should mobilize structural financial transformation mechanisms.

Taken together, **Figure 1**, **Figure 2**, and **Figure 3**, and **Table 1** and **Table 2** confirm that Morocco's biodiversity finance gap reflects a systemic configuration problem rather than a purely quantitative shortfall. The challenge lies in restructuring incentives, coordination channels, and fiscal integration mechanisms so that biodiversity becomes embedded within economic governance frameworks.

Beyond these systemic implications, the results confirm the persistence of major structural constraints hindering the performance and sustainability of Morocco's biodiversity finance system. By adopting a systemic approach combining budgetary, institutional, and governance analysis, this study represents a first at the national level. It identifies shortcomings not only in financing volumes but, more fundamentally, in their structuring, traceability, and strategic alignment with conservation priorities (BIOFIN, 2022).

The analysis shows persistent institutional fragmentation, already noted by Selnes and Kamphorst (2014), and a marginalization of biodiversity in budgetary decisions. As evidenced by **Table 1**, fragmented mandates and weak coordination reduce expenditure visibility and strategic coherence. This marginalization stems from an outdated conception of nature as an environmental externality, whereas a growing body of research demonstrates its fundamental role as a long-term productive asset (Nedopil, 2022). Although Morocco has ambitious strategies such as the NBSAP and the NSSD, their limited integration with a robust financial framework undermines their transformative potential.

International comparison reinforces this diagnosis. In Bhutan, ecological sustainability is embedded in the gross national happiness index, ensuring cross-sector policy coherence. In Costa Rica, conservation policies are supported by a stable financial architecture, notably including PES funded by fuel taxes, which enable both rural community engagement and ecosystem restoration (Pagiola, 2008). These experiences illustrate that durable biodiversity outcomes require institutionalized financial mechanisms rather than ad hoc project-based interventions.

In this light, the proposal for a results-based biodiversity budgeting mechanism emerges as a key advancement. By introducing systematic expenditure coding and harmonized indicators, such a mechanism would enhance public spending accountability and enable interministerial comparability. As reflected in the governance asymmetries identified in **Figure 2**, strengthening enabling functions is a precondition for effective field action. The OECD (2023b) similarly recommends overcoming sectoral silos through integrated budgetary frameworks that align environmental objectives with fiscal planning.

Moreover, the analysis reveals a critical asymmetry in the structure of public expenditures. Awareness, governance, and capacity-building actions receive marginal shares of allocated budgets, despite being essential to long-term conservation effectiveness. This finding, consistent with several international evaluations (BIOFIN and OECD), underscores need for strategic rebalancing toward coordination, research, and social cohesion functions within biodiversity policy.

Institutionally, the biodiversity sub-commission, although formally established, remains non-functional. Its reactivation, coupled with a mandate for intersectoral budget coordination, would represent a structural reform directly addressing the fragmentation identified in **Table 1**. Furthermore, the emergence of the TNFD offers a strategic opportunity to integrate biodiversity into the risk management frameworks of economic and financial actors (Paulson Institute, 2020). Aligning Moroccan regulatory frameworks with such standards could initiate a virtuous circle of private mobilization and improved risk transparency.

A key contribution of this study is to demonstrate that system sustainability depends on diversification of financial instruments. Rather than proposing a single solution, the findings (**Table 2** and **Figure 3**) support a hybrid strategy structured around three complementary pillars:

1. Public budgeting reform (biodiversity expenditure coding and green budgeting)
2. Financial innovation (biodiversity green bonds, trust funds, and carbon markets)
3. Private sector incentives (PPPs, ecological taxation, and ecolabels)

This multifunctional approach reduces dependence on often non-permanent international funding while embedding biodiversity within broader economic value-creation dynamics.

The analysis aligns with recent research on transformative biodiversity finance, which emphasizes the need for systemic reconfiguration of financial institutions and budget allocation rules (Hutchinson & Lucey, 2024). The experience of countries such as France, which introduced a dedicated biodiversity budget code, and Vietnam, which partially funded its national strategy through reform of environmentally harmful subsidies, demonstrates that ambitious yet feasible reforms are achievable when supported by coherent institutional design.

In short, this study contributes to an applied research agenda aimed at reforming public action. It demonstrates that biodiversity financing in Morocco is not solely a matter of resource scarcity, but fundamentally one of structural design and strategic alignment deficits. By linking biodiversity policy to economic governance, fiscal integration, and institutional coordination, the study provides both an analytical and operational foundation for the future National Biodiversity Strategy (NBSAP 2025-2035) and its integration into Morocco's broader sustainability trajectory.

Policy Recommendations: A Sequenced Reform Pathway

The empirical findings (**Table 1**, **Table 2**, and **Figure 3**) indicate that Morocco's biodiversity finance gap stems primarily from structural weaknesses in governance design, expenditure traceability, and incentive alignment rather than

from absolute scarcity of resources. In line with the systemic implications identified before, policy reform must therefore follow a sequenced pathway combining short-term institutional consolidation with longer-term structural financial transformation.

In the short term, priority should be given to governance-enhancing reforms capable of strengthening transparency and coordination. First, the introduction of a dedicated biodiversity budget code and systematic expenditure tagging would address the opacity and fragmentation identified in **Table 1**. By enabling cross-ministerial comparability and improved monitoring, such a reform would provide the empirical basis for performance-based allocation mechanisms. Second, the reactivation of the biodiversity sub-commission with a formal mandate for intersectoral budget coordination would directly tackle institutional silos and enhance strategic coherence between the NBSAP and fiscal planning processes.

Third, the establishment of a standardized monitoring and reporting framework for biodiversity-related expenditures would operationalize the enabling functions shown to be underfinanced in **Figure 2**, linking financial inputs to measurable ecological outcomes. Finally, pilot PES schemes in selected priority landscapes could serve as experimental platforms to test territorial mobilization models, while a structured roadmap for identifying environmentally harmful subsidies would prepare the ground for deeper fiscal reform.

Once governance consolidation and expenditure traceability are strengthened, a second phase of structural transformation becomes feasible. Building on the diagnostic presented in **Table 2** and the prioritization analysis in **Figure 3**, progressive reform and reallocation of environmentally harmful subsidies would realign fiscal incentives with biodiversity objectives. The establishment of a multi-stakeholder biodiversity trust fund could stabilize long-term funding flows and reduce dependency on external donors by pooling public and private resources within a blended finance framework.

In parallel, integrating biodiversity criteria into Morocco's green bond taxonomy would mobilize capital markets and align domestic financial instruments with international sustainable finance standards. Embedding natural capital accounting (SEEA-EA) into national planning and budget cycles would further institutionalize biodiversity as a macroeconomic variable, directly addressing the systemic resilience concerns highlighted in **Figure 1**. Finally, gradual alignment with the TNFD framework would incorporate nature-related risks into financial sector regulation, encouraging private sector engagement and strengthening long-term risk transparency (Paulson Institute, 2020).

The sequencing logic underpinning this two-stage reform pathway reflects the prioritization structure identified before. Governance consolidation must precede financial expansion. Without improved coordination, traceability, and monitoring capacity, ambitious instruments such as subsidy reform, blended finance mechanisms, or biodiversity-linked green bonds risk limited effectiveness. Conversely, once institutional foundations are stabilized, financial diversification can enhance resilience and reduce structural dependency on volatile external funding.

By structuring reform along this sequenced trajectory, biodiversity finance becomes integrated into fiscal modernization and economic governance rather than treated as a peripheral environmental policy domain. This approach reinforces the central argument of the article: sustainable biodiversity financing in Morocco requires systemic institutional reconfiguration rather than incremental budget increases alone.

CONCLUSION

This study has shed light on the structural shortcomings of Morocco's biodiversity finance system by providing a rigorous analytical framework grounded in a systemic approach. Despite the strategic importance of natural capital to the national economy particularly in key sectors such as agriculture, tourism, and water resource management biodiversity remains marginalized in budgetary decision-making and governance mechanisms. This paradox reveals a persistent inconsistency between the political discourse acknowledging environmental challenges and their effective consideration within financing frameworks.

Beyond the observation of insufficient resources, this research demonstrates that the real issue lies in transforming the institutional, legal, and financial framework that governs the allocation and management of biodiversity-related funds. The approach adopted has enabled the identification of bottlenecks limiting financial mobilization, while proposing a series of realistic and context-specific levers. Among these, green budgeting, biodiversity budget tagging, reform of environmentally harmful subsidies, and the development of market-based mechanisms (e.g., carbon credits, PES, and biodiversity-linked green bonds) have emerged as priorities.

The recommendations put forward follow the logic of ecosystem-based transition: they are not solely aimed at increasing financial flows but at establishing more integrated governance, based on transparency, expenditure traceability, and the participation of non-state actors. The reactivation of the National Biodiversity Sub-Commission, its expansion to include economic and financial ministries, and the formalization of its role in multisectoral coordination are critical steps toward overcoming institutional silos. Also, the integration of biodiversity into national budgetary instruments, particularly through natural capital accounting would enhance the allocative efficiency of public policies.

This research thus contributes to the emerging literature on biodiversity finance, offering a context-specific reading of the Moroccan case with broader regional resonance. It provides policymakers with an operational roadmap grounded in international comparative experiences and rigorous evaluation criteria (BIOFIN, TNFD, and OECD). By adopting an ambitious yet pragmatic reform trajectory, Morocco could position itself as a regional laboratory for nature-based sustainable finance.

For future research, several avenues merit further exploration: quantitative analysis of the impact of proposed financial instruments on biodiversity indicators; ex-ante evaluations of the redistributive effects of environmental fiscal reforms; and examination of the role of local

communities in the multi-level governance of biodiversity funding. In sum, repositioning natural capital as a strategic asset for sustainable development represents not only an ecological imperative, but also an economic and geopolitical opportunity for the Kingdom.

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