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Resource mobilization and financial mechanism: resource mobilization

Study on the relationship between debt sustainability and implementation of the Convention***

Note by the Secretariat

Introduction

1. In decision 16/34 the Executive Secretary was requested, subject to the availability of resources, to commission, or undertake, alongside relevant international institutions, studies on: (a) the relationship between debt sustainability and the implementation of the Convention; (b) how the guidance on safeguards in biodiversity finance mechanisms adopted in decisions XII/3 and 14/15 has been implemented, identifying good practices and lessons learned, as well as opportunities for improving implementation of the guidance; and (c) the relationship between biodiversity and climate finance (para. 26 (b)).

2. A study on the relationship between debt sustainability and the implementation of the Convention is provided in the present document. The study has been prepared by an independent consultant who was commissioned by the Secretariat. Notification No. 2026-013 was issued on 27 January 2026 to invite peer reviews of an earlier draft. Notification No. 2026-027 was issued on 12 March 2026, to extend the deadline for the peer review of the document to 20 May 2026, following a request by the Subsidiary Body on Implementation at its sixth meeting. The present final draft considered all inputs received until this deadline.

3. The document is issued in the form and language in which it was received.

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*** The present document is being issued without formal editing.

CONVENTION ON BIOLOGICAL DIVERSITY

STUDY ON THE RELATIONSHIP BETWEEN DEBT SUSTAINABILITY AND IMPLEMENTATION OF THE CONVENTION

Prepared in response to Decision 16/34: Resource mobilization, paragraph 26(b)(i)
September 2026

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Contributor Index: Reviewing Parties and Organizations

Parties: Argentina; Belgium; Brazil; Colombia; France; Germany; Japan; Mexico; Netherlands; Peru; Russian Federation; Switzerland; United Kingdom.

United Nations and intergovernmental bodies: Office of the United Nations High Commissioner for Human Rights (OHCHR); United Nations Development Programme (UNDP);

Observer organizations, networks and academic institutions: Boston University; ETH Zurich; University of British Columbia; Association des Jeunes Courageux du Congo; FARN; Finance for Biodiversity Foundation; Friends of the Earth International; Friends of the Earth Malaysia; Greenpeace International; Institutional Investors Group on Climate Change; The Common Initiative; Third World Network; The Nature Conservancy; CBD Women’s Caucus; Global Youth Biodiversity Network

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AIP	Agreement in Principle (debt restructuring)
BBA	Business and Biodiversity Assessment (IPBES)
BIOFIN	Biodiversity Finance Initiative (UNDP)
CAMPA	Compensatory Afforestation Fund Management and Planning Authority (India)
CAR	Cadastro Ambiental Rural (Rural Environmental Registry, Brazil)
CBD	Convention on Biological Diversity
CCRIF SPC	Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company
CIF	Climate Investment Funds
COCOBOD	Ghana Cocoa Board
CONABIO	Comissão Nacional da Biodiversidade (National Biodiversity Commission, Brazil)
CRDC	Climate Resilient Debt Clause
CRGE	Climate Resilient Green Economy (Ethiopia)
CWON	Changing Wealth of Nations (World Bank)
DFFE	Department of Forestry, Fisheries and the Environment (South Africa)
DSA	Debt Sustainability Analysis
DSF	Debt Sustainability Framework
DSSI	Debt Service Suspension Initiative
ECF	Extended Credit Facility (IMF)
EFF	Extended Fund Facility (IMF)
EPANB	Estratégia e Plano de Ação Nacionais para a Biodiversidade (Brazil National Biodiversity Strategy and Action Plan)
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAS	Foreign Agricultural Service (USDA)
FX	Foreign Exchange
FY	Fiscal year
G20	Group of Twenty
GBF	Global Biodiversity Framework
GDP	Gross Domestic Product
ICMA	International Capital Market Association
ICMS Ecológico	Imposto sobre Circulação de Mercadorias e Serviços, ecological allocation (Brazilian ecological fiscal transfer)
IFC	International Finance Corporation
IFI	International Financial Institution
IMF	International Monetary Fund
INFORM	Index for Risk Management
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
KMGBF	Kunming-Montreal Global Biodiversity Framework
LDC	Least Developed Country
LIC	Low-Income Country
LIC-DSF	Low-Income Country Debt Sustainability Framework
MEF	Ministerio de Economía y Finanzas (Ministry of Economy and Finance, Peru)

MoEFCC	Ministry of Environment, Forest and Climate Change (India)
MY	Marketing year
NBER	National Bureau of Economic Research
NBSAP	National Biodiversity Strategy and Action Plan
NDC	Nationally Determined Contribution
NGFS	Network for Greening the Financial System
OECD	Organisation for Economic Co-operation and Development
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PCRIC	Pacific Catastrophe Risk Insurance Company
PRGT	Poverty Reduction and Growth Trust (IMF)
RSF	Resilience and Sustainability Facility (IMF)
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDG	Sustainable Development Goal
SEEA	System of Environmental-Economic Accounting
SEEA-EA	System of Environmental-Economic Accounting—Ecosystem Accounting
SIDS	Small Island Developing States
SINANPE	Sistema Nacional de Áreas Naturales Protegidas por el Estado (Peru)
SIP	Selected Issues Paper (IMF)
SOAS	School of Oriental and African Studies, University of London
TC	Tropical Cyclone
TEEB	The Economics of Ecosystems and Biodiversity
TNFD	Taskforce on Nature-related Financial Disclosures
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
USD	United States dollar
V20	Vulnerable Twenty Group
WDI	World Development Indicators (World Bank)
WDPA	World Database on Protected Areas
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

This study was prepared in response to Decision 16/34: Resource mobilization, which requested an examination of the relationship between debt sustainability and implementation of the Convention on Biological Diversity. Its purpose is to clarify where and how debt–biodiversity interactions become macro-relevant, and where they remain indirect or weak across country contexts. In this study, macro-relevance means materiality for fiscal space, external balances, contingent liabilities, growth, borrowing costs, or debt sustainability.

The study is diagnostic in nature. It does not rank countries, assess national performance or ambition, prescribe financial instruments, or advance negotiating positions. Its contribution is to provide a structured basis for interpreting when debt sustainability conditions are likely to shape implementation of the Convention, when biodiversity outcomes may become relevant to debt sustainability, and when other explanations are more informative.

The analysis finds that the debt–biodiversity relationship operates in two directions, but with asymmetric weight. The forward channel runs from debt conditions to implementation of the Convention; the reverse channel runs from biodiversity outcomes to debt sustainability. Debt conditions more frequently and more immediately shape implementation feasibility through fiscal compression, expenditure constraint, revenue weakness, planning volatility, and institutional capacity. Biodiversity outcomes affect debt sustainability only under specific structural conditions, operating through nature-dependent revenues, risk amplification, contingent liabilities, long-term productivity effects, and, in some cases, sovereign-risk perceptions that transmit through borrowing costs. These reverse channels are conditional and do not apply uniformly across Parties.

The forward channel is the more widespread. Elevated interest burdens can compress discretionary fiscal space; fiscal adjustment and restructuring can disrupt multi-year planning; weak revenue mobilization can make even moderate debt burdens binding; and institutional capacity determines whether available resources can be converted into implementation. Biodiversity expenditure is especially exposed to these pressures because it is often discretionary, fragmented across institutions, dependent on recurrent operating costs, and less politically protected than higher-salience spending categories.

The reverse channel is more selective. Biodiversity outcomes become macro-relevant where ecosystem services support revenues, foreign-exchange earnings, disaster resilience, contingent-liability management, or long-term productivity at sovereign scale. This is most likely in economies with concentrated dependence on nature-linked sectors, high disaster exposure, or material reliance on renewable natural capital. In large or diversified economies, biodiversity loss may be severe in ecological, social, sectoral, or regional terms, but does not typically aggregate into sovereign-scale fiscal effects through currently observed channels. Scenario-based tipping-point and nature-collapse dynamics remain relevant, but they operate through stress mechanisms that are distinct from observed-channel analysis.

A central contribution of the study is a diagnostic framework that differentiates countries according to fiscal constraint and nature-linked economic exposure. The framework identifies four configurations:

1. **Structural Nexus countries:** Countries facing both elevated fiscal constraints and high nature-linked exposure, making both forward and reverse channels plausible.
2. **Fiscal Stress countries**: Countries facing elevated fiscal constraints but lower sovereign-scale nature exposure, so debt affects implementation of the convention primarily through general fiscal compression.
3. **Nature Exposed countries:** Countries that have high nature-linked exposure without a current interest-to-revenue signal of fiscal stress, although concessional debt structures or recent restructuring may mask fragility.
4. **Lower Dual Exposure countries:** Countries that do not show elevated values on either dimension, making the debt–biodiversity relationship examined in this study less directly macro-fiscal.

The framework highlights substantial heterogeneity across Parties and cautions against uniform interpretations. In some contexts, fiscal ceilings and debt-service pressures are central to implementation feasibility. In others, institutional capacity, governance arrangements, political prioritization, land-use regimes, or sector-specific pressures are more decisive. Accurate interpretation depends on identifying which constraint binds in practice rather than assuming a single debt–biodiversity pathway.

The study also underscores the importance of judgment in the use of fiscal, debt, and nature-exposure indicators. On the fiscal side, headline debt-to-GDP ratios can obscure the compression that binds discretionary spending in practice. Interest payments as a share of government revenue offer a sharper signal of fiscal compression, but they too have limits, particularly where concessional debt structures or restructuring history mask underlying fragility. On the nature-linked exposure side, renewable natural capital and flow indicators help identify nature-linked economic dependence, but they do not measure biodiversity condition, species abundance, ecosystem integrity, or management effectiveness directly. Screening indicators therefore guide analytical attention; they do not determine conclusions mechanically.

The implications for implementation of the Convention are differentiated. Where fiscal compression binds, additional biodiversity finance may not translate into sustained implementation unless the underlying fiscal envelope, allocation processes, and institutional capacity are considered. Where nature-linked exposure is high, biodiversity outcomes may warrant attention in macro-fiscal analysis, natural-capital accounting, and risk assessment. Where neither dimension is elevated, implementation challenges are more likely to be explained primarily by institutional, governance, political-economy, or sectoral factors rather than by debt sustainability alone.

Debt-related, fiscal-insulation, and risk-transfer instruments are relevant only insofar as they engage the transmission channels identified in the study. Debt-for-nature swaps, thematic bonds, sustainability-linked sovereign bonds, conservation trust funds, state-contingent clauses, sovereign parametric risk pools, catastrophe bonds, and parametric ecosystem insurance each operate through different channels and under different conditions. None bypasses underlying fiscal, debt-sustainability, or institutional constraints. Their relevance depends on debt sustainability, market access, creditor composition, institutional readiness, trigger design, governance, and the country configuration in which they are used.

The heterogeneity documented here has direct implications for how approaches to resource mobilization under Target 19 are likely to operate across Parties. Countries facing fiscal compression, countries with high nature-linked exposure, and countries where neither dimension is elevated will not face the same implementation constraints or financing conditions. This differentiation also underscores the continued relevance of international financial flows and concessional finance referenced in sub-target 19(a) and Article 20 of the Convention.

Within the CBD process, this study is intended as a clarifying analytical input. It does not represent a negotiating position, endorse particular proposals, or prejudge discussions on resource mobilization or implementation support. By distinguishing where debt sustainability is likely to shape implementation, where biodiversity outcomes may become macro-fiscally relevant, and where other explanations are more informative, the study seeks to support more differentiated consideration of debt–biodiversity interactions across diverse country contexts.

1. INTRODUCTION

1.1 Mandate and Purpose

At its sixteenth meeting, the Conference of the Parties to the Convention on Biological Diversity adopted Decision 16/34: Resource mobilization. Paragraph 26(b)(i) of that Decision requests the Executive Secretary to commission a study on the relationship between debt sustainability and implementation of the Convention. This study responds to that mandate.

The request reflects increasing attention to the fiscal and macroeconomic conditions under which Parties are expected to implement the Convention and the Kunming-Montreal Global Biodiversity Framework, alongside concerns that debt dynamics may shape, or in some contexts be shaped by, biodiversity outcomes. The study examines that relationship at the sovereign and macro-fiscal level. It asks where debt sustainability conditions may constrain the capacity of Parties to implement the Convention, and where biodiversity outcomes may become relevant to debt sustainability through identifiable macro-fiscal channels. In this study, "macro-relevant" refers to effects large enough to matter for fiscal space, external earnings, growth prospects, contingent liabilities, borrowing costs, or debt sustainability, rather than effects that remain primarily local, sectoral, ecological, or social.

Throughout the analysis, "implementation" refers to Parties' efforts to give effect to the Convention's three mutually reinforcing objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. It also refers to the targets and actions set out in the Kunming-Montreal Global Biodiversity Framework. The terms "implementation", "biodiversity implementation", "Convention implementation" and "implementation of the Convention" are used interchangeably in this sense throughout. References to implementation outcomes mean the ecological, ecosystem-service, and institutional results that implementation is intended to produce.

The study is analytical and diagnostic in nature. It does not propose policy responses, prescribe financial instruments, assess national performance, rank countries, or advance negotiating positions. Where instruments are discussed, they are mapped to the transmission framework as interpretive examples; the study does not recommend their use or assess their effectiveness. The purpose of the study is to support informed consideration by the Subsidiary Body on Implementation and other relevant bodies by providing a structured basis for interpretation.

1.2 Why Debt Sustainability Matters for Biodiversity Implementation

Debt sustainability matters for biodiversity implementation because many implementation functions depend on fiscal capacity, budgetary discretion, and institutional continuity. Biodiversity-related expenditure, enforcement, monitoring, protected-area management, ecological restoration, data systems, and inter-agency coordination are often financed through discretionary budget lines. These lines can be sensitive to interest burdens, fiscal consolidation, revenue volatility, and interruptions in medium-term planning.

Where debt service absorbs a large share of government revenue, the resources available for discretionary public functions narrow. Biodiversity expenditure is often exposed in this setting because it is typically fragmented across institutions, dependent on recurrent operating costs, and less protected than high-salience or statutory spending categories. Debt sustainability therefore matters not only because it affects a country's ability to service obligations, but because it shapes the fiscal envelope within which implementation of the Convention must compete.

At the same time, biodiversity outcomes may, in certain contexts, have macro-fiscal relevance. In economies where government revenue, foreign-exchange earnings, disaster exposure, or long-term productivity are closely linked to ecosystem services or nature-dependent sectors, biodiversity degradation

can affect fiscal performance and debt sustainability indirectly over time. These effects operate through channels such as revenue erosion, risk amplification, contingent liabilities, reduced resilience, and long-term impacts on productivity and growth.

These relationships are neither uniform nor automatic. Debt conditions do not constrain biodiversity implementation in the same way across countries, and biodiversity outcomes do not systematically affect debt sustainability. Overgeneralizing either direction risks mischaracterizing implementation challenges and misidentifying the constraints that bind in practice.

1.3 A Two-Directional but Asymmetric Analytical Framework

The study adopts a two-directional analytical framework. It recognizes interactions running from debt sustainability to implementation of the Convention, and from biodiversity outcomes to debt sustainability. It also emphasizes that the two directions operate with asymmetric weight.

The forward channel, from debt sustainability to Convention implementation, is more immediate and more widespread. Elevated interest burdens can compress discretionary fiscal space. Fiscal adjustment and debt restructuring can disrupt multi-year planning and narrow financing options. Revenue weakness can make even moderate debt burdens binding. Institutional capacity and execution determine whether resources, once available, can be converted into implementation. These mechanisms are relevant across a broad range of country contexts where fiscal constraint binds.

The reverse channel, from biodiversity outcomes to debt sustainability, is more indirect and conditional. It becomes macro-relevant only where biodiversity outcomes affect fiscal or debt conditions at sovereign scale. This may occur where ecosystem services support government revenues or foreign-exchange earnings; where coral reefs, mangroves, forests, wetlands, watersheds, or other ecosystems reduce disaster-related fiscal risks; or where renewable natural capital depletion affects long-term productivity and debt-carrying capacity. In some cases, nature-related risks may also influence sovereign-risk perceptions and borrowing costs.

Recognizing this asymmetry is essential to avoid both overstating and understating the relevance of debt-biodiversity interactions. Biodiversity loss can be severe in ecological and social terms, and can have fiscal consequences at sectoral or regional levels, without becoming material for sovereign debt sustainability. Over observable policy and fiscal timeframes, the reverse channel becomes relevant at sovereign scale where ecosystem services support revenues, external earnings, disaster resilience, productivity, or borrowing conditions in ways that affect debt dynamics. This does not exclude larger effects under tipping-point or nature-collapse scenarios, where ecological thresholds may generate risks not yet visible in current fiscal or market data.

It should also be noted that not all commitments made by Parties under the Convention, and not all targets under the Kunming-Montreal Global Biodiversity Framework, have direct fiscal or debt-sustainability dimensions. Some implementation actions, including regulatory measures, mainstreaming, governance reforms, planning requirements, and incentive realignment, may operate partly or substantially outside direct public expenditure constraints. The debt-biodiversity relationship examined in this study is therefore most directly relevant where implementation of the Convention depends on fiscal resources, institutional capacity, or financing predictability, or where ecosystem services are macro-fiscally material.

1.4 A Diagnostic Approach and Its Rationale

The study uses a diagnostic approach to clarify how the relationship between debt sustainability and implementation of the Convention operates across different country contexts. It identifies transmission channels, specifies the structural conditions under which they are likely to operate, and distinguishes contexts where debt sustainability is a useful explanatory lens from those where institutional, governance, political-economy, or sectoral constraints are more informative.

This approach also reflects the nature of the available evidence. Comparable biodiversity expenditure data remains limited across countries, biodiversity outcomes are difficult to measure consistently at sovereign scale, and natural-capital valuation involves methodological choices that affect comparability. Debt sustainability indicators provide important signals of fiscal risk, but they do not, on their own, determine implementation feasibility or macro-fiscal relevance. The study therefore uses indicators to guide interpretation, not to establish causality or classify performance mechanically.

The diagnostic framework differentiates countries according to two dimensions: fiscal constraint and nature-linked economic exposure. Fiscal constraint is assessed primarily through the share of government revenue absorbed by interest payments, supplemented by revenue capacity, debt distress classifications, and debt composition. Nature-linked exposure is assessed through flow indicators, including tourism and agriculture, forestry, and fisheries, and through renewable natural capital as a share of comprehensive wealth. The combination of these dimensions produces four configurations: Structural Nexus, Fiscal Stress, Nature Exposed, and Lower Dual Exposure.

- **Structural Nexus** countries face both elevated fiscal constraints and high nature-linked exposure, making both forward and reverse channels plausible.
- **Fiscal Stress** countries face elevated fiscal constraint but lower sovereign-scale nature exposure, so debt affects biodiversity implementation primarily through fiscal compression and related institutional effects.
- **Nature Exposed** countries have high nature-linked exposure without a current interest-to-revenue signal of fiscal stress, although concessional debt structures or recent restructuring may mask fragility.
- **Lower Dual Exposure** countries do not show elevated fiscal constraint or nature-linked macro-fiscal exposure, making the debt-biodiversity relationship examined in this study less directly relevant at the sovereign and macro-fiscal level.

This framework provides a common analytical foundation for interpreting diverse country contexts. It helps distinguish cases where debt sustainability is likely to be a binding constraint on implementation, cases where biodiversity outcomes may become macro-fiscally relevant, and cases where institutional, governance, political-economy, or sectoral explanations are more informative.

1.5 Scope and Structure of the Study

The study examines debt-biodiversity interactions at the sovereign and macro-fiscal level. It does not examine project-level financing, subnational fiscal systems in detail, or the full range of biodiversity policy instruments. Country experiences are used illustratively to clarify mechanisms and boundary conditions. They are not used to rank performance, assign responsibility, or identify cases of success or failure.

The remainder of the study is structured as follows. Section 2 reviews the evidence base and analytical foundations, including fiscal and debt sustainability literature, biodiversity finance evidence, nature-related macro-financial risk literature, and quantitative modeling of nature-debt linkages. Section 3 examines the forward channel through which debt sustainability conditions can constrain implementation of the Convention. Section 4 examines the conditional reverse channel through which biodiversity outcomes may affect debt sustainability. Section 5 presents the cross-country diagnostic framework based on fiscal constraint and nature-linked economic exposure. Section 6 translates this framework into interpretive implications for implementation of the Convention, engagement with finance ministries and international financial institutions, and the analytical relevance of debt-related, fiscal-insulation, and risk-transfer instruments. Section 7 concludes by situating the study within the CBD process as a clarifying analytical input, including its relevance for differentiated consideration of resource mobilization under Target 19 and Article 20.

2. EVIDENCE BASE AND ANALYTICAL FOUNDATIONS

This section establishes the evidence base for the diagnostic framework used in the study. It is organized around the study's two-directional but asymmetric framing. The first strand of evidence concerns the forward channel, through which debt sustainability conditions affect the capacity of Parties to implement the Convention. The second concerns the reverse channel, through which biodiversity outcomes may, under specific structural conditions, become relevant to debt sustainability. A final strand examines quantitative modeling of nature-debt linkages, which provides indicative evidence on potential scale while underscoring the uncertainty and context-specificity of these effects.

The forward channel draws on fiscal and debt sustainability literature, together with biodiversity finance evidence showing that implementation remains substantially exposed to public budgets, budgetary prioritization, and debt service pressures. The reverse channel draws on natural capital, ecosystem services, nature-related macro-financial risk, and sovereign-risk literature. These bodies of work show that nature can be economically and fiscally relevant where government revenue, foreign exchange earnings, disaster exposure, or long-term productivity depend materially on ecosystem services and natural capital.

The transmission channels examined are established in existing literature. The study's contribution lies in integrating them for the specific diagnostic question posed by Decision 16/34, paragraph 26(b)(i): how debt sustainability conditions affect implementation of the Convention, and when biodiversity outcomes may become relevant to sovereign debt dynamics. This framing helps distinguish analytically grounded relationships from broader claims about biodiversity finance, sovereign risk, or environmental policy.

2.1 Forward Channel Evidence: Fiscal Space, Debt Sustainability, and Biodiversity Implementation Finance

Implementation of the Convention is structurally exposed to public budgets. Across most jurisdictions, biodiversity-related expenditure, enforcement, and institutional capacity are financed primarily through discretionary government spending, with private finance and innovative instruments playing complementary but comparatively limited roles relative to estimated needs.[1] This exposure makes the fiscal economics and debt sustainability literature directly relevant to the forward channel: the conditions under which budgets are set, adjusted, and constrained shape what implementation is feasible.

Global assessments consistently document a large and persistent gap between current biodiversity finance and the resources implied by the Kunming-Montreal Global Biodiversity Framework, in particular Target 19 and its sub-target 19(a) on international financial resources.[2] Comprehensive gap assessments estimate annual biodiversity financing needs on the order of several hundred billion United States dollars, far exceeding current flows.[3] Within that landscape, public sources account for most of the identifiable spending. The Biodiversity Finance Initiative (BIOFIN) of the United Nations Development Programme (UNDP), applied across more than 130 participating countries, provides the most systematic empirical basis for tracking biodiversity expenditure across government budgets and estimating financing gaps at the national level, though country coverage and methodological harmonization remain incomplete.[4] Related statistical frameworks, including Environmental Protection Expenditure Accounts and the System of

[1]OECD, *A Comprehensive Overview of Global Biodiversity Finance*, OECD Environment Policy Papers No. 47 (Paris: OECD Publishing, 2020); OECD, *Biodiversity and Development Finance 2015–2022: Contributing to Target 19 of the Kunming-Montreal Global Biodiversity Framework* (Paris: OECD Publishing, 2024).
[2]OECD, *Biodiversity and Development Finance 2015–2022: Contributing to Target 19 of the Kunming-Montreal Global Biodiversity Framework*.
[3]Paulson Institute, The Nature Conservancy, and Cornell Atkinson Center for Sustainability, *Financing Nature: Closing the Global Biodiversity Financing Gap* (Chicago: Paulson Institute, 2020).
[4]UNDP, *BIOFIN Workbook 2024: Finance for Nature* (New York: UNDP, 2024)

Environmental-Economic Accounting (SEEA), highlight persistent challenges in consistently identifying biodiversity-related spending within national accounts.[5] Because implementation of the Convention depends predominantly on the public envelope, it is exposed to the same fiscal pressures and debt service dynamics that affect other discretionary spending categories.

The institutional framework for assessing whether sovereign debt trajectories are sustainable is provided by the IMF–World Bank Debt Sustainability Framework (DSF), which classifies countries into risk categories that inform lending decisions and policy surveillance.[6] Climate-related considerations have been progressively integrated through supplementary tools and country-specific analysis, while nature-related considerations remain less systematically incorporated. The DSF focuses on aggregate fiscal and external sustainability rather than on the composition of public expenditure. For the purposes of this study, the relevant implication is that debt sustainability conditions matter not only because they affect whether a country can service its obligations, but because they shape the fiscal envelope within which biodiversity-related expenditure, staffing, enforcement, monitoring, and institutional delivery must compete.

The scale and persistence of debt pressure across developing countries is the structural backdrop against which the forward channel operates. The United Nations Conference on Trade and Development (UNCTAD) documents the scale, composition, and distribution of sovereign debt burdens across developing countries in its *A World of Debt reports*.[7] The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), in its *Economic and Social Survey of Asia and the Pacific 2023: Rethinking Public Debt for the Sustainable Development Goals*, argues that public debt sustainability analysis should better account for countries' ability to finance SDG-related investment, including through expanded fiscal space and more effective debt treatment for countries facing distress.[8] These recent assessments establish that forward-channel pressure on implementation of the Convention is structurally widespread among CBD Parties, rather than confined to a small set of distressed cases.

Debt composition shapes how aggregate indicators translate into actual fiscal pressure. Instrument type, creditor mix, currency, and maturity determine the burden of debt service, the complexity of restructuring, and the policy space available within a given debt-to-GDP ratio. UNCTAD analysis documents substantial variation in creditor composition across developing countries, with implications for restructuring complexity, financing access, and conditionality dynamics.[9] Resource-backed loans, in which repayment is secured against commodity export revenues or resource concessions, have received particular attention given their documented empirical association with accelerated natural resource depletion, a feedback dynamic relevant to several CBD Parties.[10] This compositional dimension informs the screening interpretation in Section 5.3 and the restructuring and collateralization discussion in Sections 3.2 and 3.3.

The fiscal consolidation literature further clarifies why biodiversity-related expenditure is often vulnerable during adjustment episodes. When governments reduce deficits through expenditure restraint, spending categories that lack statutory protection, strong political constituencies, or immediate visibility are more likely to absorb cuts or delays. Biodiversity-related spending frequently has these characteristics. It is often spread across ministries and agencies, includes both capital and recurrent elements, and depends on continuous funding for enforcement, monitoring, protected-area management, ecological restoration, and

[5]United Nations, European Commission, Food and Agriculture Organization of the United Nations, Organisation for Economic Co-operation and Development, International Monetary Fund, and World Bank, *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*, White cover version (New York: United Nations, 2021); Eurostat, *Environmental Protection Expenditure Accounts: Handbook — 2017 Edition* (Luxembourg: Publications Office of the European Union, 2017).
[6]International Monetary Fund and World Bank, *Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries*, IMF Policy Paper (Washington, DC: International Monetary Fund and World Bank, 2018); International Monetary Fund and World Bank, *Supplement to 2018 Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries* (Washington, DC: International Monetary Fund and World Bank, 2024).
[7]UNCTAD, *A World of Debt 2024: A Growing Burden to Global Prosperity* (Geneva: UNCTAD, 2024).
[8]United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), *Economic and Social Survey of Asia and the Pacific 2023: Rethinking Public Debt for the Sustainable Development Goals* (Bangkok: United Nations, 2023).
[9]UNCTAD, *A World of Debt 2025: It Is Time for Reform* (Geneva: United Nations Conference on Trade and Development, 2025).
[10]Yacouba Coulibaly, "The Effects of Resource-Backed Loans on Deforestation: Evidence from Developing Countries," *World Development* 188 (2025): 106905.

institutional coordination. As a result, fiscal adjustment can affect implementation not only through headline budget reductions, but through deferred maintenance, hiring freezes, weakened enforcement, delayed procurement, and reduced capacity to execute multi-year plans.[11]

Taken together, the fiscal and biodiversity finance literatures establish the evidence base for the forward channel developed in Section 3. Debt sustainability conditions can affect implementation of the Convention through fiscal space compression, adjustment pressure, revenue constraints, and institutional-capacity effects. The strength of this relationship depends on country context. It is likely to be strongest where interest burdens are high, revenue mobilization is weak, biodiversity expenditure is discretionary, and environmental institutions lack budgetary protection. It is likely to be weaker where fiscal space is available, biodiversity institutions have stable funding arrangements, or implementation relies primarily on regulatory and governance measures rather than public expenditure.

2.2 Reverse Channel Foundations: Ecosystem Services and Nature-Dependent Economic Activity

The reverse channel examined in this study rests on a foundational body of literature on ecosystem services and nature-dependent economic activity more broadly. This literature establishes that ecosystems generate flows of services that support production, livelihoods, resilience, and long-term welfare, even where those services are not fully priced in markets or reflected in national accounts. These services include, among others, water regulation, soil fertility, pollination, coastal protection, carbon storage, habitat provision, and the ecological conditions that support agriculture, fisheries, forestry, tourism, and other nature-dependent sectors.

Ecosystem-service valuation work helped make visible the economic significance of services that conventional accounts often treat as external to production. The Economics of Ecosystems and Biodiversity (TEEB) initiative and the Dasgupta Review developed this work into a broader economic argument: nature is not simply an environmental concern, but an asset base that supports economic activity and intergenerational wealth. Where that asset base is depleted, economic performance may be affected through lower productivity, reduced resilience, higher replacement costs, or the loss of nature-derived income streams.[12]

For the purposes of this study, the key implication is not that biodiversity loss automatically affects sovereign debt sustainability. Rather, this literature helps identify the structural conditions under which biodiversity outcomes may become macro-relevant. These conditions arise where public revenue, foreign exchange earnings, employment, or productive capacity are materially linked to ecosystem services or nature-dependent sectors; where ecosystems provide protective services that reduce fiscal exposure to shocks; or where degradation of these ecosystems constrains long-term growth potential. This provides the conceptual foundation for the three reverse transmission channels examined in Section 4: nature-dependent revenues, risk amplification, and long-term productivity effects.

This literature also helps clarify the limits of the reverse channel. Dependence on ecosystem services and the underlying biodiversity is not the same as debt vulnerability. Biodiversity degradation may generate serious ecological, social, cultural, and local economic harms without materially affecting sovereign debt dynamics. The macro-fiscal relevance of biodiversity outcomes depends on scale, substitutability, concentration, and transmission into fiscal balances, external accounts, growth, or contingent liabilities. This distinction is central to the diagnostic approach used in this study, which seeks to identify where biodiversity outcomes plausibly become macro-critical and where they do not.

The World Bank's Changing Wealth of Nations (CWON) and the System of Environmental-Economic Accounting Ecosystem Accounting (SEEA-EA) provide operational links between these concepts and the

[11]S. Gupta, B. Clements, E. Baldacci, and C. Mulas-Granados, "Fiscal Policy, Expenditure Composition, and Growth in Low-Income Countries," *Journal of International Money and Finance* 24, no. 3 (2005): 441–463.
[12]Partha Dasgupta, *The Economics of Biodiversity: The Dasgupta Review* (London: HM Treasury, 2021).

diagnostic approach used later in the study. Changing Wealth of Nations identifies "natural capital" as one component of national wealth, alongside produced and human capital, and therefore provides a basis for considering whether growth and wealth accumulation rely on depletion of natural assets.13 SEEA-EA, adopted by the United Nations Statistical Commission in 2021, provides an international statistical standard for ecosystem accounting and physical accounts, with internationally recognized principles and recommendations for monetary valuation of ecosystem services and assets.14 These frameworks do not remove uncertainty in valuation or solve all problems of cross-country comparability, but they provide a common basis for identifying where ecosystem dependence may be relevant to macro-fiscal analysis.

This literature therefore supplies the foundation for the reverse side of the debt-biodiversity relationship. It explains why biodiversity outcomes can matter for debt sustainability in some contexts, while supporting the study's caution that such effects are conditional rather than universal. The next subsection turns from this foundational economic logic to the more recent macro-financial and sovereign-risk literature that has begun to incorporate nature-related risks into financial supervision, credit analysis, and debt sustainability debates.

2.3 Reverse Channel Evidence: Nature-Related Macro-Financial and Sovereign Risk

Building on the foundational ecological-economic literature discussed in Section 2.2, a growing macro-financial literature shows that nature-related risks are increasingly addressed at the level of intergovernmental science, mainstream financial economics, and institutional supervision. This subsection traces three lines of recognition: intergovernmental scientific assessment, academic financial economics, and institutional treatment by the IMF, central banks, and disclosure frameworks. It then turns to the sovereign-risk literature as the bridge to the reverse transmission channels examined in Section 4.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Methodological Assessment Report on the Impact and Dependence of Business on Biodiversity and Nature's Contributions to People, the Business and Biodiversity Assessment (BBA), was approved by representatives of more than 150 IPBES Member Governments in February 2026 and provides the first global assessment of how economic activity depends on and impacts biodiversity. It identifies biodiversity loss as a critical and pervasive systemic risk to the economy, financial stability, and human wellbeing, and underscores the universal ecological dependence of economic activity on nature.[15] As an intergovernmentally approved scientific assessment, the BBA carries particular weight for the analytical framing of this study, while the study's diagnostic framework still distinguishes universal ecological dependence from country-specific macro-fiscal materiality.

In academic financial economics, recent empirical work documents that the mechanisms set out in the foundational and scientific literature show up in observed market behavior. Giglio, Kuchler, Stroebel, and Wang provide evidence that sovereign credit default swap spreads widen in response to negative biodiversity news, with the effect stronger for countries whose ecosystems are already more depleted.[16] Subsequent work by the same authors introduces a "twin-crises multiplier" through which nature degradation and climate change reinforce one another, with ecosystem services entering economic production directly.[17] These findings support the view that the reverse channel is conceptually grounded,

[13]World Bank, *The Changing Wealth of Nations 2024* (Washington, DC: World Bank, 2024).
[14]United Nations, European Commission, Food and Agriculture Organization of the United Nations, Organisation for Economic Co-operation and Development, International Monetary Fund, and World Bank, *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA*), White cover version (New York: United Nations, 2021).
[15]IPBES, *Summary for Policymakers of the Methodological Assessment Report on the Impact and Dependency of Business on Biodiversity and Nature's Contributions to People*, ed. M. Jones, S. Polasky, X. Rueda, S. Brooks, J. Carter Ingram, B. N. Egoh, A. von Hase, R. Kohsaka, M. Kulak, K. Leach, R. Loyola, L. Mandle, V. Rodriguez-Osuna, M. Schaafsma, and L. J. Sonter (Bonn: IPBES secretariat, 2026), https://doi.org/10.5281/zenodo.15369060.
[16]Stefano Giglio, Theresa Kuchler, Johannes Stroebel, and Olivier Wang, "*The Economics of Biodiversity Loss*," NBER Working Paper 32678 (Cambridge, MA: National Bureau of Economic Research, 2024).
[17]Stefano Giglio, Theresa Kuchler, Johannes Stroebel, and Olivier Wang, "*Nature Loss and Climate Change: The Twin-Crises Multiplier,*" *AEA Papers and Proceedings* 115 (2025): 409–414.

scientifically recognized, and beginning to be observable in market data, though the empirical literature remains young and the pricing effects so far are concentrated in countries with depleted ecological buffers.

Institutional recognition of nature-related financial risk has advanced rapidly. The IMF's 2024 Staff Climate Note *Embedded in Nature* sets out a conceptual framework for how nature degradation affects macroeconomic aggregates and financial systems, emphasizing double materiality and distinguishing between physical risks arising from ecosystem degradation and transition risks arising from policy, legal, technological, and market responses to nature loss.[18] The Network for Greening the Financial System (NGFS), comprising over 130 central banks and financial supervisors, published a Conceptual Framework for Nature-Related Financial Risks in 2024 setting out a process for identifying nature-related exposures, assessing their economic risks, and evaluating implications for financial-system stability.[19] On the disclosure side, the Taskforce on Nature-related Financial Disclosures (TNFD) released its final recommendations in September 2023; uptake reported by the TNFD's 2025 Status Report covering 620 organizations across more than 50 countries and approximately USD 20 trillion in assets under management indicates growing uptake of nature-related disclosure among corporates and financial institutions.[20] These institutional developments increasingly place nature-related risk within the scope of macroeconomic analysis, financial supervision, and disclosure frameworks used across many jurisdictions. In parallel, operational mechanisms for transferring nature-related fiscal risk have been piloted in sovereign and subnational contexts, including sovereign parametric risk pools that transfer disaster-related fiscal risk to capital markets and reinsurance, and parametric ecosystem insurance structured against natural buffers such as reefs; their analytical placement in the debt-biodiversity framework is discussed in Section 6.4.

Recent work in the sovereign risk literature provides a conceptual bridge from this evidence base to the reverse channel as developed in this study. Volz and colleagues set out a channel-based framework for assessing how climate change can affect sovereign creditworthiness, identifying transmission pathways through fiscal impacts of climate-related disasters, fiscal consequences of adaptation and mitigation policies, macroeconomic impacts, financial-sector stability, international trade and capital flows, and political stability.[21] The channel-based logic, though developed for climate risks, provides a transferable structure for analyzing how nature-related risks more broadly may affect sovereign debt dynamics.

This study uses the nature-related macro-financial and sovereign-risk literature selectively. It does not assess sovereign credit risk, predict rating changes, or evaluate financial-sector exposure in its own right. Instead, Section 4 adapts the channel-based logic to examine when biodiversity outcomes may affect debt sustainability through three pathways: nature-dependent revenues, risk amplification, and long-term productivity effects. The biodiversity-specific application is selective and conditional: not all of these channels operate with equal force or in every country context, and the empirical relevance of each depends on structural conditions identified in Section 5. The next subsection turns to quantitative modeling exercises that have begun to estimate the possible scale of these effects under ecosystem-degradation stress scenarios.

2.4 Quantitative Modeling of Nature-Debt Linkages

The preceding subsections establish the conceptual and macro-financial basis for the reverse channel. Quantitative modeling exercises ask a narrower question: whether ecosystem degradation or natural capital loss could be large enough, under plausible stress scenarios, to affect macroeconomic performance, fiscal balances, sovereign credit risk, or debt sustainability. Much of this work builds on the World Bank's Economic Case for Nature, which developed an integrated ecosystem-economy modeling framework to

[18]IMF, *Embedded in Nature: Nature-Related Economic and Financial Risks and Policy Considerations*, Staff Climate Note 2024/002 (Washington, DC: IMF, 2024).
[19]NGFS, *Nature-related Financial Risks: A Conceptual Framework to Guide Action by Central Banks and Supervisors* (Paris: NGFS, 2024).
[20]Taskforce on Nature-related Financial Disclosures, *Recommendations of the Taskforce on Nature-related Financial Disclosures* (TNFD, September 2023); TNFD, *2025 Status Report* (TNFD, September 2025).
[21]Ulrich Volz, John Beirne, Natalie Ambrosio Preudhomme, Adrian Fenton, Emilie Mazzacurati, Nuobu Renzhi, and Jeanne Stampe, *Climate Change and Sovereign Risk* (London, Tokyo, Singapore, and Berkeley, CA: SOAS University of London, ADBI, WWF Singapore, and Four Twenty Seven, 2020).

estimate the country-level macroeconomic costs of partial collapse in select ecosystem services, particularly pollination, marine fisheries, and timber provision. The framework estimates that, under a partial collapse scenario covering these three services, global GDP in 2030 could be approximately USD 2.7 trillion lower than a no-collapse baseline, with disproportionate effects in low-income economies of around 10 percent of GDP. These figures are presented as conservative exposure estimates based on a limited subset of ecosystem services; broader collapse across additional services would imply larger losses.

The studies discussed below apply, extend, or operationalize the GDP-loss estimates produced by this framework. [22]This evidence base remains emerging and should be interpreted as exposure analysis and stress testing rather than prediction; its value lies in identifying where nature-related risks may be material for debt dynamics, not in forecasting country outcomes or establishing uniform causal relationships.

At an aggregate level, scenario-based modeling exercises combine ecosystem service loss with country-level macro-fiscal data to examine how large-scale environmental degradation could interact with growth, fiscal balances, and financing conditions. Applying the World Bank framework to a six-country sample, Kraemer and Volz estimate that, under partial ecosystem collapse scenarios, debt-to-GDP ratios in nature-exposed developing countries could rise by up to 15 percentage points within a year of the shock, with Bangladesh the most affected country in their sample.[23] The simulations suggest that in countries with high ecosystem dependence, debt sustainability assessments that omit nature-related risks may understate underlying macro-fiscal vulnerabilities.

More granular applications illustrate how these risks may translate into sovereign credit metrics. Agarwala, Burke, Klusak, Kraemer, and Volz develop a machine-learning-based credit ratings model and apply ecosystem-degradation stress scenarios across a sample of 26 countries to assess how partial nature collapse could affect sovereign default risk.[24] Under the partial collapse scenario, 12 of the 26 sampled countries face increases in estimated default probability of more than 10 percentage points. The largest increases are concentrated in countries combining high ecosystem dependence with existing fiscal vulnerabilities, with Bangladesh (+41 percentage points), Ethiopia (+38), and India (+29) the three highest in the sample. These estimates are illustrative and intended to assess exposure, not to anticipate rating actions.

International financial institutions have also begun to explore operational integration of nature into macroeconomic modeling. The World Bank's 2025 report *Mainstreaming Nature into World Bank Macroeconomic Models* describes emerging work linking its standard macroeconomic models (MANAGE-WB and MFMod) to biophysical ecosystem service models, with pilot applications in India, Uganda, and Sri Lanka assessing how ecosystem change may affect GDP, employment, and fiscal stability.[25] The Bank positions this work as a roadmap with preliminary pilot results, but it represents an early step toward incorporating nature-related considerations into the quantitative frameworks that inform development policy and lending.

Taken together, these modeling exercises do not yet constitute a standardized approach to integrating biodiversity or ecosystem-service loss into debt sustainability frameworks. Key methodological challenges remain, including data gaps in country-level natural capital accounts, valuation uncertainty for non-marketed ecosystem services, the treatment of substitutability, modeling of ecological thresholds, country

[22] Justin A. Johnson, Giovanni Ruta, Uris Baldos, Raffaello Cervigni, Shun Chonabayashi, Erwin Corong, Olga Gavryliuk, James Gerber, Thomas Hertel, Christopher Nootenboom, and Stephen Polasky, *The Economic Case for Nature: A Global Earth-Economy Model to Assess Development Policy Pathways* (Washington, DC: World Bank, 2021).

[23]Moritz Kraemer and Ulrich Volz, *Integrating Nature into Debt Sustainability Analysis* (London: Finance for Biodiversity Initiative and SOAS Centre for Sustainable Finance, July 2022), https://doi.org/10.25501/SOAS.00037715.

[24]Matthew Agarwala, Matt Burke, Patrycja Klusak, Moritz Kraemer, and Ulrich Volz, *Nature Loss and Sovereign Credit Ratings* (London and Cambridge: Finance for Biodiversity Initiative, SOAS Centre for Sustainable Finance, Bennett Institute for Public Policy at the University of Cambridge, University of East Anglia, and Sheffield Hallam University, June 2022).

[25]Arin, Tijen, Ragchaasuren Galindev, and Charl Jooste. *Mainstreaming Nature into World Bank Macroeconomic Models: Overview Report*. Washington, DC: World Bank, 2025.

comparability, and the difficulty of translating local ecosystem degradation into national macro-fiscal variables.

For this study, quantitative literature supports three conclusions. First, nature-related risks can be macro-fiscally material in countries where ecosystem dependence is high and fiscal buffers are limited. Second, the scale of potential effects is highly context-specific and depends on economic structure, revenue composition, external exposure, institutional capacity, and the availability of substitutes or adaptation responses. Third, quantitative modeling does not support a general claim that biodiversity loss affects debt sustainability uniformly across countries. It reinforces the diagnostic approach adopted in this study: the reverse channel is plausible and potentially significant in some contexts, but conditional rather than universal.

The modeling literature therefore provides an empirical bridge between the macro-financial risk literature reviewed above and the country-screening framework developed later in the study. It helps explain why the analysis in Sections 4 and 5 focuses on nature-dependent revenues, risk amplification, and long-term productivity effects, while maintaining caution about causality, comparability, and the limits of available data. The next subsection synthesizes the strands developed across Section 2 and articulates the framework's contribution to the diagnostic question posed by Decision 16/34.

2.5 Synthesis: From Evidence Base to Analytical Approach

Section 2 has reviewed four bodies of literature relevant to the relationship between debt sustainability, implementation of the Convention, and biodiversity outcomes. The forward-channel literature shows how implementation can be exposed to public budgets and to the fiscal conditions that govern discretionary spending. The reverse-channel literature establishes that natural capital and ecosystem services support economic activity, while nature-related risks are increasingly recognized within intergovernmental science, financial economics, macroeconomic surveillance, and financial supervision. The quantitative modeling literature shows that integrating nature into debt sustainability analysis is technically feasible and could materially shift assessments under stress scenarios in countries with high ecosystem dependence. Across these strands, the evidence supports conditional rather than universal claims: the macro-fiscal relevance of biodiversity outcomes depends on structural conditions that vary across country contexts.

What this literature collectively supports is the existence of directional channels operating in both directions: from debt sustainability conditions to the capacity of Parties to implement the Convention, and from biodiversity outcomes to debt sustainability where identifiable macro-fiscal transmission channels are present. It also supports the growing institutional and academic recognition of nature-related macro-financial risks, and the methodological feasibility of integrating these risks into macro-fiscal analysis. What it does not yet provide, on its own, is a unified analytical structure that applies these literatures specifically to the question posed by Decision 16/34, paragraph 26(b)(i): how debt sustainability conditions affect the capacity of Parties to implement the Convention, and how biodiversity outcomes may, under specific structural conditions, affect debt sustainability.

The study's contribution lies in synthesizing across these literature streams to address that gap. It does not introduce new transmission channels; it applies existing knowledge to the question posed by Decision 16/34, while making explicit the limitations and uncertainties that condition interpretation. The analytical framework developed in Sections 3 through 6 is diagnostic rather than prescriptive: it clarifies where debt sustainability conditions may constrain implementation, where biodiversity outcomes may become macro-fiscally relevant, and where these relationships are less direct.

The following section turns from this evidence base to a structured analysis of how debt sustainability conditions affect the capacity of Parties to implement the Convention.

3. DEBT SUSTAINABILITY AND CAPACITY TO IMPLEMENT THE CONVENTION

The forward channel: How debt conditions shape fiscal space, institutions, and delivery

This section develops the forward channel of the analytical framework: how debt sustainability conditions affect the capacity of Parties to implement the Convention. Section 2 established why these conditions are relevant. Biodiversity-related expenditure and institutional capacity remain substantially exposed to public budgets, while public spending envelopes are shaped by debt service, revenue capacity, fiscal adjustment, and debt structure. This section applies that evidence base to four established macro-fiscal transmission mechanisms through which debt dynamics shape fiscal space, institutional capacity, and implementation feasibility. The contribution lies not in identifying new channels, but in applying established dynamics to biodiversity implementation under the Convention, where reliance on public budgets remains high.

Whether debt sustainability constrains biodiversity implementation depends on how these mechanisms operate in a given context, rather than on debt levels alone. Where interest burdens remain manageable, revenue capacity is strong, or fiscal institutions provide insulation for environmental spending, debt pressures may not bind. Where these conditions are absent, debt dynamics can operate as a structural constraint, limiting the feasibility, durability, and scale of biodiversity action even where policy ambition and planning frameworks are strong.

These mechanisms operate against a global fiscal backdrop characterized by historically elevated debt burdens. UNCTAD reports that 3.4 billion people live in countries that allocate more resources to debt interest than to either health or education[26]. As of March 2026, the IMF and World Bank Debt Sustainability Framework classified 9 LIC-DSF countries as being in debt distress and 23 at high risk of external debt distress[27,] indicating that serious debt sustainability concerns remain widespread across a substantial share of developing countries. Formal classifications, however, understate the extent of fiscal constraint experienced in practice; countries that retain market access and avoid crisis classification can nonetheless face binding constraints through revenue pressures, debt-structure effects, or institutional channels examined below.

Drawing on established macro-fiscal analysis, the transmission from debt sustainability to biodiversity implementation operates through four channels whose relevance depends on country-specific fiscal and institutional conditions:

- **fiscal compression** arising from rising debt service burdens that crowd out discretionary expenditure;
- **adjustment and planning disruption** associated with fiscal consolidation, debt distress, and restructuring episodes;
- **revenue constraint**s that render even moderate debt burdens binding in low-revenue contexts; and
- **institutional capacity and execution constraints** that determine how fiscal pressure translates into biodiversity implementation, even where fiscal resources formally exist.

In resource-dependent economies, fiscal and foreign-exchange pressure can also amplify degradation risks by increasing incentives to expand extraction, weaken safeguards, or prioritize short-term revenue generation. This is treated as a context-dependent amplification mechanism rather than as a separate

[26]UNCTAD, *A World of Debt 2025: It Is Time for Reform* (Geneva: United Nations Conference on Trade and Development, 2025)
[27]IMF and World Bank, *List of LIC DSAs for PRGT-eligible countries* (as of 31 March 2026); see also IMF and World Bank, *Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries* (Washington, DC: IMF, 2018), and its 2024 Supplement.

universal channel. The country examples in this section clarify transmission mechanisms; they do not rank performance or establish generalized causal claims.

3.1 Fiscal Space, Debt Service, and Discretionary Spending

The first transmission channel through which debt sustainability conditions affect biodiversity implementation is fiscal compression. Debt service obligations, particularly interest payments, are high-priority claims on government revenue. Where they are not met, governments may face arrears, default, loss of market access, or broader financial instability. As these claims rise, the resources available for other public purposes narrow, intensifying competition across spending categories within the budget. Biodiversity-related expenditure is often exposed in this setting because it is commonly financed through discretionary budget lines and depends on sustained allocations for staffing, enforcement, monitoring, protected-area management, restoration, and inter-agency coordination.

The fiscal significance of debt service is better captured by flow indicators than by debt stocks alone. Countries with similar debt-to-GDP ratios may face very different implementation constraints depending on interest costs, revenue mobilization, maturity profiles, currency exposure, and budget institutions. Interest payments that absorb a large share of government revenue reduce the fiscal space available for discretionary expenditure even where the headline debt stock appears manageable. For this study, interest payments above 20 percent of government revenue are treated as an indicative stress marker rather than a formal debt-sustainability threshold. This marker is useful because it identifies contexts in which debt service has become large enough to compete directly with core development and implementation spending.

The distribution of interest burdens across developing countries is uneven, with acute fiscal pressure concentrated in a subset of high-burden countries. UNCTAD reports that, in 2024, half of developing countries allocated at least 8 percent of government revenues to interest payments, while 61 developing countries allocated 10 percent or more. UNDP similarly reports that 17 developing countries spent more than 20 percent of government revenue on interest payments, a level strongly associated with default risk[28]. This distribution matters for the Convention because it means that fiscal compression is not uniform across Parties. Some countries retain meaningful budgetary space despite elevated debt stocks, while others face severe constraints because debt service absorbs a large share of a narrow revenue base.

For biodiversity spending specifically, these constraints are often pronounced because such expenditure has several features that disadvantage it in fiscal competition:

- **Non-entitlement status:** Biodiversity spending is not protected by statutory obligations in most jurisdictions, unlike debt service, pensions, civil service wages, or statutory social transfers. In such contexts, biodiversity budgets are subject to annual budget processes with limited statutory protection, making them vulnerable to reallocation when fiscal pressure intensifies.
- **Lower short-term political salience:** Biodiversity spending often commands less immediate political attention than health, education, infrastructure, security, or other sectors with more visible constituent benefits. This can place it at a disadvantage when governments face difficult fiscal choices, particularly where budget decisions are shaped by short electoral cycles and near-term delivery pressures.
- **Institutional and budgetary fragmentation:** Biodiversity objectives are typically implemented across multiple ministries, agencies, and levels of government rather than through a single, consolidated budget line. This dispersion weakens budget ownership and political defense, making biodiversity expenditures more vulnerable to incremental cuts during fiscal consolidation without triggering explicit policy reversals.

[28]UNCTAD, *A World of Debt 2025: It Is Time for Reform* (Geneva: United Nations Conference on Trade and Development, 2025), 17–18; UNDP, *Development Gives Way to Debt*, UNDP Debt Update, Development Futures Series (New York: UNDP, February 2025).

- **Long time horizons:** Many biodiversity investments require sustained financing over multiple budget cycles before implementation gains become visible. Restoration, protected-area expansion, monitoring systems, and ecological recovery cannot usually be delivered through one-off allocations. This creates a mismatch between biodiversity implementation needs and annual budget processes that reward shorter delivery cycles and clearer near-term returns.
- **Dependence on execution capacity:** Even where allocations are approved, implementation depends on procurement systems, staffing, inter-agency coordination, local delivery capacity, and monitoring arrangements. Fiscal compression can weaken these systems over time through hiring freezes, deferred maintenance, reduced field operations, and delayed disbursement.

This fiscal compression channel operates not only in crisis contexts but also as a chronic constraint affecting countries across the debt sustainability spectrum. Countries that retain market access and avoid formal debt distress classifications may still experience sustained compression of discretionary fiscal space over time. In such cases, biodiversity implementation is constrained less by abrupt budget cuts than by the cumulative effect of repeated under-allocation, delayed execution, and limited capacity to scale implementation over multiple budget cycles.

This chronic pattern is reinforced by the way fiscal consolidation is typically implemented. The standard literature on the composition of fiscal adjustment finds that public investment often contracts more sharply than government consumption during fiscal consolidations, particularly under high-debt conditions, spending-based adjustments, and following debt or financial crises. This pattern reflects political-economy constraints on wage and entitlement reductions, the relative ease of deferring discretionary capital projects, and, in some adjustment episodes, the prioritization of near-term fiscal targets.[29].

Environmental spending is not insulated by this aggregate pattern. Three features expose biodiversity-relevant expenditure to compression regardless of whether aggregate adjustment falls more on capital or on recurrent spending. First, biodiversity programs include both capital components (new protected area establishment, infrastructure, restoration) and recurrent components (enforcement, monitoring, management staff, operational costs), so both forms of consolidation reach environmental budgets through different lines. Second, environmental ministries and protected-area authorities often manage small budgets relative to larger social, economic, or security portfolios. When a large share of these budgets is absorbed by fixed costs, across-the-board reductions can disproportionately weaken field operations, maintenance, monitoring, and enforcement capacity. Third, biodiversity allocations are often weakly positioned within both recurrent and capital budgets. Within recurrent spending, biodiversity-related operating costs, field activities, monitoring, maintenance, and enforcement compete with wages, statutory transfers, and entitlement-like expenditures that usually carry stronger legal or political protection. Within capital spending, biodiversity-related investments compete with infrastructure projects that often have clearer visibility, stronger delivery narratives, or more powerful political champions.

The structural exposure of biodiversity expenditure to fiscal pressure does not apply uniformly across all implementation actions. Public-good biodiversity functions, including protected-area management, enforcement, monitoring, regulatory oversight, and conservation of non-revenue-generating ecosystems, typically depend most directly on public budgets and mandates because their benefits are diffuse and not easily captured through revenue models. Other activities, where cost recovery, blended finance, user fees, or private investment can be structured with adequate safeguards, may be less directly dependent on the annual budget. Distinguishing these categories is important for identifying where fiscal compression is most likely to bind.

[29]Moulaye Bamba, Jean-Louis Combes, and Alexandru Minea, "*The Effects of Fiscal Consolidations on the Composition of Government Spending*," Applied Economics 52, no. 14 (2020): 1517–1532; Luis Servén, "*Fiscal Rules, Public Investment, and Growth*," World Bank Policy Research Working Paper No. 4382 (Washington, DC: World Bank, 2007); and William Easterly and Luis Servén, eds., *The Limits of Stabilization: Infrastructure, Public Deficits, and Growth in Latin America* (Stanford, CA and Washington, DC: Stanford University Press and World Bank, 2003).

Box 3.1: Brazil and South Africa: Configurations of the Fiscal Compression Channel

Brazil and South Africa illustrate how high interest burdens can constrain biodiversity implementation in countries that retain market access, maintain active policy frameworks, and avoid formal debt distress classification. In both cases, the constraint does not operate primarily through abrupt crisis retrenchment. It operates through persistent pressure on discretionary fiscal space, limiting the scale, predictability, and fiscal anchoring of biodiversity implementation.

The two cases illustrate different configurations of the same fiscal-compression channel. Brazil shows a strategic-financing constraint: renewed political ambition and policy direction must be converted into sustained implementation capacity within a budget system already shaped by high interest costs, expenditure rigidities, and consolidation pressures. South Africa shows a delivery-adaptation constraint: biodiversity institutions and policy instruments remain active, but constrained public budgets increase reliance on stewardship, regulatory tools, protected-area management models, offsets, and biodiversity-economy strategies to maintain implementation under fiscal pressure.

Brazil. On the IMF general-government gross-debt definition used for cross-country comparability, Brazil's gross debt was estimated at 87.3 percent of GDP in 2024 and projected to rise to around 99 percent by 2030. Gross interest payments were on the order of 8 percent of GDP in 2024, close to one-fifth of general government revenue and around a quarter of total expenditure, among the highest interest burdens in the sample. On the net-interest basis used for cross-country comparability the ratio is lower, at roughly 15 percent of revenue, because interest income on reserves and foreign-exchange swap results offset part of the gross bill; the gross figure is the more relevant measure of the claim on discretionary spending within which biodiversity-related expenditure must compete. The IMF's 2025 Article IV consultation identifies elevated public debt and spending rigidities as constraints that crowd out priority investment. For biodiversity implementation, the implication is not that fiscal pressure determines policy choices mechanically, but that ambitious implementation must operate within a budget system already marked by high interest costs, rigid expenditure commitments, and continuing consolidation pressure.

Brazil's recent experience illustrates this distinction. The loosening of environmental governance and enforcement during 2019–2022 occurred alongside fiscal constraint, but it also reflected shifts in policy priorities. The post-2023 reversal, including the establishment of EPANB 2025–2030 and the adoption of national biodiversity targets, demonstrates that political priorities can shift within broadly similar macro-fiscal conditions. The federal action plan comprises 234 actions requiring collaboration across 50 ministries, autonomous agencies and affiliated entities, underscoring the scale of coordination and sustained resourcing needed to convert strategy into implementation. The fiscal-space issue therefore lies less in the absence of ambition than in converting renewed ambition into sustained implementation capacity across ministries, agencies, and budget cycles, where biodiversity-relevant expenditure remains exposed to annual budget negotiation and competing fiscal demands. Complementary instruments, including payments for environmental services, rural environmental regularization, and blended-finance initiatives, can help extend fiscal capacity, but they do not remove the need for predictable public funding for enforcement, monitoring, restoration, protected-area management, and inter-agency delivery.

South Africa. South Africa presents a similar pattern of chronic fiscal pressure without formal debt distress. Gross debt is projected to stabilize close to 78 percent of GDP, while debt-service costs remain around one-fifth of government revenue and decline only gradually over the medium term. Fiscal credibility is improving and primary surpluses are being maintained, but the expenditure environment remains constrained. The Department of Forestry, Fisheries and the Environment's 2025/26 allocation of R9.08 billion represents only 0.35 percent of national appropriation and a real decrease from the previous year, illustrating the limited budgetary space available to a department responsible for a wide set of climate, biodiversity, pollution, fisheries, forestry, and environmental-governance mandates.

South Africa illustrates a delivery constraint under sustained fiscal pressure. Its biodiversity institutions and policy instruments remain active, yet constrained public budgets have increased the importance of biodiversity stewardship, regulatory instruments, biodiversity-economy strategies, protected-area management models, and offset mechanisms. These mechanisms extend implementation capacity under fiscal constraint, but their reach is uneven. They are most applicable where tourism assets, private-land stewardship opportunities, user fees, or regulatory obligations can support implementation. They are less able to substitute for predictable public funding for enforcement, monitoring, ecological management, restoration of non-revenue-generating ecosystems, and other public-good functions that do not generate reliable revenue streams.

The comparison clarifies the channel mechanism. Brazil and South Africa do not show that debt pressure mechanically determines biodiversity policy direction or automatically causes biodiversity retrenchment. They show that high interest burdens can constrain implementation by limiting discretionary space, increasing dependence on annual prioritization, and making delivery more vulnerable to delayed execution, limited real budget growth, and uneven capacity across agencies and budget cycles. In both cases, fiscal compression operates less through explicit policy reversal than through the difficulty of converting ambition and institutional capability into sustained, predictable implementation at scale.

Sources: IMF Article IV materials; national government budget and biodiversity-planning documents; and sector-agency plans. Full citations are provided in the References section.

3.2 Adjustment and Planning Disruption

The second transmission channel operates during periods of debt distress, fiscal adjustment, and debt restructuring. Unlike the chronic fiscal compression described in Section 3.1, this channel works through disruption: fiscal baselines become uncertain, borrowing options narrow, foreign-exchange availability tightens, and medium-term planning horizons shorten. These effects can last for several budget cycles, particularly where restructuring negotiations are prolonged or where fiscal adjustment is implemented under external financing programs. As of late 2025, four countries have applied to the G20 Common Framework: Chad, Zambia, Ghana, and Ethiopia, with negotiation timelines extending well beyond initial expectations.

Debt distress affects biodiversity implementation through several mechanisms. Countries often lose affordable market access before entering a formal restructuring or IMF-supported program. IMF arrangements may then introduce limits on non-concessional external borrowing, while restructuring uncertainty and creditor negotiations further narrow the financing options available to line ministries and implementing agencies. In parallel, exchange-rate pressure and reserve scarcity can disrupt conservation operations that depend on imported inputs, including vehicles, fuel, monitoring equipment, and technical services, even where domestic-currency budget allocations have been approved and disbursed. The operational constraint operates through external account pressures rather than through the domestic budget envelope and is therefore not fully captured by aggregate fiscal indicators.

The result extends beyond diminished funding to lower predictability, a weaker capacity to plan across ecological timeframes, and greater difficulty sustaining implementation systems during precisely the period when environmental institutions may face heightened pressure. For biodiversity implementation, adjustment and restructuring create five specific challenges that compound fiscal compression.

- **Market access loss and financing-option narrowing:** Countries experiencing fiscal deterioration often face rising sovereign spreads, weaker investor demand, and effective loss of affordable access to commercial debt markets before formal restructuring begins. For biodiversity, this can make market-based instruments, including sovereign green or blue bonds and sustainability-linked instruments, unavailable or prohibitively expensive precisely when fiscal pressures are intensifying. Concessional multilateral and bilateral sources may remain available, but they are typically slower to mobilize,

limited in volume, and highly competitive across sectors. IMF-supported programs may further narrow the instrument set through limits on non-concessional external borrowing, including market-rate borrowing and sovereign-guaranteed structures, unless instruments are concessional, credit-enhanced, or otherwise compatible with program requirements.

- **Planning-horizon disruption:** Multi-year conservation, restoration, protected-area management, and ecosystem-monitoring programs require sustained funding commitments across planning periods that often span five to ten years or longer. During debt distress and restructuring, prolonged creditor negotiations, uncertain debt-treatment timelines, program reviews, and conditional fiscal targets can make medium-term budget planning unreliable. Line ministries and implementing agencies may be unable to project available resources beyond the annual budget cycle with confidence, encouraging defensive planning focused on institutional continuity and compliance with annual ceilings rather than longer-term ecosystem management objectives.
- **Foreign-exchange scarcity and operational disruption:** In debt-distressed economies, binding constraints on biodiversity implementation may arise not only from domestic-currency fiscal allocations but also from foreign-exchange availability. Conservation operations can depend on imported vehicles, fuel, monitoring equipment, veterinary supplies, communications technology, and specialized technical services. Where foreign exchange is rationed or prioritized for essential imports and debt-service needs, environmental agencies may find it difficult to convert approved domestic-currency allocations into operational capacity. This foreign-exchange channel is distinct from, but often interacts with, the domestic budget constraint.
- **Debt composition and resource-linked financing pressure:** Debt structure can shape how adjustment pressure affects biodiversity implementation. Where borrowing is denominated in foreign-currency, collateralized, or linked directly or indirectly to commodity export revenues, fiscal and external-liquidity pressure may become more closely connected to natural-resource use. Resource-backed loans and other collateralized arrangements are not a universal feature of debt distress, but where they are present, they can tighten the link between debt service, export generation, and pressure on biodiversity-relevant safeguards.[30] This reinforces the need to interpret adjustment episodes through debt structure as well as headline debt levels.
- **Crisis-driven extraction and degradation pressures:** In resource-dependent economies, fiscal and foreign-exchange pressure can increase incentives to expand export extraction, relax safeguards, or intensify household and firm reliance on ecosystems for income. These dynamics may involve governments, firms, and households responding to fiscal stress, price signals, livelihood pressures, or foreign-exchange needs. They should be treated as a context-dependent amplification mechanism, not as a universal outcome of debt distress.

The evidence on crisis and environmental degradation is mixed, which is why the mechanism requires careful interpretation. Economic downturns can reduce some forms of environmental pressure where demand contracts, but they can also increase degradation where enforcement weakens, resource dependence is high, foreign-exchange needs are acute, or households rely on forests, fisheries, land, and fuelwood as economic safety nets. For this study, the relevant point is not that all debt crises accelerate biodiversity loss, but that debt distress can create conditions under which biodiversity implementation is disrupted at the same time as degradation pressures intensify.

Box 3.2: Economic Crises and Environmental Degradation—What Does the Evidence Show?

Economic crises can intensify environmental degradation where fiscal pressure, foreign-exchange needs, weakened enforcement, and livelihood stress dominate. During the 1997–1998 Asian financial crisis, evidence from Indonesia points to a crisis configuration in which rupiah devaluation, relative-

[30] Yacouba Coulibaly, *"The Effects of Resource-Backed Loans on Deforestation: Evidence from Developing Countries*," World Development 188 (2025): 106905, https://doi.org/10.1016/j.worlddev.2024.106905.

price shifts, public-expenditure pressures, weakened enforcement, and rural coping strategies affected forest pressures in different directions. Pagiola's assessment does not claim a simple crisis-driven acceleration in measured deforestation; rather, it finds heterogeneous effects, with some pressures reduced and others intensified, and identifies weakened authority and enforcement in Indonesia as a particular source of concern.[31] COVID-19 provides a second illustration of the mechanism: while not a debt crisis, the pandemic disrupted monitoring, enforcement, and rural livelihoods in ways that increased illegal logging, mining, land conversion, and forest pressure in some contexts.[32] Recent evidence from the Peruvian Amazon finds that COVID-19 case intensity was associated with higher deforestation, especially in districts with coca production or illegal mining.[33]

Cross-national evidence also supports the possibility of crisis-driven degradation. Shandra et al. find that debt service and structural adjustment are associated with higher deforestation in a sample of poor countries, consistent with a mechanism in which countries expand commodity exports or resource extraction to generate foreign exchange and meet external obligations.[34] More recent work by Forster, Bhandary and Gallagher finds that IMF programs are associated with a 9.2 percent increase in annual tree-cover loss in low- and middle-income countries between 2000 and 2020.[35] The authors note that this association is not driven by explicit forest conditionality, since only 34 of 35,915 IMF program conditions over four decades relate directly to forest management, but by fiscal and external-sector reforms that can alter incentives for public expenditure, exports, and resource use.

Where demand contraction dominates the crisis configuration, environmental pressure may fall temporarily rather than rise. Antonarakis et al., using Global Forest Watch data for more than 150 countries and more than 100 financial crises, find that financial crises are associated at the global level with lower deforestation rates and reductions in several deforestation drivers, including roundwood, cattle, and cocoa production.[36] Pacca et al., examining 419 financial crises across more than 150 countries between 1970 and 2014, similarly find short-term reductions in CO_2, SO_2, and NO_x emissions, reflecting reduced industrial activity.[37] These results differ from the extraction- and enforcement-driven cases described above because the dominant mechanism is reduced demand rather than intensified resource extraction, weakened safeguards, or livelihood stress.

The empirical record therefore does not support a uniform claim that crises always accelerate degradation. It supports a conditional interpretation. Where fiscal pressure, foreign-exchange scarcity, enforcement disruption, commodity dependence, or livelihood stress dominate, crises can intensify degradation pressures. Where demand contraction dominates, environmental pressure may fall temporarily. For biodiversity implementation under debt distress, the relevant point is that adjustment

[31] Peter Dauvergne, "*The Environmental Implications of Asia's 1997 Financial Crisis*," IDS Bulletin 30, no. 3 (1999): 31–42; Stefano Pagiola, "*Deforestation and Land Use Changes Induced by the East Asian Economic Crisis"* (Washington, DC: World Bank, 2001); David L. A. Gaveau, Matthew Linkie, Suyadi, Patrice Levang, and Nigel Leader-Williams, *"Three Decades of Deforestation in Southwest Sumatra: Effects of Coffee Prices, Law Enforcement and Rural Poverty,*" Biological Conservation 142 (2009): 597–605.

[32] Pedro H. S. Brancalion et al*., Emerging Threats Linking Tropical Deforestation and the COVID-19 Pandemic*, *Perspectives in Ecology and Conservation* 18, no. 4 (2020): 243–246; Vibha Singhal et al., *COVID-19, Deforestation, and Green Economy*, Frontiers in Forests and Global Change 6 (2024): 1305779. These sources support the mechanism and review evidence of pandemic-linked forest pressure but should not be treated as uniform global causal evidence.

[33] Jerico Fiestas-Flores, Minoru Higa and Javier G. Montoya-Zumaeta, *COVID-19 Impacts on Amazon Deforestation*, *Trees, Forests and People* 20 (2025): 100888.

[34] John M. Shandra, Eran Shor, Gary Maynard and Bruce London, "*Debt, Structural Adjustment and Deforestation: A Cross-National Study*," *Journal of World-Systems Research* 14, no. 1 (2008): 1–21.

[35] Timon Forster, Rishikesh Ram Bhandary and Kevin P. Gallagher, "*Cutting Trees to Balance Budgets: International Monetary Fund Programs Are Associated with Increased Deforestation*," *One Earth* 9, no. 4 (2026): 101676.

[36] Alexander S. Antonarakis, Lucia Pacca and Andreas Antoniades, *The Effect of Financial Crises on Deforestation: A Global and Regional Panel Data Analysis*, Sustainability Science 17 (2022): 1037–1057.

[37] Lucia Pacca, Alexander S. Antonarakis, Patrick Schröder and Andreas Antoniades, "*The Effect of Financial Crises on Air Pollutant Emissions: An Assessment of the Short- vs. Medium-Term Effects*," Science of the Total Environment 698 (2020): 133614.

and restructuring can disrupt implementation capacity at the same time as degradation pressures increase in particular country contexts.

The evidence in Box 3.2 clarifies why crisis-driven degradation should be treated as conditional rather than universal. The relevant question for country interpretation is which disruption mechanisms dominate. Where acute fiscal and foreign-exchange pressure coincides with extractive revenue incentives, weakened safeguards, or livelihood stress, debt distress can amplify degradation pressures. Where those conditions are less prominent, the main constraint may instead be planning uncertainty, borrowing limits, and operational disruption.

Recent sovereign debt restructurings involving private creditors, including several cases associated with G20 Common Framework processes, show that debt-treatment processes can extend across several budget cycles as program reviews, creditor negotiations, debt-treatment assumptions, and financing restrictions evolve.[38] For biodiversity institutions, this matters because implementation plans, protected-area management, restoration programs, monitoring systems, and staffing decisions depend on predictable medium-term resources.

The country examples below illustrate two distinct configurations. Ghana illustrates a regulatory-pressure configuration: acute fiscal and foreign-exchange stress sharpened the political-economy trade-offs around resource extraction, including contested changes to mining rules affecting forest reserves. Ethiopia illustrates a planning-disruption configuration: prolonged debt-treatment uncertainty, weak revenue capacity, and foreign-exchange scarcity can constrain implementation planning and operational delivery even without an explicit regulatory rollback.

Box 3.3: Ghana: Debt Distress, Regulatory Pressure, and Forest-Reserve Risk

Ghana illustrates a regulatory-pressure configuration in which acute fiscal and foreign-exchange stress sharpened trade-offs around extractive activity, enforcement capacity, and forest-reserve protection. Public debt rose to levels assessed as unsustainable in 2022, market access was lost, the currency depreciated sharply, inflation surged, and the government suspended external debt service. An IMF-supported Extended Credit Facility was approved in May 2023, alongside domestic and external debt treatments. Although restructuring improved headline debt indicators, the post-restructuring fiscal path remained shaped by tight expenditure control, limited borrowing space, and continued pressure to restore foreign-exchange earnings.

The biodiversity-relevant mechanism is visible in the interaction between debt distress, gold-sector incentives, and forest-reserve governance. In November 2022, as Ghana entered default and restructuring negotiations, Legislative Instrument 2462 created a legal pathway for mining in forest reserves subject to presidential approval. The timing matters because the regulatory change occurred within the same period of acute fiscal stress in which Ghana was managing debt default, restructuring negotiations, foreign-exchange scarcity, and intensified pressure to restore export earnings. In the context of high gold prices, foreign-exchange needs, and enforcement challenges associated with illegal small-scale mining, forest-reserve protection became more exposed to short-term revenue and extractive-sector pressures.

The subsequent repeal of L.I. 2462 illustrates an implementation-relevant asymmetry. Regulatory openings can occur quickly during periods of fiscal and political pressure, while rebuilding

[38] International Monetary Fund, *A Stocktaking of the Current International Architecture for Resolving Sovereign Debt Involving Private Sector Creditors*, IMF Policy Paper No. 2025/034 (Washington, DC: IMF, 2025).

enforcement credibility, restoring degraded ecosystems, and re-establishing trust in forest-reserve protection takes longer. Ghana revoked L.I. 2462 in December 2025, after sustained public and civil-society pressure. The repeal narrowed one legal pathway for mining in forest reserves, but the broader pressures from illegal mining, water pollution, forest degradation, and cocoa-sector stress remain wider than the instrument itself.

For this study, Ghana's relevance lies in the configuration of pressures: debt distress, foreign-exchange scarcity, extractive-sector incentives, and weakened enforcement capacity operating within the same period. The case shows how debt distress can narrow the policy and enforcement space within which biodiversity safeguards operate, particularly in economies where export earnings and fiscal recovery are closely linked to natural-resource sectors. The reverse-channel implications of ecosystem degradation for export earnings, water-treatment costs, cocoa-sector resilience, and fiscal risk are addressed separately in Section 4.

Sources: IMF Article IV and DSA materials; national government debt and regulatory documents; relevant international organization reports; and cited media reporting. Full citations are provided in the References section.

Ethiopia illustrates a different adjustment configuration. Whereas Ghana shows how fiscal stress can sharpen extractive-sector and regulatory pressures, Ethiopia shows how prolonged debt-treatment uncertainty, weak revenue capacity, and external-liquidity pressure can complicate medium-term implementation planning.

Box 3.4: Ethiopia: Debt-Treatment Uncertainty, External Liquidity, and Implementation Planning

Ethiopia illustrates a planning-disruption configuration in which debt distress constrains biodiversity implementation through uncertainty over fiscal baselines, external financing assumptions, and debt-treatment terms. The relevant constraint is not a discrete change in biodiversity policy, but the difficulty of sustaining medium-term planning and operational delivery while fiscal stabilization and external-liquidity management remain dominant macroeconomic priorities.

Ethiopia requested treatment under the G20 Common Framework in February 2021, defaulted on its Eurobond coupon in December 2023, and entered a four-year IMF-supported Extended Credit Facility in July 2024. Official-creditor negotiations subsequently advanced, including a restructuring agreement covering approximately USD 8.4 billion in official debt and providing material debt-service relief through 2028. The private-creditor component, however, remained more difficult, with bondholder discussions continuing into 2026. This prolonged sequence matters for implementation because biodiversity programs depend on predictable planning horizons, not only on annual budget allocations.

The domestic fiscal constraint is reinforced by Ethiopia's narrow revenue base. Government revenue stood at approximately 9.2 percent of GDP in FY2024/25, down substantially from a decade earlier. In this setting, even moderate debt stocks can become binding when measured against the government's capacity to raise and allocate revenue. Biodiversity-related institutions therefore face a constrained budget environment in which staffing, patrols, monitoring systems, protected-area management, restoration activities, and inter-agency coordination must compete with stabilization priorities and other urgent expenditure demands.

External liquidity adds a separate operational constraint. Conservation delivery often requires imported vehicles, fuel, monitoring equipment, communications systems, veterinary supplies, and technical services. Where foreign exchange is scarce or prioritized for essential imports, debt service, and

macroeconomic stabilization, approved domestic-currency allocations may not translate into effective field capacity. This distinguishes Ethiopia from cases where the main constraint is simply the size of the domestic budget envelope.

Ethiopia's updated biodiversity planning architecture remains important. The country has long-standing biodiversity institutions and an updated National Biodiversity Strategy and Action Plan (NBSAP) aligned with the Kunming-Montreal Global Biodiversity Framework. The implementation challenge lies in the gap between policy ambition and fiscal-operational feasibility. In the absence of a protected medium-term financing envelope, biodiversity objectives remain vulnerable to annual budget negotiations, delayed releases, foreign-exchange shortages, and reliance on project-based partner financing.

For this study, Ethiopia shows how debt distress can shorten planning horizons and weaken operational predictability even without an explicit reversal of biodiversity policy. The case highlights a distinct form of adjustment and planning disruption: fiscal stabilization, debt treatment, and external-liquidity management can shape what biodiversity commitments are feasible to implement over the medium term.

Sources: IMF and World Bank debt-sustainability materials; national government biodiversity- planning and institutional documents; and cited reporting. Full citations are provided in the References section.

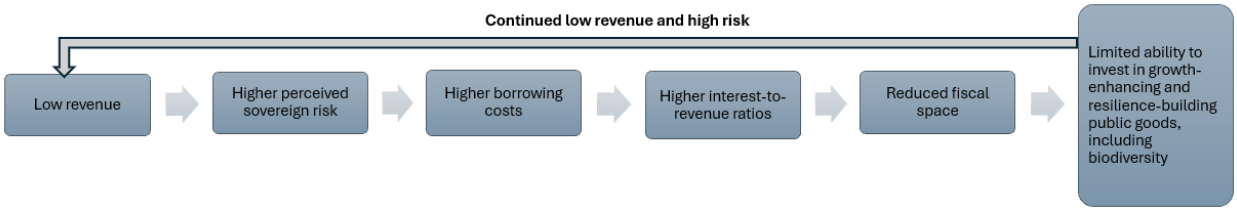
3.3 Revenue Constraints and When Moderate Debt Becomes Binding

A third transmission channel operates through the interaction between debt burdens and domestic revenue capacity. Countries with weak revenue mobilization face qualitatively different implementation constraints from countries with stronger fiscal bases, even where headline debt-to-GDP ratios are similar. This distinction is important for interpreting biodiversity implementation because what matters for discretionary spending is not debt stock alone, but debt service relative to the government revenue envelope within which biodiversity-related expenditure must compete.

This mechanism is particularly relevant for countries that appear only moderately indebted by conventional debt-stock metrics but face severe fiscal constraints in practice. Countries with weaker revenue bases can face disproportionately high interest burdens relative to government revenue, even where headline debt-to-GDP ratios appear moderate. This denominator effect reduces the revenue envelope available for discretionary public expenditure and is illustrated by the cross-country screening in Section 5.[39]

Fig 1. The Low-Revenue–High-Risk Fiscal Feedback Loop

How weak revenue mobilization, elevated borrowing costs, and debt service pressures reinforce constrained fiscal space and underinvestment in growth- and resilience-enhancing public goods.



This pattern has important implications for interpreting debt sustainability in the context of Convention implementation. Debt sustainability frameworks already include revenue-based indicators, but public discussion often gives disproportionate attention to debt-to-GDP ratios. For biodiversity implementation, this can be misleading. A country with moderate debt-to-GDP but very low revenue may have less practical

[39] Cross-country diagnostic analysis based on the 50-country dataset, supplemented by country-case interpretation; see Sections 5 and Annex B.

room for discretionary biodiversity expenditure than a country with higher debt but a broader revenue base, lower interest costs, or stronger budgetary institutions.

For biodiversity implementation, revenue constraints amplify fiscal pressure through several mechanisms:

- **Crowding within a narrow discretionary envelope:** When revenue is low relative to GDP, debt service, wages, statutory obligations, subsidies, and essential services absorb a large share of available resources. Biodiversity then competes in a residual envelope that may be small, volatile, or unprotected, even where headline debt ratios do not suggest acute distress.
- **Limited capacity to smooth implementation spending:** Countries with narrow revenue bases have less ability to maintain spending through economic downturns, disasters, or external shocks. When floods, droughts, cyclones, food-security pressures, or reconstruction needs arise, emergency spending can absorb a large share of the already limited discretionary envelope. Biodiversity budgets are therefore more exposed to pro-cyclical adjustment, with allocations and releases declining precisely when ecological, livelihood, and enforcement pressures may be rising. For Convention implementation, this can interrupt multi-year NBSAP delivery, delay restoration and monitoring programs, and weaken continuity in protected-area operations.[40]
- **Dependence on external financing**: Low domestic revenue increases reliance on bilateral grants, multilateral finance, and project-based support for biodiversity programs. This can provide important resources, but it also creates volatility, fragmentation, and exposure to donor priorities, especially where core recurrent costs for enforcement, monitoring, staffing, and protected-area management remain domestically underfunded.

Bangladesh illustrates this pattern. It shows how a country that appears only moderately indebted by headline metrics can face severe constraints on discretionary fiscal space because revenue mobilization is exceptionally low.

Box 3.5: When Moderate Debt Becomes Binding: Bangladesh

Bangladesh illustrates how moderate debt can become functionally binding when revenue capacity is very weak. Public and publicly guaranteed debt stood at around 41 percent of GDP in FY25, while revenue and grants were only about 8.0 percent of GDP. Tax revenue fell from 7.4 percent of GDP in FY24 to 6.9 percent in FY25, reflecting not only Bangladesh's long-standing structural revenue weakness but also a more recent cyclical shock associated with weakened compliance, subdued public-sector purchases, public unrest, and disruption at the revenue authority. Interest payments were approximately 2.3 percent of GDP, equivalent to 28 percent of government revenue and grants. Bangladesh therefore does not illustrate acute debt distress driven by an exceptionally high debt stock. It illustrates how a narrow and shock-sensitive revenue base can make moderate debt burdens binding for discretionary public expenditure, including biodiversity implementation under the Convention.

This framing is reinforced by the recent deterioration in Bangladesh's debt-risk assessment. The IMF and World Bank moved Bangladesh from low to moderate risk of external and overall debt distress in 2025, and subsequent assessment continued to emphasize limited space to absorb shocks. This matters for biodiversity implementation because a country can appear only moderately indebted by debt-to-GDP metrics while still having limited fiscal room to sustain discretionary public functions. In Bangladesh, protected-area management, enforcement, restoration, monitoring, biodiversity data systems, and inter-agency coordination must compete within a very narrow budget envelope, alongside interest payments, subsidies, wages, social expenditure, and other urgent claims on public resources.

[40] Expert Review on Debt, Nature and Climate, *Tackling the Vicious Circle: The Interim Report of the Expert Review on Debt, Nature and Climate*, Independent Expert Group co-chaired by Vera Songwe and Moritz Kraemer, October 2024; Expert Review on Debt, Nature and Climate, *Healthy Debt on a Healthy Planet: Towards a Virtuous Circle of Sovereign Debt, Nature and Climate Resilience*, Final Report, April 2025. The Expert Review was established in 2023 by the governments of Colombia, France, Germany and Kenya.

The revenue constraint affects implementation through three linked channels. First, debt service crowds into a narrow budget envelope, limiting predictable allocations for biodiversity-related public functions. Second, low revenue capacity reduces the government's ability to smooth spending through downturns, disasters, and external shocks. This is particularly relevant in Bangladesh, where natural-disaster stress tests materially worsen debt-service-to-revenue indicators. Emergency response, reconstruction, food-security support, and adaptation needs can absorb discretionary resources, increasing the risk that biodiversity programs are delayed, scaled back, or left dependent on annual budget negotiations. Third, weak domestic revenue capacity increases reliance on external and project-based finance. Such financing can support important biodiversity initiatives, but it may not reliably fund core recurrent costs such as staffing, enforcement, monitoring, and protected-area operations.

Bangladesh also shows a useful contrast between climate-related fiscal management and biodiversity finance. The country has developed climate-public-financial-management tools over time, including a Climate Fiscal Framework and climate budget tracking. Comparable biodiversity-finance tools are more recent. The BIOFIN Umbrella Programme was launched in 2025 to support biodiversity finance planning, including possible instruments such as biodiversity budget tagging, a National Biodiversity Trust Fund, eco-tourism revenue sharing, and payments for ecosystem services. For Convention implementation, the relevance is not that Bangladesh lacks biodiversity policy, but that the fiscal and budget-management architecture for translating biodiversity commitments into predictable financing remains less mature than the climate-finance architecture and is being developed in a period of tighter revenue, higher interest claims, and reduced shock-absorption capacity.

Bangladesh therefore shows why debt sustainability and Convention implementation should be interpreted through a revenue lens, not through debt-to-GDP alone. The constraint is not primarily the absence of biodiversity policy or an acute debt crisis. It is persistent fiscal rigidity: low revenue, recent revenue disruption, high interest claims on government resources, limited shock-absorption capacity, and reliance on project-based finance combine to reduce the scale, predictability, and durability of biodiversity implementation. The full Bangladesh country case, including institutional and implementation dynamics, is presented in Annex B5.

Sources: IMF and World Bank debt-sustainability materials; national government budget and biodiversity documents; and international organization reports. Full citations are provided in the References section.

3.4 Institutional Capacity, Execution, and Non-Fiscal Constraints

The fourth channel concerns institutional capacity and execution. Sections 3.1 to 3.3 describe how debt sustainability conditions can affect the size, predictability, and composition of fiscal space available for Convention implementation. This section addresses a separate but closely related question: whether fiscal space, once available, can be converted into biodiversity outcomes. The channel is therefore both mediating and boundary-setting. Institutional capacity can shape how debt-related fiscal constraints affect implementation, but institutional and governance constraints can also bind independently of debt sustainability.

This distinction is important for interpreting the debt-biodiversity relationship. Where biodiversity institutions are under-resourced, fragmented, or unable to absorb and execute funds, fiscal pressure can magnify existing implementation weaknesses. Where responsibilities are clear, management systems are protected, and accountability is strong, institutions may be able to sustain targeted implementation even under fiscal constraint. At the same time, weak enforcement, land-use governance failures, political-economy pressures, corruption, or uneven subnational execution can limit biodiversity outcomes even where the macro-fiscal position is not the binding constraint. Additional fiscal space may therefore be necessary for Convention implementation, but it is not always sufficient.

The academic literature supports this more nuanced interpretation. Recent work on external debt and natural-resource depletion finds that the debt-resource relationship is shaped by institutional and

governance conditions rather than operating through a simple mechanical fiscal channel. Cobbold and Acheampong, using panel data from 53 developing countries over 1998–2021, examine governance stringency as a mediating pathway between external debt and natural-resource depletion.[41] Other research on corruption, rent-seeking, and land conversion shows that weak governance and enforcement can intensify forest loss and illegal extraction, including independently of debt sustainability conditions.[42] The relevant point for this study is not that governance replaces fiscal analysis, but that governance and execution capacity can shape whether fiscal constraints become implementation constraints, and whether available financing produces durable biodiversity outcomes.

Several recurring patterns in the country evidence illustrate this interaction:

- **Resources without execution capacity:** In some countries, resources exist on paper but remain underutilized because of administrative bottlenecks, weak project pipelines, procurement delays, inter-governmental coordination failures, land availability constraints, or limited absorptive capacity. These cases show that the presence of budget allocations, environmental funds, or donor commitments does not guarantee implementation where the institutional machinery required to execute programs is weak.

- **Targeted effectiveness under fiscal constraint:** Even in fiscally constrained contexts, focused biodiversity programs can sometimes deliver measurable results where responsibilities are clear, political visibility is high, accountability is strong, and financing or management structures are ring-fenced. These successes are important, but they are often narrow in scope and difficult to scale across broader biodiversity portfolios.

- **Divergence under common fiscal conditions:** In federal or decentralized systems, subnational jurisdictions operating under similar macro-fiscal conditions may show wide variation in biodiversity outcomes. This divergence reflects differences in administrative capacity, political prioritization, enforcement credibility, and coordination between levels of government. It is especially relevant for protected-area management, restoration, land-use regulation, and enforcement against illegal extraction.[43]

- **Enforcement and political-economy constraints:** Biodiversity implementation often depends on enforcement against activities that are economically or politically powerful, including illegal logging, illegal mining, land conversion, wildlife trafficking, and encroachment into protected areas. Where enforcement institutions are weak, underfunded, or politically constrained, additional biodiversity allocations may have limited effect where the underlying governance constraints persist.

The interaction between fiscal and institutional constraints is therefore reinforcing rather than additive. Fiscal pressure can erode institutional capacity over time through staff attrition, deferred maintenance, delayed procurement, reduced training, and weakened monitoring and enforcement systems. Weak institutions, in turn, reduce absorptive capacity and make it harder to use available resources effectively. This creates a practical implementation problem: biodiversity agencies may face both inadequate resources and limited capacity to convert available resources into durable outcomes.

India illustrates why institutional capacity and execution need to be distinguished from debt distress. India has elevated public debt and large interest payments in the Union budget, but it retains strong market access

[41]Emmanuel Yamoah Cobbold and Theophilus Acheampong, *"External Debt and Natural Resource Depletion: Insights from Developing Countries,*" Economic Systems 50, no. 2 (2026).

[42]See, for example, Gregmar I. Galinato and Suzette P. Galinato, "The Short-Run and Long-Run Effects of Corruption Control and Political Stability on Forest Cover," *Ecological Economics* 89 (2013): 153–161, on the role of governance conditions in shaping forest-cover outcomes through agricultural land expansion; and Richard Damania, Jason Russ, David Wheeler and Alvaro Federico Barra, "The Road to Growth: Measuring the Tradeoffs between Economic Growth and Ecological Destruction," *World Development* 101 (2018): 351–376, on the trade-offs between road development, economic gains, deforestation and biodiversity risk in the Democratic Republic of the Congo.

[43]See the cross-country diagnostic analysis in Section 5 and the country-case interpretation in Annex B.

and does not face debt distress in the sense discussed in Sections 3.2 and 3.3.[44] Interest payments absorb approximately 24 percent of general government revenue, a substantial claim on the fiscal envelope that nonetheless coexists with continued market access.[45] This matters for fiscal prioritization, but India's biodiversity implementation challenge cannot be explained primarily as an acute sovereign-debt constraint. India's scale, federal structure, fragmented land-use governance, and uneven subnational capacity mean that biodiversity outcomes vary substantially across states, ecosystems, and programs.

Box 3.6: Fiscal Space Without Full Delivery: India's Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Paradox

India illustrates that fiscal space is necessary but not sufficient for biodiversity implementation. CAMPA is one of the largest dedicated conservation-finance mechanisms in the world. By March 2023, more than Rs. 55,000 crore had been transferred to states and Union Territories for compensatory afforestation and related activities. Yet implementation has not matched the scale of available finance. A Supreme Court-mandated Central Empowered Committee assessment found that around 85 percent of the compensatory afforestation area target had been achieved between 2019–20 and 2023–24, while only around 67.5 percent of CAMPA funds had been utilized.

The constraint in this case is not simply lack of fiscal resources. Fund utilization has been affected by administrative procedures, coordination between central and state authorities, land availability constraints, project preparation, monitoring systems, and absorptive capacity in implementing agencies. These institutional factors shape whether dedicated environmental finance can be converted into biodiversity-relevant delivery.

India also illustrates the opposite pattern: targeted programs can perform more effectively where institutional focus, monitoring, political visibility, and ring-fenced structures are stronger. Project Tiger is an important example. Tiger populations increased from approximately 1,400 in 2006 to a minimum estimate of 3,167 in the 2022 census, supported by sustained institutional attention, clear metrics, and dedicated implementation arrangements.

The contrast between CAMPA and Project Tiger is analytically important. It shows that biodiversity implementation cannot be reduced to the size of the fiscal envelope. Where institutional conditions are favorable, even targeted resources can support measurable outcomes. Where institutional bottlenecks bind, substantial dedicated funds can remain only partially utilized. For Convention implementation, the case illustrates that resource mobilization and execution capacity are connected dimensions of implementation.

Sources: National government and statutory-body materials, including CAMPA reporting, Central Empowered Committee assessments, and Comptroller and Auditor General audits. Full citations are provided in the References section.

Peru illustrates the complementary pattern, where fiscal headroom and environmental budget growth can coexist with persistent biodiversity outcome gaps. Peru's public debt is substantially below many regional peers,[46] and it does not face a binding macro-fiscal constraint comparable to the debt-distress or low-revenue cases discussed above. Yet biodiversity outcomes remain shaped by enforcement, land-use governance, and political-economy pressures in the Amazon. Illegal logging, illegal mining, agricultural

[44]IMF, *India: 2025 Article IV Consultation - Press Release; Staff Report; and Statement by the Executive Director for India*, IMF Country Report No. 25/314 (November 2025); IMF World Economic Outlook Database (October 2025 vintage). India is assessed as a market-access country at moderate risk of sovereign stress. General government gross debt (central plus state) is approximately 82 percent of GDP, while the authorities target central government debt of about 50±1 percent of GDP by FY2030/31.

[45]General government interest as a share of general government revenue (approximately 24 percent), IMF World Economic Outlook (October 2025 vintage), general-government basis; see Annex A. General government revenue includes state-level revenue, so this ratio is lower than interest measured against central-government revenue receipts alone.

[46]IMF, Peru: Article IV Consultation Staff Reports; Ministerio de Economía y Finanzas (MEF) fiscal data. Peru's general government gross debt at approximately 32 percent of GDP.

expansion associated with illicit economies, and agro-commodity expansion create pressures that cannot be addressed through conservation budgets alone.

The controversy around Law 31973, approved in January 2024 and amending Peru's Forestry and Wildlife Law, illustrates this point.[47] The amendments were criticized for weakening the legal framework governing land-use change, both by suspending forest-zoning requirements for enabling titles and by exempting certain agricultural land from classification requirements, which critics argued would regularize historical conversion. In February 2025 the Constitutional Court declared the suspension of the zoning requirement unconstitutional, while upholding the exemption and the transfer of forest categorization authority between ministries. The episode shows that legal and institutional choices can weaken biodiversity safeguards, and can partially correct them, without any change in fiscal conditions. Peru therefore demonstrates that additional fiscal resources, while important, may not translate into stronger biodiversity outcomes where the binding constraints are enforcement capacity, land-use governance and political economy.

For this study, the implication is that debt sustainability affects Convention implementation through fiscal space, planning horizons, revenue capacity, and institutional execution. These channels interact but should not be conflated. In some countries, the binding constraint is the resource envelope. In others, it is execution capacity, enforcement credibility, or land-use governance. In many cases, both are present: fiscal pressure weakens institutions, while weak institutions reduce the effectiveness of available finance. This interaction is relevant for diagnosing how debt sustainability conditions affect implementation of the Convention.

3.5 Summary: When and How Debt Sustainability Constrains Implementation

The preceding analysis identifies four analytical channels through which debt sustainability conditions can constrain biodiversity implementation under the Convention. The first three channels operate primarily through fiscal and macro-financial conditions: chronic fiscal compression, adjustment and planning disruption, and revenue constraints. The fourth channel, institutional capacity and execution, explains why those fiscal constraints do not translate mechanically into implementation outcomes. Together, these channels provide a diagnostic framework for interpreting when debt sustainability is likely to be a binding constraint on implementation, and when other institutional or governance factors may be more decisive.

- **Chronic fiscal compression:** High interest burdens reduce discretionary fiscal space over extended periods, systematically disadvantaging biodiversity expenditure that lacks statutory protection, political visibility, or strong execution mandates. This channel operates continuously in countries with elevated but sustainable debt, affecting implementation through gradual erosion of resources, staffing, maintenance, monitoring, and institutional capacity rather than through acute crisis.
- **Adjustment and planning disruption:** Debt distress, restructuring, and fiscal adjustment can shorten planning horizons, narrow financing options, disrupt foreign-exchange availability, and weaken operational predictability. This channel matters for Convention implementation because protected-area management, restoration, monitoring systems, enforcement, biodiversity data platforms, and inter-agency coordination require multi-year continuity. In some contexts, adjustment pressure may also interact with debt composition, commodity dependence, and weakened safeguards to intensify pressure on biodiversity-relevant institutions and ecosystems.
- **Revenue constraints**: Low revenue mobilization can make moderate debt burdens binding by producing high interest-to-revenue ratios and narrowing the discretionary budget envelope. This

[47]Law 31973 of 11 January 2024 (Soto-Cerrón Law), amending Forestry and Wildlife Law No. 29763 of 2011. The law reassigned forest categorization authority to the Ministry of Agriculture, suspended the forest-zoning requirement for the granting of enabling titles, and exempted certain agricultural land from classification requirements. For contemporaneous analysis see Environmental Investigation Agency (2024), Rights and Resources Initiative (2024), and the statement of the United Nations Special Rapporteur on the Rights of Indigenous Peoples (January 2024). By judgment of 25 February 2025 in Exps. 00002, 00003 and 00005-2024-PI/TC (consolidated), the Constitutional Court declared the First and Second Transitory Complementary Provisions unconstitutional on environmental-protection and prior-consultation grounds, while upholding the reassignment of categorisation authority and the exemption of certain agricultural land from classification requirements.

channel is especially important where debt-to-GDP ratios alone understate fiscal constraint. For Convention implementation, weak revenue capacity reduces predictable funding for core biodiversity functions, limits the ability to smooth spending through shocks, and increases reliance on external or project-based finance.

- **Institutional capacity and execution**: The translation of fiscal resources into biodiversity outcomes depends on mandate clarity, staffing, procurement systems, data infrastructure, enforcement credibility, and coordination across agencies and levels of government. Institutional capacity can amplify or dampen debt-related fiscal constraints, but institutional and governance constraints can also bind independently of debt sustainability. This channel therefore serves both as a transmission filter and as a boundary condition for the debt-biodiversity relationship.

These channels are not mutually exclusive. In many countries, they operate simultaneously and reinforce one another. Fiscal pressure can reduce institutional capacity through staff attrition, deferred maintenance, delayed procurement, and weaker enforcement. Weak institutions can then reduce absorptive capacity, making available finance harder to deploy effectively. Revenue constraints can intensify both fiscal compression and reliance on external project finance. Adjustment episodes can shorten planning horizons precisely when biodiversity institutions need continuity.

These four channels also clarify the limits of the debt-sustainability lens. Biodiversity outcomes are shaped not only by debt burdens, but also by land-use governance, enforcement credibility, political-economy pressures, fiscal-policy composition, subsidies, tax incentives, credit programs, and other public interventions. These factors may reinforce or offset debt-related pressures, but they are not always caused by debt sustainability conditions. The diagnostic task is therefore to identify which constraint is binding in each country's context: the resource envelope, financing predictability, revenue capacity, institutional execution, or wider governance and political-economy conditions.

Section 5 applies these four channels to the cross-country evidence, distinguishing countries where debt sustainability appears to be a primary constraint on Convention implementation from those where debt interacts with, but does not fully explain, biodiversity implementation challenges.

4. BIODIVERSITY OUTCOMES AND DEBT SUSTAINABILITY

The reverse channel: when ecosystem health becomes macro-critical

Section 3 examined the forward channel: how debt sustainability conditions can constrain implementation of the Convention through fiscal compression, adjustment and planning disruption, revenue constraints, and institutional capacity and execution. This section turns to the reverse channel: how outcomes associated with implementation of the Convention can affect debt sustainability.

The reverse channel is more conditional than the forward channel. Debt sustainability pressures can affect implementation of the Convention across a wide range of countries because public finance, planning horizons, revenue capacity, and institutional execution are central to implementation. By contrast, implementation outcomes affect debt sustainability only where they influence macro-fiscal variables at meaningful scale. The relevant question is therefore not whether convention implementation outcomes are environmentally or socially important, but whether they affect government revenues, foreign-exchange earnings, public expenditure, contingent liabilities, growth prospects, or sovereign risk perceptions.

These outcomes include better protection and management of ecosystems, reduced degradation, restoration of natural assets, more sustainable use of biodiversity-dependent sectors, improved resilience to climate and disaster risks, and stronger biodiversity governance and financing systems. Not all such outcomes have direct implications for debt sustainability. The reverse channel is strongest where these outcomes affect sectors, assets, or risks that are macroeconomically significant, particularly where nature-derived flows are not readily substitutable[48].

The analysis focuses on physical risks, where ecological and ecosystem-service outcomes are transmitted to fiscal and debt dynamics. Transition risks, where policy or market responses to biodiversity issues affect financial stability and sovereign creditworthiness, are an adjacent dimension of nature-related financial risk addressed in the NGFS and TNFD literature but lie outside this study's scope.

Three transmission pathways structure the analysis that follows. First, Convention implementation outcomes can affect nature-dependent revenues and foreign-exchange earnings, particularly where tourism, fisheries, forestry, agriculture, or other biodiversity-dependent sectors are fiscally or externally important. Second, ecosystem protection and restoration can affect fiscal risk and contingent liabilities by influencing exposure to disasters, coastal erosion, flooding, water stress, and other shocks that create public expenditure pressures. Third, sustained degradation or depletion of natural capital can affect long-term productivity, growth assumptions, and the credibility of debt-sustainability projections, particularly in economies where natural capital is a large share of national wealth.

This framing also clarifies the limits of the reverse channel. Biodiversity degradation can be severe without becoming a material driver of sovereign debt dynamics, particularly in large or diversified economies where nature-dependent sectors are macroeconomically smaller or where fiscal institutions can absorb localized losses. Conversely, in smaller, less diversified, or highly nature-dependent economies, Convention implementation outcomes may be directly relevant to debt sustainability because they affect export earnings, fiscal resilience, disaster exposure, and long-term growth. The analysis that follows therefore treats the reverse channel as conditional, context-specific, and dependent on the scale at which biodiversity-related outcomes enter the macro-fiscal accounts.

4.1 Nature-Dependent Revenues and Foreign Exchange

The first reverse channel operates through nature-dependent revenues and foreign-exchange earnings. Convention implementation outcomes can protect or restore the ecosystem services that support revenue-generating sectors, while implementation gaps or ecosystem degradation can reduce sector output, visitor spending, export earnings, or taxable income. This channel is relevant where tourism, fisheries, forestry,

[48]Neumayer (2025) provides the canonical treatment of strong sustainability and the limited substitutability between natural and produced or human capital.

agriculture, or other biodiversity-dependent sectors account for a significant share of GDP, government revenue, or external earnings.

This channel should be interpreted conditionally. Ecosystem degradation does not automatically translate into sovereign-debt stress. The debt-sustainability relevance of implementation outcomes depends on the scale of the affected sectors in the economy, the degree of tax, fee, or royalty capture by the sovereign (meaning the central government in its capacity as borrower), the foreign-exchange dependence of public debt, and the substitutability of nature-derived flows by other sources of revenue or external earnings. The channel is strongest where nature-dependent sectors are macroeconomically significant and where alternative sources of revenue or foreign exchange cannot readily fill the gap left by sector decline.

Tourism is the clearest illustration of this mechanism. In economies where reefs, beaches, marine biodiversity, forests, wildlife, or landscapes are central to destination competitiveness, ecosystem degradation can weaken the country's tourism value proposition, reduce visitor spending, and lower foreign-exchange inflows. The fiscal effects may appear through goods and services taxes, departure taxes, protected-area fees, corporate income taxes, employment-related taxes, and reduced activity in tourism-linked sectors. The channel is especially relevant for tourism-dependent small island developing States (SIDS), where tourism can account for a large share of GDP and foreign-exchange earnings. In these cases, the macro-fiscal issue is not that all tourism is biodiversity-dependent, but that ecosystem quality may be central to the revenue and foreign-exchange base that supports debt service.

The economic significance of reef- and mangrove-based tourism is reinforced by ecosystem-service valuations in Belize. Cooper, Burke and Bood's World Resources Institute assessment[49] estimated that reef- and mangrove-associated tourism contributed US$150–196 million to Belize's economy in 2007, equivalent to 12–15 percent of GDP, with additional contributions from reef- and mangrove-dependent fisheries and shoreline protection. The same study estimated the combined annual value of tourism, fisheries and shoreline protection services from coral reefs and mangroves at US$395–559 million. Coastal protection services have distinct fiscal implications and are examined in Section 4.2.

Fisheries present a parallel revenue and foreign-exchange channel. Where fisheries are economically significant, unsustainable harvesting, habitat degradation, destructive fishing practices, or loss of nursery ecosystems can reduce license revenues, landing fees, export earnings, and tax receipts from fisheries-related activity. The fiscal relevance is greatest where fish exports are an important source of foreign currency, where public revenues depend on fishing licenses or access agreements, or where fisheries support a large share of coastal employment and taxable activity. Food-security and livelihood impacts may also create expenditure pressures, but those effects are treated primarily under the fiscal-risk channel in Section 4.2.

The same revenue-based reverse channel can operate in commodity-producing economies where ecosystem services underpin export production. Agricultural exports may depend on pollination, soil fertility, water regulation, shade systems, and pest regulation. Forestry and agroforestry systems may depend on the maintenance of forest cover and watershed functions. Where these ecosystem services are degraded, export production can decline, foreign-exchange earnings can weaken, and state-linked marketing or stabilization systems may face financial pressure. Ghana's cocoa sector illustrates this mechanism outside the tourism-dependent small island developing States (SIDS) context.

Belize illustrates the revenue and foreign-exchange channel in particularly direct form, with reef-dependent tourism functioning as a central source of fiscal and external earnings and the channel reflected in policy through the 2021 Blue Bond transaction. The configuration is set out in Box 4.1.

[49]Emily Cooper, Lauretta Burke, and Nadia Bood*, Coastal Capital: Belize — The Economic Contribution of Belize's Coral Reefs and Mangroves* (Washington, DC: World Resources Institute, 2009).

Box 4.1: Ecosystems as Revenue Infrastructure: Belize

Belize illustrates the revenue and foreign-exchange pathway because reef and coastal ecosystem health are closely linked to tourism, external earnings, and public revenue. The Belize Barrier Reef, the second largest barrier reef system in the world, supports a tourism sector that is central to the country's economy. Tourism contributes approximately 40–46 percent of GDP and about 37 percent of national employment. An estimated 25 percent of tourism is directly reef-dependent, including diving, snorkeling and marine wildlife viewing.

The macro-fiscal transmission mechanism operates through several channels. Tourism activity generates goods and services tax receipts, departure taxes, protected-area and visitor fees, corporate taxes from tourism operators, and income taxes from tourism employment. It also generates foreign-exchange inflows that are important for a small open economy with a fixed exchange-rate peg to the US dollar and external debt-service obligations. Degradation of reef and coastal ecosystems would not eliminate all tourism activity, but it could reduce the value of the country's tourism offer, weaken visitor spending, and increase pressure on the balance of payments.

Belize's recent fiscal improvement illustrates why this channel matters, while also showing the need for careful attribution. The country recorded strong tourism recovery after the COVID-19 shock, with 562,405 overnight visitor arrivals in 2024, a record level. This recovery supported growth, foreign-exchange earnings, and fiscal consolidation, contributing to a marked reduction in public debt from a pandemic-period peak above 100 percent of GDP to approximately 61 percent by 2024. The improvement should not be attributed to reef health alone, but it demonstrates the macro-fiscal importance of tourism in Belize's debt trajectory.

The 2021 Blue Bond transaction further illustrates policy recognition of the reef-tourism-fiscal nexus. The transaction refinanced Belize's outstanding external commercial debt at a substantial discount and reduced public debt by approximately 12 percent of GDP, while creating long-term marine conservation commitments and financing arrangements. The structure did not prove a precise causal relationship between reef health and debt sustainability. Rather, it embedded the recognition that maintaining marine and coastal ecosystems is relevant to the economic base that supports tourism, foreign-exchange earnings, and sovereign repayment capacity.

Belize illustrates the channel in operation: a small open economy where ecosystem condition is closely linked to a major foreign-exchange sector, and where policy has explicitly recognized the link through the Blue Bond structure even in the absence of a precise causal estimate.

Sources: IMF Article IV materials; national tourism data; and conservation-finance case documentation. Full citations are provided in the References section.

Ghana illustrates the same channel in a commodity-export configuration, where forest-based ecosystem services support cocoa production and where degradation in cocoa-growing regions has affected export earnings, foreign-exchange availability, and the financial position of the state cocoa marketing board. The configuration is set out in Box 4.2

Box 4.2: Cocoa, Ecosystem Services, and Sovereign Exposure: Ghana

Ghana illustrates the revenue and foreign-exchange pathway through a commodity-export configuration distinct from the tourism-dependent SIDS case. Cocoa is Ghana's third-largest source of foreign exchange after gold and crude oil, generating around US$2 billion annually, and it supports

livelihoods for an estimated 800,000 farming households concentrated in Ghana's cocoa-growing regions.

The macro-fiscal transmission operates through ecosystem-dependent commodity production and a state-linked marketing system. Cocoa productivity depends on ecosystem services including pollination, soil fertility, water availability from forested watersheds, and natural pest regulation. The Ghana Cocoa Board (COCOBOD), the state-owned entity responsible for purchasing, marketing, and exporting cocoa, intermediates between farmers and global markets and has historically financed seasonal purchases through pre-export syndicated loans. Changes in production volume therefore transmit relatively directly to export earnings, foreign-exchange availability, and the financial position of a state-linked entity to which the sovereign is exposed.

Ghana's cocoa production fell from a recent peak of approximately 1.04 million tonnes to 530,873 tonnes in MY 2023/24, according to COCOBOD data reported by USDA/FAS. Reported production and purchase figures vary by source and accounting period. Multiple interacting drivers contributed to the decline: ageing tree stock and reduced replanting; swollen shoot virus and black pod disease, exacerbated by reductions in government-supplied inputs; climate stress; deforestation that reduced shade cover and pollinator habitat; water contamination from illegal small-scale gold mining, or galamsey, in cocoa-growing regions; and significant smuggling of cocoa to neighboring countries with higher farmgate prices. The decline is overdetermined by multiple non-fiscal drivers, with ecosystem degradation as one of several material factors.

The fiscal transmission to the sovereign operated through COCOBOD's financial position. The pre-export syndicated loan model on which the cocoa financing system had relied was disrupted during the crisis period: for MY 2024/25, COCOBOD did not raise a traditional pre-export syndicated loan for the first time since 1992 and shifted toward a trader-financing model. These dynamics generated contingent fiscal exposure for the sovereign through potential support to COCOBOD.

The EU is Ghana's largest cocoa export market. The EU Deforestation Regulation, the application of which has been delayed and is currently scheduled to apply to large and medium operators from 30 December 2026 and to micro and small operators from 30 June 2027, will require covered cocoa products placed on or exported from the EU market to be verified as not originating from land deforested since December 2020. Historic deforestation in cocoa-growing regions therefore translates, through this regulatory mechanism, into forward-looking compliance exposure for export earnings.

Ghana's cocoa-sector stress is not attributable to debt restructuring. Cocoa-sector stress cannot be reduced to a single driver. Ecosystem degradation, disease, climate stress, illegal mining, and smuggling each appears capable of materially weakening production or export performance, and together they reinforce the sector's fiscal and external vulnerability. This affects debt sustainability through export earnings, foreign-exchange availability, producer-financing arrangements, and associated fiscal risks, a transmission distinct from the restructuring mechanics examined in Box 3.3. The case indicates that ecosystem-dependent commodity production can affect sovereign debt dynamics through export earnings, foreign-exchange availability, and the financial position of a state-linked marketing entity, even where biodiversity does not appear directly as a budget line item.

Sources: National sector data (cocoa board and agricultural agencies); international organization datasets and regulation; and cited media reporting. Full citations are provided in the References section.

4.2 Ecosystem Protection, Fiscal Risk, and Contingent Liabilities

A second reverse channel operates through ecosystem-based risk-reduction services and their interaction with fiscal exposure to natural hazards. Convention implementation outcomes can maintain or restore ecosystems that reduce hazard exposure, attenuate disaster damage, and lower the public expenditure pressures and contingent liabilities that may arise when disasters strike. Implementation gaps or ecosystem

degradation can have the opposite effect, allowing higher wave energy, larger storm-surge penetration, more extensive flooding, faster coastal erosion, or greater landslide and runoff risk to reach exposed populations and infrastructure.

These services are particularly relevant for coastal and island economies, where coral reefs, mangroves, seagrass beds, and coastal wetlands function as natural protective infrastructure. Analogous risk-reduction services are provided by forest ecosystems in mountainous, urban, and peri-urban contexts, including slope stabilization, water-flow regulation, reduction of surface runoff, erosion control, and mitigation of landslide and flood risks.

The debt-sustainability relevance of this channel depends on disaster exposure, the size of fiscal buffers, the depth of insurance and contingency finance, the structure of public debt, and the degree to which built infrastructure can substitute for ecosystem-based protection. The channel is strongest in economies that face frequent and large climate-related shocks, hold limited fiscal buffers and rely on coastal or forest ecosystems whose protective services are difficult to replicate cost-effectively through engineered alternatives.

Scientific evidence on ecosystem protective services has become increasingly robust. Coral reefs reduce incoming wave energy by an average of 97 percent based on global meta-analysis, with reef crests dissipating most of this energy.[50] Mangrove forests provide complementary protection: a 100-metre-wide mangrove belt can reduce wave heights by 13–66 percent depending on forest density and wave conditions, while mangrove root systems trap sediments, stabilize coastlines, and provide nursery habitat for commercially important species.[51] Built substitutes such as seawalls, breakwaters, and revetments are costly to construct and maintain, and provide imperfect protection where they are deployed. Healthy reef and mangrove systems can therefore represent infrastructure-equivalent value that avoids government expenditure on built coastal infrastructure, disaster response, and post-disaster reconstruction. The loss of these protective services therefore reduces both a natural asset and an implicit avoided-expenditure stream that has fiscal significance even where ecosystem services do not appear directly in national accounts.

Belize, discussed in Section 4.1 as a revenue and foreign-exchange case, also illustrates the avoided-expenditure dimension of coastal ecosystems. Cooper, Burke and Bood's World Resources Institute assessment estimated that Belize's coral reefs provided US$120–180 million per year in avoided damages, while mangroves provided an additional US$111–167 million, yielding a combined shoreline-protection value of US$231–347 million per year.[52] These estimates cover only selected services and should be treated as a lower-bound estimate of reef and mangrove value. The analytical point here is that ecosystems support multiple fiscal functions concurrently. The same coastal systems can underpin revenue generation, foreign-exchange earnings, and avoided coastal-damage costs within the same country, and the channels operate together rather than as alternatives. Which channel is most consequential for debt sustainability in any given context depends on disaster exposure, the size of the revenue-generating sector, and the substitutability of natural protection through built alternatives. The infrastructure-equivalent value of intact reef and mangrove systems has also been the analytical basis for operational parametric insurance structures that explicitly insure ecosystems as fiscal-protection assets, with the Quintana Roo Coastal Zone Management Trust (Mexico, 2018) the operative precedent; the analytical placement of such instruments in the debt-biodiversity framework is set out in Section 6.4.

When protective ecosystems degrade through pollution, physical destruction for coastal development, climate-induced bleaching, land-use change, or other pressures, the loss of protective services can amplify the fiscal cost of disaster exposure. Emergency response and humanitarian relief expenditures may rise as storms cause greater damage. Reconstruction of public infrastructure, including roads, ports, utilities, and public buildings, can generate capital expenditure pressures financed through borrowing, grants, or

[50]Filippo Ferrario, Michael W. Beck, Curt D. Storlazzi, Fiorenza Micheli, Christine C. Shepard, and Laura Airoldi, "*The Effectiveness of Coral Reefs for Coastal Hazard Risk Reduction and Adaptation*," Nature Communications 5 (2014): 3794.
[51]Anna McIvor, Iris Möller, Tom Spencer, and Mark Spalding, *Reduction of Wind and Swell Waves by Mangroves, Natural Coastal Protection Series* (Cambridge: The Nature Conservancy and Wetlands International, 2012).
[52]Cooper, Burke and Bood 2009 (see Footnote 49).

reallocation of scarce fiscal resources. Revenue losses may follow disrupted economic activity, while social transfers and livelihood support requirements may increase for populations that lose homes, productive assets, or both. Contingent liabilities from state-owned enterprises and public utilities exposed to direct physical damage can also crystallize on the sovereign balance sheet. New borrowing typically rises where fiscal buffers, insurance payouts, and emergency grant support are insufficient to cover the combined cost. These channels are also relevant where revenue-side losses arise from ecosystem-services decline outside disaster contexts, including fisheries decline, watershed degradation, or pollinator loss, and they connect to the primary balance and the debt-stock dynamics treated in the transmission discussion that follows Section 4.3.

For countries with limited fiscal buffers or already-elevated debt levels, these disaster-related costs can materially affect debt-sustainability trajectories. A major event that would have caused moderate damage with intact reef, mangrove, wetland, or forest protection may cause significantly greater damage without that protection, potentially shifting a country's post-disaster fiscal position from manageable to sustained stress. The effect operates through both the level and volatility of public debt, and through the contingent-liability profile, rather than necessarily through average growth or revenue performance.

Repeated Shocks, Recovery Capacity, and the Debt Ratchet

In highly disaster-exposed economies, repeated shocks can interact with ecosystem degradation to generate a ratchet-like dynamic in public debt. When a major shock occurs, governments face immediate emergency spending and reconstruction needs financed through borrowing, grants, or reallocation of fiscal resources. Output and revenues may recover only partially before the next shock. Where subsequent disasters strike before full recovery, additional fiscal pressure is created and debt may ratchet upward. As coral reefs, mangroves, wetlands, forests, and other natural buffers deteriorate, disasters of comparable meteorological intensity can cause progressively greater damage to infrastructure, housing, and productive assets, raising emergency costs, reconstruction needs, and contingent liabilities even if hazard frequency and intensity remain unchanged.

This channel is partially reflected in standard debt-sustainability analysis through lower baseline growth assumptions and the inclusion of natural-disaster shocks in stress tests. The condition of natural protective ecosystems that shape the magnitude of disaster losses is, however, generally not explicitly incorporated as a determinant of damage severity. As a result, progressive ecosystem degradation can worsen debt trajectories in ways that current standard frameworks may not capture, even where fiscal policy and borrowing behavior remain unchanged.

Vanuatu illustrates this channel in a particularly direct form: an economy with exceptional disaster exposure, narrow fiscal buffers, ecosystem-dependent protective services, and debt-sustainability metrics shaped by repeated shocks. The configuration is set out in Box 4.3.

Box 4.3: Ecosystem Protection and Fiscal Risk in a Shock-Exposed Economy: Vanuatu

Vanuatu illustrates the fiscal-risk and contingent-liability pathway through one of the world's highest concentrations of natural-hazard exposure. The country is consistently ranked among the world's most disaster-exposed economies, with exposure to tropical cyclones, earthquakes, tsunamis, volcanic activity, and climate-related coastal pressures. World Bank modeling estimates that Vanuatu faces approximately US$48 million per year in expected asset losses from earthquakes and tropical cyclones alone, before accounting for the larger fiscal effects of individual extreme events.

The macro-fiscal transmission operates through ecosystem-dependent protective services and a narrow fiscal base. Coral reefs, mangroves, seagrass beds, coastal wetlands, forests, and watersheds help attenuate wave energy, reduce storm-surge penetration, stabilize coastlines, regulate water flows, and lower physical damage from extreme events. In an economy where engineered substitutes are costly

relative to GDP, fiscal buffers are limited, and the public sector bears substantial post-disaster recovery costs, the condition of these ecosystems can affect the fiscal severity of a given shock.

Recent major events illustrate the scale of the channel. Tropical Cyclone Pam in 2015 caused damage and losses of approximately US$450 million, equivalent to around 64 percent of GDP. Tropical Cyclone Harold in 2020 generated economic impacts of approximately US$617 million, equivalent to around 61 percent of GDP. In March 2023, two cyclones within 48 hours, followed by an earthquake, affected a large share of the population. A major earthquake struck Port Vila in December 2024. Each event created emergency response costs, reconstruction needs, and revenue disruptions, while several occurred before the effects of previous shocks had been fully absorbed.

The fiscal-risk channel is amplified by state-linked exposures and a narrow revenue base. Air Vanuatu entered liquidation in 2024, after which a creditor agreement and transfer to a government-owned vehicle reduced some immediate contingent-liability pressures but left continuing operational and guarantee-related risks. The Economic Citizenship Program has been an important but volatile revenue source and remains subject to external scrutiny. These pressures matter because they narrow fiscal buffers: where state-linked exposures and revenue uncertainty already constrain fiscal space, the value of ecosystem protection in limiting disaster damage becomes more macro-fiscally relevant.

Vanuatu's debt position reflects the cumulative effect of these pressures. The 2025 IMF Article IV consultation assesses public debt as sustainable but continues to classify the overall risk of debt distress as high, while external debt risk has eased to moderate following the Air Vanuatu creditor agreement, conservative external borrowing, and sustained donor support. The fiscal trajectory illustrates how natural disaster shocks, state-linked exposures, and limited revenue diversification can interact over time to shape debt-sustainability outcomes even where no single event immediately triggers distress.

The condition of Vanuatu's natural protective ecosystems is not separately captured in standard debt-sustainability analysis, although natural-disaster shocks are incorporated through stress tests and baseline growth assumptions. Vanuatu is also not covered by the World Bank's Changing Wealth of Nations 2024 dataset, so the natural-capital wealth metrics used elsewhere in this study are unavailable for this case. This does not imply that the channel is absent. It shows that part of the relevant fiscal-risk exposure sits outside conventional measurement frameworks.

Vanuatu's case illustrates a mechanism distinct from the revenue-and-foreign-exchange pathway examined in Section 4.1. The most important reverse-channel mechanism is fiscal-risk absorption: ecosystems help reduce the public cost of disasters and the contingent liabilities that follow. The channel is strongest in stress periods rather than in average annual revenue data, and its macro-fiscal relevance does not depend on the size of biodiversity-related budget allocations. In Vanuatu, the relevant asset is the protective function of ecosystems that reduces disaster-related fiscal volatility.

Sources: IMF and World Bank debt-sustainability materials; national post-disaster needs assessments; and international organization disaster-risk datasets. Full citations are provided in the References section.

4.3 Long-Term Productivity and Depletion of Natural Assets

A third reverse channel operates through natural assets and associated ecosystem services, productivity, and long-term growth. Convention implementation outcomes can help maintain the ecosystems and renewable natural assets that support agricultural productivity, fisheries, forestry, water regulation, soil fertility, pollination, and other inputs to production. Implementation gaps or ecosystem degradation can erode this productive base over time, lowering potential output, weakening export capacity, and reducing the future income and revenue base from which public debt is serviced.

This channel differs from the revenue and fiscal-risk pathways examined in Sections 4.1 and 4.2. The revenue channel operates through identifiable current flows such as tourism receipts, export earnings, and sector-linked tax revenues. The fiscal-risk channel operates through avoided expenditure, contingent

liabilities, and disaster-related borrowing. The renewable-natural-capital channel is more structural: it concerns the underlying ecosystem-linked asset base that supports future growth, fiscal capacity, and debt-carrying capacity. Its effects may be gradual, difficult to observe in annual budgets, and visible in macro-fiscal indicators only after depletion has already affected productivity, resilience, or external earnings.

Wealth-accounting approaches are useful in this context because GDP alone can mask depletion of the productive asset base. Current output may rise where forests are cleared, fish stocks are overharvested, soils are degraded, or other renewable natural assets are drawn down to generate income. In such cases, near-term GDP may overstate the sustainability of future growth. The World Bank's Changing Wealth of Nations 2024, which covers 151 countries between 1995 and 2020, addresses this problem by treating natural capital as one component of comprehensive national wealth, alongside produced capital, human capital, and net foreign assets. For this study, the relevant focus is the renewable natural capital component, because it is more closely connected to ecosystem services, biodiversity-related production systems, and the renewable asset base that Convention implementation seeks to protect.

CWON 2024 documents a broad erosion of renewable natural wealth between 1995 and 2020. Renewable natural capital per capita fell globally by more than 20 percent, while the land-based asset categories measured by the World Bank declined by roughly 18–28 percent over the period. The World Bank's current CWON 2024 summary reports that the real value of marine fish stocks fell by more than 25 percent since 1995. Hydropower was the principal exception, increasing by 23 percent.[53] This pattern contrasts with the growth in produced capital and, to a lesser extent, human capital, indicating that renewable natural assets have not kept pace with population growth or asset accumulation elsewhere in the portfolio. Over the same period, real comprehensive wealth per capita increased by approximately 21 percent globally, but more than 25 percent of countries recorded positive GDP-per-capita growth while their real wealth per capita declined. This divergence indicates that in a significant subset of countries, measured economic growth has not been matched by expansion of the underlying productive asset base. In wealth-accounting terms, this corresponds to consumption of capital recorded as income, a pattern that is not sustainable over sufficiently long horizons.

This distinction matters for debt sustainability because debt-carrying capacity depends on future income, not only on current output. A growth path that relies on depletion of renewable natural capital may temporarily support GDP, exports, or public revenue while weakening the asset base that supports those flows over time. The fiscal effect may not appear immediately. It can emerge later through lower agricultural yields, depleted fisheries, reduced forest productivity, water insecurity, higher production costs, lower export competitiveness, or weaker resilience to climate and environmental shocks. Conventional debt-sustainability assessments project future GDP paths largely on the basis of historical growth trends, then evaluate whether projected revenues can service accumulated debt. Where historical growth has been achieved partly through depletion of renewable natural capital, projecting those rates forward without adjustment may implicitly assume that similar growth can continue without accounting for the declining asset base. Debt-sustainability assessments that do not consider natural capital trajectories may therefore overestimate long-term growth potential and underestimate debt-related risks in resource- and nature-dependent economies, with consequences for the perceived feasibility of sustained Convention implementation. Renewable-natural-capital depletion can affect debt sustainability through the denominator and revenue-base channels: lower potential output, weaker tax capacity, reduced external earnings, and diminished resilience to shocks. Global modeling discussed in Section 2.4 illustrates the scale of potential output effects under partial collapse scenarios for selected ecosystem services.

The macro-fiscal effects of depletion may also be non-linear. The Dasgupta Review describes biodiversity as prone to tipping points and irreversible changes: as ecosystems approach critical thresholds, gradual depletion can produce discontinuous declines in the services they provide.[54] Ecosystem degradation can accumulate gradually without visible effects on fiscal indicators until ecological thresholds are crossed, after which losses in productivity, food supply, water regulation, fisheries, forest services, or resilience may

[53]World Bank, *The Changing Wealth of Nations 2024: Revisiting the Measurement of Comprehensive Wealth* (Washington, DC: World Bank, 2024).
[54]Partha Dasgupta, *The Economics of Biodiversity: The Dasgupta Review* (London: HM Treasury, 2021).

materialize abruptly. Examples documented in the ecological-economics literature include the collapse of commercial fisheries following sustained over-exploitation, the loss of pollinator services after sustained habitat conversion, and the conversion of forest landscapes from net carbon sinks to net sources following deforestation and degradation. For sovereign debt sustainability, the implication is that the natural-capital channel may show limited macro-fiscal effect during long periods of gradual depletion and then deliver a discontinuous growth, revenue, or expenditure shock when a threshold is crossed. These threshold effects are difficult to incorporate into standard debt projections, which generally rely on baseline growth, revenue, and expenditure paths rather than ecological regime shifts.

The risks may also extend beyond national borders. Ecosystem-service losses can affect shared watersheds, migratory fish stocks, regional food markets, commodity supply chains, disease dynamics, migration pressures, and cross-border livelihood systems. These spillovers do not automatically create sovereign debt stress, but they can become macro-fiscally relevant where they affect growth, external balances, food-import needs, fiscal revenue, public expenditure, or borrowing requirements. For this study, the relevant issue is not the existence of cross-border ecological effects in general, but whether they are large enough to affect the fiscal or external variables through which debt sustainability is assessed.

The study's empirical screening provides a diagnostic illustration of structural exposure. In the country sample, high dependence on renewable natural capital often coincides with weaker revenue capacity, suggesting that some of the countries most reliant on renewable natural assets also have less fiscal capacity to maintain them. This finding does not establish causal evidence that biodiversity loss has worsened debt sustainability. It identifies a configuration of vulnerability: renewable natural capital is economically important, fiscal capacity is limited, and the public sector may be poorly positioned to finance the conservation, restoration, and management needed to sustain the productive base. This interpretation requires caution because renewable-natural-capital indicators do not measure biodiversity health directly. The renewable natural capital components used in the study capture ecosystem-linked assets and services such as agricultural land, forests, fisheries, mangroves, timber, non-wood forest products, forest recreation, and forest water services. These indicators are closer to the biodiversity-relevant asset base than aggregate natural-capital measures that include fossil fuels and minerals, but they still do not measure species abundance, ecosystem condition, habitat integrity, or management effectiveness directly. For this study, renewable natural capital is therefore used as a screening tool for structural exposure to ecosystem-service depletion, not as a biodiversity-performance measure.

The debt relevance of this depletion of natural assets depends on scale and transmission. If ecosystem degradation lowers agricultural productivity, reduces fish stocks, weakens water security, raises input costs, undermines land productivity, or reduces export competitiveness, the economy's capacity to generate the resources needed for debt service may decline. In countries with already weak revenue systems, even modest reductions in growth or taxable income can become binding. The channel therefore remains conditional. Dependence on natural assets and associated ecosystem services does not automatically imply sovereign debt vulnerability, and biodiversity loss does not mechanically produce macro-fiscal stress. The debt relevance depends on the scale of ecosystem-service dependence, the availability of substitutes, the structure of exports and public revenue, the strength of institutions, and the ability of the economy to diversify or reinvest. The same caution applies to tipping-point and cross-border effects. They strengthen the case for screening renewable-natural-capital risks in macro-fiscal analysis, but they should not be treated as automatic debt-sustainability shocks unless a plausible transmission to growth, revenue, exports, expenditure, or contingent liabilities can be identified.

The Changing Wealth of Nations 2024 explicitly addresses limited substitutability as a methodological consideration in wealth accounting, acknowledging that declines in natural capital cannot always be offset by accumulation of other asset categories, and that strong-versus-weak sustainability questions remain analytically open.[55] In contexts where substitution is limited, Convention implementation outcomes can influence debt sustainability primarily through their effects on long-term growth potential rather than through short-term fiscal flows. The analytical implication is that renewable-natural-capital indicators

[55]World Bank, *The Changing Wealth of Nations 2024: Revisiting the Measurement of Comprehensive Wealth* (Washington, DC: World Bank, 2024).

should be used to identify where closer macro-fiscal scrutiny is warranted, not to infer debt risk on their own. This channel helps explain why Convention implementation outcomes may matter for long-term debt sustainability in some countries while remaining weak or indirect in others.

4.4 Transmission to Debt Dynamics and Sovereign Risk Pricing

The preceding sections identify three pathways through which Convention implementation outcomes can become relevant to debt sustainability: nature-dependent revenues and foreign exchange; ecosystem protection, fiscal risk, and contingent liabilities; and long-term productivity linked to renewable natural capital. This section translates those pathways into the debt-dynamics variables through which macro-fiscal relevance is assessed.

For this purpose, several terms are used in a specific macro-fiscal sense:

- *Primary balance* refers to government revenue minus non-interest expenditure. It shows whether the government is borrowing to finance current spending before interest payments are counted.
- *Debt stock* refers to the total outstanding amount of public debt.
- *Debt-service burden* refers to interest and principal payments due on existing debt.
- *Economic growth* affects the size of the economy relative to the debt stock. Slower growth can worsen debt ratios even if borrowing does not increase.
- *External balances and foreign exchange earnings* affect a country's capacity to service foreign-currency debt.
- *Contingent liabilities* are potential obligations that may fall on the sovereign if a shock, guarantee, public utility, state-owned enterprise, or other state-linked entity requires support.
- *Borrowing costs* refer to the interest rates governments pay on new or refinanced debt, including the risk premium investors demand to hold sovereign debt. In debt-dynamics analysis, the relevant issue is often whether the effective interest rate on public debt is higher or lower than the economy's growth rate.

The reverse channels enter debt dynamics through five main routes: the primary balance, the growth denominator, external earnings, contingent liabilities, and borrowing costs.

1. **Primary-balance effects**: Biodiversity outcomes can affect the primary balance through both revenue and expenditure. On the revenue side, ecosystem degradation may reduce tourism receipts, fisheries income, commodity exports, agricultural output, protected-area fees, or other taxable activity in nature-dependent sectors. On the expenditure side, degradation may increase emergency response costs, reconstruction needs, social transfers, public-health costs, water-treatment costs, ecosystem-restoration costs, or support to affected households and firms. Where governments have limited ability to cut other spending or raise alternative revenue, these effects can widen the primary deficit and increase borrowing needs.
2. **Growth and denominator effects**: Debt sustainability is usually assessed in relation to GDP because the debt-to-GDP ratio compares the debt stock with the size of the economy that supports it. If ecosystem degradation reduces output growth, the debt ratio can worsen even without a large increase in new borrowing. This is the denominator effect: the debt stock may be unchanged, but GDP grows more slowly or declines. The channel is strongest where agriculture, fisheries, forestry, tourism, water-dependent production, or other nature-linked sectors account for a significant share of output, exports, employment, or taxable income.
3. **External-balance and foreign-exchange effects**: Many developing countries service part of their debt in foreign currency. In such cases, the capacity to earn or access foreign exchange is central to debt sustainability. Biodiversity outcomes can matter where ecosystem degradation reduces tourism receipts, fish exports, agricultural exports, or other nature-dependent sources of foreign exchange, or where degradation increases food, fuel, water, or reconstruction-related imports. This channel is particularly relevant where public debt has a significant foreign-currency component, reserves are limited, or exchange-rate depreciation would increase the local-currency cost of external debt service.

4. **Contingent-liability and shock-financing effects**: Some biodiversity-related fiscal risks do not appear as public debt until a shock occurs. Disaster losses, damage to public utilities, support for state-owned enterprises, guarantees to public infrastructure providers, or emergency assistance to subnational governments and households may crystallize as public obligations only after an event. Ecosystem degradation can increase the probability or severity of such obligations where reefs, mangroves, wetlands, forests, watersheds, or other ecosystems normally reduce physical damage. This is why protective ecosystems can matter for debt sustainability even when biodiversity expenditure itself is small relative to GDP.
5. **Interest-rate and risk-premium effects**: Biodiversity-related risks may affect sovereign borrowing costs where investors, credit-rating agencies, or official lenders view them as material to growth, fiscal resilience, external earnings, or default risk. Higher borrowing costs then feed back into debt dynamics by increasing the interest bill and reducing the fiscal space available for other priorities. The Network for Greening the Financial System (NGFS) has developed analytical frameworks for assessing nature-related financial risks, and a small but growing body of empirical work has begun to examine whether biodiversity-related considerations are reflected in sovereign credit ratings and bond pricing. This channel is still emerging and should be interpreted cautiously, but it indicates how biodiversity-related risks may move from physical or fiscal exposure into market pricing.

The relative importance of these five transmission routes varies by country context. In highly nature-dependent small economies, the primary-balance impact through revenue effects may be dominant and relatively immediate. In countries with growth models built substantially on nature-dependent sectors, the growth and denominator effect may be most consequential over medium-term horizons. The external-balance channel is most relevant for countries with material foreign-currency debt and limited reserves. Contingent-liability effects are most relevant for highly disaster-exposed countries with narrow fiscal buffers, as illustrated by the Vanuatu case in Section 4.2. The interest-rate channel is likely to be most relevant for countries near market-access thresholds, where marginal changes in perceived risk can significantly affect refinancing capacity.

Emerging empirical evidence suggests that the interest rate channel may already be observable in market data, with biodiversity indicators showing signs of incorporation into sovereign credit ratings and credit default swap pricing. The evidence is set out in Box 4.4.

Box 4.4: Market Pricing of Biodiversity-Related Sovereign Risk

The interest-rate channel mapped in the preceding subsection operates through investor perceptions of nature-related risk. A small but growing empirical literature, distinct from the forward-looking stress tests reviewed in Section 2.4, examines whether these perceptions are already reflected in sovereign credit markets under current conditions.

Şeker and İşgüven (2025), using cross-country sovereign credit-score data and generalized method of moments estimation, find that biodiversity indicators are statistically associated with sovereign credit scores after controlling for standard macroeconomic and institutional determinants. The relationship is nuanced and varies across country groups and credit-rating levels, but the finding suggests that biodiversity-related conditions may already be correlated with factors reflected in sovereign credit assessments.

Separately, Giglio, Kuchler, Stroebel, and Wang (2024) find that sovereign credit default swap spreads widen in response to negative biodiversity news, with larger effects for countries whose ecosystems are already more depleted. This market response is consistent with investors revising sovereign risk assessments in light of nature-related information, particularly where ecological buffers are thinner.

Taken together, these findings indicate that the interest-rate channel mapped above is not purely hypothetical. Market participants appear to be beginning to price biodiversity-related risks into sovereign debt valuations, even in the absence of formal nature-adjusted sovereign-risk methodologies. The empirical literature remains young, and the measured effects should be interpreted

cautiously. Its significance lies in showing that biodiversity-related sovereign-risk pricing is observable, not only modelled in forward-looking stress tests.

Sources: Şeker and İşgüven (2025); Giglio, Kuchler, Stroebel, and Wang (2024). See References for full citations.

The evidence in Box 4.4 supports a limited conclusion. Biodiversity-related risks may already be visible in some sovereign-risk measures, particularly where they are perceived to affect output, fiscal resilience, or default risk. The next section sets out the boundary conditions for this interpretation: biodiversity outcomes do not become debt-relevant simply because they are ecologically significant, but where their transmission to growth, revenue, expenditure, foreign exchange, contingent liabilities, or borrowing costs is material at sovereign scale.

4.5 Limits and Non-Cases: When Convention Implementation Outcomes Are Not Macro-Fiscally Material

The channels examined in Sections 4.1 through 4.4 describe how Convention implementation outcomes can become macro-fiscally relevant in affected economies, but they do not establish that all such outcomes are macro-fiscally material. Analytical discipline requires identifying where these channels are weak, diffuse, buffered, or not observable at sovereign scale as clearly as identifying where they do bind, in order to avoid overstating the relevance of biodiversity outcomes in contexts where their effects remain limited to local, sectoral, or regional scales. The "non-case" classification developed in this section reflects observed-channel analysis under current conditions. It does not preclude material transmission under nature-collapse or tipping-point scenarios where threshold dynamics and non-equilibrium effects may operate through different mechanisms than those captured in the observed-channel framework.

Convention implementation outcomes materially affect debt sustainability only where specific structural conditions are present. These include high economic dependence on nature-based activities for output, employment, or foreign exchange; significant disaster exposure in which ecosystems provide sovereign-scale protective services; or trajectories of renewable natural capital depletion that materially affect medium-term growth potential. Where these conditions are absent, biodiversity loss may generate substantial environmental and social costs without transmitting meaningfully to aggregate fiscal balances or debt dynamics. In countries with strong substitution capacity, where engineered infrastructure can replace natural protection cost-effectively, where economic diversification away from nature-dependent sectors is feasible, and where fiscal buffers cushion revenue volatility, the macro-fiscal materiality of the channels examined in Sections 4.1 through 4.4 is reduced.

One class of non-cases consists of large, diversified economies. In such contexts, biodiversity degradation may affect specific regions or sectors but is diluted at the sovereign level by economic scale, sectoral diversification, and broad revenue bases. Aggregation across multiple growth engines limits the extent to which nature-related shocks can generate concentrated fiscal or debt effects, even where environmental degradation is extensive.

This boundary condition concerns sovereign-scale macro-fiscal transmission and not biodiversity significance. For mega biodiverse non-case economies that host ecosystems of global significance, the consequences of degradation extend beyond national borders through climate regulation, pollination, food-system resilience, and other ecosystem services of global reach, with relevance for implementation of the Kunming-Montreal Global Biodiversity Framework that is analytically distinct from the macro-fiscal channels examined here.

A second class of non-cases reflects deep fiscal buffers and strong market access, rather than economic structure alone. Countries with low debt burdens, ample reserves, diversified financing sources, and sustained access to capital markets can absorb sizeable nature-related shocks without triggering debt-sustainability concerns. A disaster imposing fiscal costs equivalent to 10 percent of GDP may be

manageable for a country with low debt, strong buffers, and recovery capacity, while the same shock could be destabilizing for a highly indebted economy with limited market access. In this sense, the reverse channel interacts with existing fiscal conditions rather than operating independently of them.

A third class of non-cases reflects the structure of fiscal capture itself. Where nature-dependent activities are predominantly informal, subsistence-based, or otherwise outside the tax base, biodiversity loss can impose severe costs on households and communities without generating proportionate effects on government revenue, public expenditure, foreign-exchange earnings, or other macro-fiscal indicators. In such contexts, the absence of macro-fiscal transmission reflects the structure of the formal economy rather than the absence of harm. The reverse channels examined in Sections 4.1 through 4.4 operate through fiscal flows and formal sector activity; degradation that bypasses those flows can be ecologically and socially severe while remaining macro-fiscally weak in observed indicators.

A fourth class of non-cases relates to geography and disaster exposure. Countries with limited exposure to recurrent disasters face reduced relevance of the disaster-risk amplification channel examined in Section 4.2, although forest, watershed, and freshwater ecosystem degradation can generate analogous, generally smaller-scale fiscal risks in inland and mountainous contexts. The disaster amplification mechanism therefore requires both exposure to recurrent hazards and the presence of protective ecosystems and is geographically concentrated.

The non-case classification reflects observed-channel analysis under current conditions and is bounded by two further analytical considerations. First, the tipping-point and irreversibility dynamics discussed in Section 4.3 may operate through threshold mechanisms not captured in observed market or fiscal data. Countries classified as non-cases under current conditions may face material macro-fiscal consequences under nature-collapse or systemic ecological breakdown scenarios. Second, the cross-border spillover effects identified in Section 4.3 mean that the protective conditions of one country's ecosystem services can affect another country's debt sustainability through trade, food prices, shared ecosystems, or migration pressures. A country may therefore be a non-case for its own biodiversity outcomes but a recipient of macro-fiscal effects originating in other countries' biodiversity outcomes. Neither consideration overturns the observed-channel non-case classification, but both indicate that the classification is bounded in time and in scope.

India illustrates several of these conditions in combination: a megadiverse economy with extensive environmental degradation but limited macro-fiscal transmission through the reverse channels examined in Sections 4.1 through 4.4. The configuration is set out in Box 4.5.

Box 4.5: Biodiversity Loss with Limited Sovereign Debt Transmission

India illustrates a context in which Convention implementation outcomes, while environmentally, socially, and economically significant at sectoral and local levels, have limited transmission to sovereign debt dynamics through the observed reverse channels examined in Sections 4.1 through 4.4.

India is one of the world's recognized megadiverse countries and faces substantial biodiversity pressures across multiple ecosystems. Forests in the Western Ghats, Himalayan ecosystems, mangrove systems, grasslands, freshwater systems, and coastal and marine ecosystems all face documented pressures, with significant implications for local livelihoods, food security, water security, health, and ecosystem services. These impacts are real and consequential at subnational and community levels.

The revenue and foreign-exchange channels examined in Section 4.1 are limited by India's economic structure and diversification. Agriculture, forestry, and fishing contribute approximately 16 percent of GDP, with the long-term share declining as the economy has shifted toward services and manufacturing. Tourism is large in absolute terms, but it is not predominantly ecosystem-dependent in the sense observed in reef- or nature-based small island economies. Demand is driven substantially by cultural heritage, religious pilgrimage, urban centers, domestic tourism, and business activity.

Fisheries contribute around 1 percent of GDP. Even substantial biodiversity-related pressures in these sectors are therefore unlikely to generate a single concentrated fiscal or foreign exchange shock at the national level under currently observed channels. The informal and subsistence character of much agricultural activity in India further weakens fiscal transmission: approximately 45 percent of the workforce is employed in agriculture and allied activities, while the sector contributes only about 16 percent of GDP, indicating a large component of activity that is not fully captured in tax flows or formal-sector indicators.

Renewable natural-capital indicators can still flag structural exposure, but they do not by themselves establish sovereign-scale debt transmission. Aggregate natural capital constitutes approximately 37 percent of India's total wealth under the World Bank's Changing Wealth of Nations 2024 framework, but the share is dominated by agricultural land and subsoil assets rather than ecosystems that generate large foreign-exchange flows or sovereign-scale disaster protection. In India, the relevant renewable-natural-capital exposure is mediated through agricultural land, forests, fisheries, water systems, and ecosystem services that support livelihoods and regional productivity. These assets are important for welfare, food security, and subnational development, but the mechanisms through which Convention implementation outcomes would transmit to sovereign debt dynamics remain diluted by economic scale, sectoral diversification, domestic financing depth, and the absence of a single nature-dependent sector large enough to dominate national revenue, exports, or debt-service capacity.

The fiscal-risk channel examined in Section 4.2 is also more diffuse than in highly disaster-exposed small island economies. India is exposed to floods, droughts, cyclones, heat stress, landslides, coastal erosion, and water stress, and ecosystems such as mangroves, forests, wetlands, and watersheds provide important protective services. However, disaster impacts are distributed across a large federal system and mediated through national, state, local, and sectoral institutions. A single ecosystem-related disaster shock is therefore less likely to dominate the national debt trajectory, although it may be highly material for affected states, cities, communities, or infrastructure systems.

India therefore illustrates a critical boundary condition for the reverse channel. Severe biodiversity degradation can coexist with limited observed macro-fiscal transmission where economic diversification, scale, domestic financing depth, and revenue structure prevent environmental shocks from becoming sovereign debt risks at the national level. This is a statement about sovereign-scale debt transmission, not about biodiversity significance.

The preceding analysis examines currently observed transmission channels under prevailing economic and ecological conditions. Scenario-based modeling of sovereign creditworthiness under partial nature-collapse conditions can reach different conclusions because it examines stress scenarios in which threshold dynamics and ecosystem-service collapse overwhelm existing buffers. For example, Agarwala, Burke, Klusak, Kraemer, and Volz (2022) find that India would fall four notches on the 20-notch credit-rating scale by 2030 under a partial ecosystems collapse scenario of fisheries, tropical timber production, and wild pollination. The observed-channel analysis and the scenario-based analysis are therefore analytically distinct and complementary. The former examines how current biodiversity dynamics transmit through revenue, fiscal-risk, external-balance, productivity, and pricing channels at sovereign scale. The latter examines projected creditworthiness effects under extreme nature-collapse conditions. The non-case classification in this section is therefore conditional on the observed-channel framework and prevailing macro-fiscal structure. Under scenario-based or tipping-point conditions discussed in Section 4.3, the assessment could differ materially.

Sources: National reporting to the Convention; World Bank dataset; IMF Article IV materials; and cited academic literature. Full citations are provided in the References section.

The analysis in this section shows that Convention implementation outcomes can affect debt sustainability through identifiable macro-fiscal pathways, but only under specific structural conditions. The strongest reverse-channel cases arise where ecosystem services are material to sovereign-scale revenues, foreign-

exchange earnings, disaster-related fiscal risk, contingent liabilities, or long-term productive capacity. Belize, Ghana, and Vanuatu illustrate distinct configurations: revenue and foreign-exchange flows, state-linked commodity exposure, and disaster-related fiscal risk respectively. India illustrates a contrasting boundary condition: biodiversity loss may be environmentally and socially significant while remaining too diffuse, diversified, or buffered to transmit materially to sovereign debt dynamics under observed channels.

The resulting interpretation is therefore conditional rather than universal. Biodiversity loss does not mechanically produce sovereign debt stress, and Convention implementation outcomes should not be treated as debt-relevant simply because they are ecologically significant. They become debt-relevant where the transmission to growth, revenue, expenditure, external earnings, contingent liabilities, or borrowing costs is material at sovereign scale. Scenario-based nature-collapse analysis remains important because threshold effects and cross-border spillovers may generate risks not visible in current fiscal or market data. However, for observed-channel analysis, country context determines whether the reverse channel is strong, weak, or largely indirect.

This conclusion reinforces the asymmetry identified in the study. The debt-to-implementation channel is more immediate and widespread because fiscal pressure, adjustment, and institutional constraints can directly affect the resources and capacities available for Convention implementation. The biodiversity-to-debt channel is more conditional and context-specific. Its relevance is greatest where ecosystem services form part of the sovereign revenue base, external-earnings base, fiscal-risk profile, or long-term productive asset base. This distinction provides the basis for the cross-country diagnostic analysis presented in the next section.

5. CROSS-COUNTRY DIAGNOSTIC ANALYSIS

Section 3 established the forward channel through which debt sustainability conditions can constrain Convention implementation, and Section 4 established the conditional reverse channel through which implementation outcomes can affect debt sustainability. This section presents a cross-country diagnostic analysis designed to identify where the structural conditions for these mechanisms are most likely to be present across a 50-country sample.[56]

The framework's diagnostic purpose is to characterize how the transmission channels established in Sections 3 and 4 distribute across the sample, signal where deeper country-specific assessment may be most warranted and identify structural commonalities across countries facing similar configurations of fiscal capacity and nature dependence.

The analysis draws on indicators with varying coverage. Debt and revenue indicators are available for the full sample; renewable natural capital indicators are available for 47 of 50 countries; flow indicators are available for the full sample; and biodiversity expenditure indicators are uneven in coverage and methodology, as discussed below. Detailed methodology, country list, coverage notes, and data sources are presented in Annex A.

Box 5.1: Scope and Purpose

This analysis characterizes cross-country patterns in fiscal constraint and nature-linked exposure. It provides empirical descriptive context for the transmission mechanisms discussed in Sections 3 and 4 and identifies country configurations where those mechanisms are structurally plausible.

The analysis aims to describe distributions across the sample, identify countries where both fiscal constraint and nature-linked exposure are elevated, and group countries into configurations that may share similar structural profiles. It does not establish causal relationships, make predictions, or substitute for country-specific analysis of institutional conditions.

The framework is a screening tool. Countries identified in particular configurations are not thereby assessed as performing well or poorly; the framework identifies structural conditions, not policy outcomes.

5.1 Indicators

The screening framework draws on indicators that map to the mechanisms established in Sections 3 and 4. Fiscal-constraint indicators screen for compression of the discretionary expenditure base from which implementation is largely funded. Nature-linked exposure indicators screen for the structural significance of the ecosystem-linked asset base that implementation aims to conserve and sustainably use. Neither set of indicators measures implementation performance directly; both characterize structural conditions under which implementation challenges and opportunities arise.

The primary fiscal constraint indicator is interest payments as a percentage of government revenue. As established in Section 3.1, this captures how much of the government's revenue envelope is absorbed by debt servicing, which is the non-discretionary claim that most directly compresses fiscal space for biodiversity and other discretionary expenditures. Supplementary indicators include debt-to-GDP ratios, external debt ratios, and IMF–World Bank Debt Sustainability Framework (DSF) risk classifications.

Nature-linked exposure is measured through flow indicators and a stock indicator. Flow indicators capture near-term revenue and economic exposure through tourism's total contribution to GDP and agriculture, forestry, and fisheries as a percentage of GDP. The stock indicator is renewable natural capital as a share of total comprehensive wealth, drawn from the World Bank's Changing Wealth of Nations 2024

[56]See Annex A for country selection rationale and full sample composition.

framework.[57] The stock indicator captures the relative composition of national wealth and the productivity channel examined in Section 4.3.

The study uses renewable natural capital rather than aggregate natural capital in order to focus on ecosystem-linked assets most relevant to biodiversity-related production systems, ecosystem services, and Convention implementation. Renewable natural capital under the CWON 2024 framework includes agricultural land, timber, non-wood forest products, forest recreation services, forest water services, mangroves, marine fish stocks, and protected areas. Non-renewable natural capital, including fossil fuels and minerals, is excluded from the screening framework because it primarily reflects extractive and commodity-price exposure rather than biodiversity-relevant transmission channels. Aggregate natural capital can be high in resource-rich economies because of oil, gas, or mineral reserves, but this does not necessarily indicate biodiversity-relevant macro-fiscal exposure.

The indicators used for fiscal constraint, debt composition, and nature-linked exposure draw on relatively standardized data from IMF Article IV consultations, World Bank development indicators, and the Changing Wealth of Nations 2024 dataset. Biodiversity expenditure indicators are treated differently. The Biodiversity Finance Initiative (BIOFIN) methodology has supported many countries in measuring biodiversity expenditure, assessing financing needs, and identifying solutions, but country coverage and comparability remain constraints because expenditure tracking systems differ across jurisdictions, methodologies vary in how cross-sectoral expenditure is classified, and reporting frequency is uneven. The screening framework therefore uses biodiversity expenditure as supporting context where available, not as a primary classification variable. Detailed coverage notes for each indicator category are presented in Annex A.

The screening framework is intended as a starting point for diagnostic analysis rather than a complete characterization of debt-biodiversity transmission. The indicators used here capture broad structural conditions across the sample but do not exhaust the relevant analytical dimensions. Country-specific assessment will often require complementary indicators tailored to particular profiles. External debt composition and foreign-exchange earnings from nature-based sectors, such as international tourism receipts and agricultural and fisheries export earnings, are relevant where external financing pressure operates through the foreign-exchange channel examined in Section 4.1. Sovereign credit ratings and market-access conditions provide complementary signals where the interest-to-revenue measure may understate distress. BIOFIN expenditure analysis adds operational depth where coverage permits. The framework identifies where these and other complementary inquiries are likely to be most useful.

5.2 Observed Patterns

This section describes how fiscal constraint and nature-linked exposure are distributed across the 50-country sample. The patterns described here are inputs to the screening framework presented in Section 5.3.

1. Fiscal constraint is unevenly distributed.[58]

Most sampled countries do not cross this study's chosen interest-burden screen, but a significant minority face severe constraints where interest payments absorb 20 percent or more of government revenue. For this constrained group, fiscal compression on the discretionary envelope is likely to be a binding macro-fiscal condition that interacts with political and institutional factors in shaping biodiversity-related expenditure. For the majority, aggregate fiscal compression is unlikely to be the binding constraint on biodiversity

[57]Renewable natural capital is constructed from the World Bank's Changing Wealth of Nations database (2024) as the sum of cropland, pastureland, forest, fisheries, and protected area ecosystem service values for 2020, expressed as a share of total comprehensive wealth. See Annex A for methodological details and coverage notes.

[58]At the extreme, one country (Sri Lanka, following its 2022 default) allocated approximately 80 percent of revenue to interest payments at the peak of distress. Several others exceed 40 percent. Source: World Bank World Development Indicators; for Sri Lanka context, IMF, Sri Lanka: First Review Under the Extended Arrangement.

implementation; institutional capacity, governance, and political prioritization are more plausibly the relevant factors.

2. **Revenue capacity mediates the practical burden of debt.**[59]

Revenue capacity also varies widely across the sample. Government revenue ranges from below 10 percent of GDP in some low-income economies to over 40 percent in some high-income economies, producing wide variation in the practical burden of any given debt level. Several countries with revenue below 15 percent of GDP show high interest-to-revenue ratios even at moderate headline debt, illustrating that revenue capacity mediates how debt translates into fiscal compression.

3. **Nature-linked economic exposure also varies widely.**[60]

Tourism dependence concentrates among SIDS, where natural attractions often underpin the primary economic sector. Agriculture dependence concentrates among low-income countries, where ecosystem-dependent production accounts for substantial shares of output, employment, and foreign exchange. In more diversified economies, these sectors represent a much smaller share of economic activity, limiting the macro-fiscal relevance of ecosystem degradation despite potentially severe local impacts.

Renewable natural capital stocks are more widely dispersed than flows. High shares concentrate among low-income economies, where renewable natural capital constitutes a larger fraction of total wealth in the absence of comparable produced, human, and intangible capital stocks. Stock indicators therefore capture structural exposure to long-run productivity and ecosystem-service effects rather than near-term fiscal risk.

4. **Stock and flow measures do not consistently coincide.**[61]

Some countries cross the nature exposure threshold through stock indicators only, others through flow indicators only, and others through both. Kenya and Uganda illustrate cases where flow exposure is central to the classification, with nature-linked exposure operating primarily through agriculture rather than aggregate natural-capital depletion. Both dimensions are required for comprehensive screening, as they illuminate different transmission channels.

Joint exposure to both dimensions is relatively uncommon. In this sample, joint exposure is concentrated among a relatively small group of countries, many of them in sub-Saharan Africa, with cross-regional cases requiring particular judgment about which transmission channels actually operate (Box 5.2).

5.3 Screening Framework

Combining fiscal constraint and nature-linked exposure produces a screening framework with four configurations, corresponding to high and low fiscal constraint paired with high and low nature-linked exposure. The framework supports structured, first-pass identification of where each transmission channel is most likely to operate. It is intended to provide Parties with a systematic comparative starting point for diagnostic analysis, helping to prioritize where deeper country-specific assessment is most needed. The four configurations describe structural patterns, not rankings of fiscal or environmental performance.

The framework uses approximate upper-quartile thresholds as indicative screening bands: interest payments above 15–20 percent of revenue for fiscal constraint, and either renewable natural capital above 30 percent of total wealth or combined tourism and agriculture-forestry-fisheries above 22 percent of GDP for nature-

[59]Bangladesh illustrates this pattern. IMF data show public debt at around 39–41 percent of GDP, while government revenue remains below 9 percent of GDP. See IMF, Bangladesh: 2025 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Bangladesh, IMF Country Report No. 26/024 (Washington, DC: IMF, 2026); IMF DataMapper, Public Finances in Modern History.

[60]Brazil exemplifies this boundary condition: globally significant biodiversity but nature-linked sectors contribute modestly to GDP, limiting reverse-channel transmission at the sovereign scale. See Section 4.5 on limits and non-cases.

[61]Kenya illustrates high agriculture-driven flow exposure (approximately 23 percent of GDP) with moderate stock exposure; Vietnam shows the reverse pattern, with higher renewable natural capital share and lower flow exposure. See Annex A for methodological discussion.

linked exposure. These thresholds are illustrative rather than definitive. They identify countries where the channels developed in Sections 3 and 4 are more likely to be structurally plausible, not to assign formal debt-risk or biodiversity-risk classifications; the logic follows from the Section 3.1 channel analysis.[62]

Table 5.1: Screening Framework

	Higher Nature-Linked Exposure	**Lower Nature-Linked Exposure**
Higher Fiscal Constraint	**A: Structural Nexus** Both forward and reverse channels are plausible. *Examples: Egypt, Ghana, Kenya, Malawi, Nigeria, Uganda*	**B: Fiscal Stress** Forward channel strongest; reverse channel limited or conditional. *Examples: Bangladesh, Brazil, Costa Rica, India (see Box 5.2), Indonesia, Mexico, South Africa, Sri Lanka*
Lower Fiscal Constraint	**C: Nature Exposed** Reverse channel potentially material; forward fiscal constraint less binding or masked. *Examples: Belize, Cambodia, Democratic Republic of Congo, Ethiopia, Fiji, Madagascar, Morocco, Nepal, Rwanda, Vanuatu, Vietnam*	**D: Lower Dual Exposure** Debt–biodiversity relationship less directly macro-fiscal. *Examples: Australia, Canada, Chile, Colombia, France, Germany, Japan, New Zealand, Kazakhstan, Peru*

The four configurations describe structural exposure profiles based on selected indicators. They do not represent performance rankings, policy effort, or implementation quality. Examples are based on the screening dataset described in Annex A.

Configuration A (Structural Nexus) identifies countries where the debt-biodiversity relationship may operate bidirectionally. High fiscal constraint limits implementation capacity (forward channels); high nature exposure means biodiversity outcomes can materially affect fiscal stability through revenue loss, disaster costs, or productivity effects (reverse channels). Some Configuration A countries are flagged primarily through flow indicators rather than stock indicators: Kenya and Uganda illustrate cases where flow exposure is central to the classification. Ghana illustrates the bidirectional pattern through paired case studies: forward-channel effects from debt restructuring on forest enforcement (Box 3.3) and reverse-channel exposure through cocoa export revenue (Box 4.2).

Configuration B (Fiscal Stress) identifies countries where fiscal constraint binds, but nature-linked exposure is lower at the sovereign scale. The forward channels are most relevant; the reverse channel is limited or conditional in line with the non-cases analysis in Section 4.5, because biodiversity loss, however severe locally, does not materially affect aggregate fiscal indicators in diversified economies under currently observed transmission channels. Within Configuration B, fiscal compression varies substantially in severity, from acute debt distress (Sri Lanka, where interest-to-revenue reached approximately 80 percent at the height of its 2022 default before declining as restructuring proceeded) through chronic upper-middle-income compression (Brazil, South Africa) to moderate market-access cases (Mexico, Indonesia). The configuration captures qualitative structural pattern rather than severity ranking. Brazil and South Africa (Box 3.1) exemplify chronic fiscal compression without nature-linked macro-fiscal feedback. Bangladesh (Box 3.5) illustrates how moderate debt becomes binding when revenue extraction is exceptionally weak. India is also placed in Configuration B based on the Section 4.5 analysis: although India crosses the

[62]UNCTAD's A World of Debt 2025 reports that 61 developing countries allocated at least 10 percent of government revenue to interest payments; it does not establish 10 percent as a formal fiscal-stress threshold. For this study, the 15–20 percent interest-to-revenue band is an analytical screening convention used to identify contexts where fiscal compression is more likely to bind discretionary expenditure. It is not an IMF, World Bank, or UNCTAD threshold. The IMF–World Bank LIC-DSF uses debt-service-to-revenue, rather than interest-to-revenue, including a 14 percent threshold for countries with weak debt-carrying capacity. Sovereign credit ratings provide a complementary indicator of broader fiscal, economic, and institutional fundamentals; interest-to-revenue is used here specifically to screen the fiscal-compression channel.

renewable natural capital threshold by indicators, the reverse-channel transmission is buffered by economic scale, diversification, and natural-capital composition (see Box 5.2).

Configuration C (Nature Exposed) identifies countries with high nature-linked exposure but lower current interest burdens.[63] This configuration includes two distinct subgroups: countries with genuine fiscal space where implementation gaps are primarily institutional, and countries where concessional debt composition or restructuring masks underlying fragility. The reverse channels examined in Sections 4.1, 4.2, and 4.3 are most plausible in this configuration. Ethiopia (Box 3.4) exemplifies the masked-fragility case, classified as In Debt Distress despite moderate interest burden because concessional financing keeps debt service costs low while underlying debt-carrying capacity is weak.

Configuration D (Lower Dual Exposure) includes countries where neither dimension reaches upper-quartile levels. The configuration is concentrated among high-income and upper-middle-income economies, reflecting the same denominator effect noted in Section 5.2: in countries with deep produced, human, and intangible capital stocks, both fiscal compression indicators and renewable natural capital shares tend to be lower at the aggregate level. The debt-biodiversity relationship as examined in this study is less directly macro-fiscal for these contexts; implementation challenges more plausibly stem from institutional capacity, governance, or political prioritization.

These framework classifications are consistent with the country experiences examined in Sections 3 and 4. Countries discussed in the context of fiscal space compression (Box 3.1), debt distress and adjustment (Boxes 3.3 and 3.4), revenue constraints (Box 3.5), and reverse-channel case studies (Boxes 4.1–4.3 and Box 4.5) fall into configurations that align with their qualitative profiles. This consistency suggests the indicators capture relevant structural conditions, though as Box 5.2 illustrates, mechanical application of thresholds cannot substitute for judgment about which transmission channels actually operate in specific contexts.

Box 5.2: When Indicators Require Judgment—India

India illustrates why the screening framework requires judgment even when a country crosses both headline thresholds. India meets both threshold conditions, with renewable natural capital at approximately 33 percent of total wealth and interest payments of approximately 24 percent of general government revenue. A mechanical application of the indicators would therefore place it in Configuration A. However, the Section 4.5 analysis indicates that India's reverse-channel transmission is buffered by economic scale, diversification, the agricultural-land composition of renewable natural capital, and the partly informal or subsistence character of affected nature-dependent activity.

India is therefore placed in Configuration B. The forward channel is relevant: fiscal constraint can affect implementation capacity, and the CAMPA paradox discussed in Box 3.6 illustrates how fiscal and institutional constraints interact. The reverse channel is more limited under currently observed transmission. Biodiversity losses in agriculture, fisheries, forests, water systems, or coastal ecosystems may be severe at local, sectoral, or state levels, but they do not clearly generate a concentrated sovereign-scale revenue, external-balance, fiscal-risk, or debt-service channel under observed conditions.

This judgment does not mean India is insulated from nature-related sovereign risk under all scenarios. Longer-horizon analysis suggests this conclusion is sensitive to scenario assumptions. Agarwala, Burke, Klusak, Kraemer, and Volz (2022) find that under a partial ecosystem-collapse scenario involving fisheries, tropical

[63]Ethiopia's low interest-to-revenue ratio despite its classification as being in debt distress reflects its heavily concessional debt composition and the distinction between interest payments and broader external debt-service indicators. The IMF–World Bank LIC-DSF uses a 14 percent external debt-service-to-revenue threshold for countries with weak debt-carrying capacity. Vanuatu's low current debt-service burden similarly reflects donor grant financing and concessional terms rather than absence of underlying fiscal fragility; the 2025 IMF Article IV downgraded external debt distress risk from high to moderate while overall risk remains high.

timber production, and wild pollination, India would fall four notches on the 20-notch credit-rating scale by 2030.

The implication is that indicators flag countries for closer examination but do not determine classifications mechanically. India's case illustrates how Section 4 channel analysis can adjust an indicator-driven placement to better reflect the configuration that applies under current observed channels.

See References for full citations

The framework in this section requires interpretation. As the configuration descriptions and Box 5.2 illustrate, indicators identify structural conditions but cannot determine which transmission channels actually operate in specific contexts. Ecological significance does not guarantee macro-fiscal relevance; debt metrics can mislead depending on composition; and institutional factors may bind even where aggregate fiscal indicators suggest capacity.

5.4 Summary

This diagnostic analysis maps the structural conditions under which the transmission channels identified in Sections 3 and 4 are most likely to be relevant. Key findings include:

- Fiscal constraint is unevenly distributed across the sample. Most countries retain meaningful fiscal space, but a non-trivial subset exceeds the 15 percent interest-to-revenue threshold where forward channels are likely to bind on discretionary expenditure including biodiversity-related expenditure.
- The configurations reveal a structural asymmetry across income levels. Configuration A, where both forward and reverse channels are plausible, includes only low-income and lower-middle-income economies. Configuration D, where neither dimension reaches upper-quartile levels, is concentrated among high-income and upper-middle-income economies. The pattern reflects systematic differences in fiscal capacity across income levels alongside the denominator effect in natural-capital accounting noted in Section 5.2.
- Revenue capacity mediates debt burden. Moderate debt-to-GDP ratios can mask severe practical constraints where revenue extraction is weak.
- Stock and flow measures capture different dimensions of nature-linked exposure. Both are required for comprehensive screening, as reliance on either alone risks misclassifying important cases. Some countries cross the nature-exposure threshold via stock indicators, others via flow indicators, and others via both.
- Framework classifications align with the country cases examined in Sections 3 and 4, reinforcing that the indicators capture relevant structural conditions when applied with appropriate judgment.

Three implications follow for Convention implementation. First, the heterogeneity documented here implies that approaches to resource mobilization under Target 19 will need to reflect the structural conditions identified in this analysis: countries in Configuration A face different binding constraints from those in Configuration B or C, and uniform expectations for domestic biodiversity finance mobilization may be unrealistic. Second, the prevalence of fiscal compression in low- and lower-middle-income economies underscores the continued relevance of international financial flows and concessional finance referenced in sub-target 19(a) and Article 20. Third, the configurations identified here may help Parties prioritize where deeper country-specific assessment of debt-biodiversity dynamics is most warranted, including in the context of NBSAP development, revision, and reporting under the monitoring framework.

Section 6 examines the interpretive implications of these findings for implementation of the Convention, finance-ministry and IFI engagement, and the diagnostic use of debt-related instruments, recognizing that structural conditions shape which constraints are likely to bind in different country contexts.

6. INTERPRETIVE IMPLICATIONS FOR IMPLEMENTATION OF THE CONVENTION

The diagnostic framework developed in Sections 3 through 5 yields interpretive implications for how Parties, finance ministries, and international institutions may understand the relationship between debt sustainability and implementation of the Convention in different country contexts. This section translates the analytical framework into guidance for interpretation. It does not propose policy measures, financial instruments, or institutional reforms.

The implications set out below concern how to read structural conditions and what they suggest about likely binding constraints. They are intended to inform analytical judgment and dialogue within the CBD process, rather than to direct policy choices, which remain the prerogative of Parties.

A central implication of the analysis is that the debt–biodiversity relationship is two-directional but asymmetric. Debt conditions more frequently and more immediately shape biodiversity implementation feasibility through fiscal constraint, expenditure compression, and planning volatility. The reverse relationship, while conceptually grounded in the institutional recognition of nature-related financial risks reviewed in Section 2.3, operates more selectively at sovereign scale, becoming macro-relevant under specific structural conditions of nature-linked economic exposure. The implications are therefore differentiated by country configuration, with attention to which direction of the relationship is most likely to bind in a given context.

6.1 Interpretive Implications by Structural Configuration

The four configurations help distinguish which part of the debt–biodiversity relationship is most relevant in a given country context. They do not assign countries to policy tracks. Each can be read through three questions: whether debt service is likely to constrain implementation; whether biodiversity outcomes are likely to affect debt sustainability; and whether other constraints, including institutional, governance, or political-economy factors, are more likely to be binding.

Configuration A: Structural Nexus

Fiscal and biodiversity risks should be assessed together rather than separately. Additional biodiversity finance may not translate into sustained implementation where debt service is already absorbing a large share of the fiscal envelope. In these countries, debt sustainability itself, and not only resource mobilization, becomes part of the implementation conversation. Debt-related and fiscal-insulation instruments may be relevant where they address the binding fiscal constraint, but their usefulness depends on debt sustainability, market access, institutional capacity, and country-specific design.

The reverse channel extends the policy conversation beyond environmental ministries. Where economies depend on ecosystem services at sovereign scale, biodiversity degradation can weaken revenues, increase disaster-related costs, reduce resilience, and undermine the fiscal conditions on which implementation depends. The clearest instrument landscape on the reverse-channel side relates to disaster-related fiscal risk transfer, where ecosystem conditions can shape the magnitude of losses. Relevant examples include sovereign parametric risk pools, state-contingent debt clauses, catastrophe bonds, and parametric ecosystem insurance linked to natural buffers such as reefs and mangroves. These instruments do not all engage biodiversity in the same way. Parametric ecosystem insurance is the most directly nature-linked; broader catastrophe-risk instruments mainly reduce post-disaster fiscal pressure and may indirectly protect biodiversity budgets from reallocation.

For the revenue and productivity sub-channels of the reverse channel, the instrument landscape is less developed than for disaster-related risk transfer. In these areas, the main implication is analytical rather than instrumental: biodiversity and ecosystem-service dependencies may need to be reflected in fiscal forecasting, debt sustainability analysis, and natural-capital accounting where they are material at sovereign scale. This reinforces the role of finance ministries, statistical agencies, and IFIs in assessing whether ecosystem degradation could affect revenues, external earnings, productivity, or long-term debt-carrying capacity.

Configuration B: Fiscal Stress

Fiscal constraint is high, but nature-linked exposure at the sovereign scale is not. The forward channel operates as in Configuration A. The reverse channel is generally weaker at sovereign scale. Biodiversity loss in diversified economies can have real fiscal consequences at sectoral and regional levels, but these do not typically aggregate into sovereign-scale fiscal effects of the kind that operate in Configuration A.

The forward-channel reading is the same as in Configuration A. The same instruments are relevant: debt-for-nature swaps, thematic bonds, conservation trust funds, and where applicable debt relief, depending on debt sustainability, market access, and country-specific conditions. What differs is the argument that supports them. In Configuration A, the case rests on both forward-channel fiscal-space grounds and reverse-channel macro-fiscal grounds. In Configuration B, only the forward-channel argument applies.

Beyond instrument choice, the binding question is how biodiversity expenditure is treated within an envelope under chronic pressure: whether it is protected or residual, whether it is predictable across budget cycles, and whether implementing institutions can deploy the resources allocated. Section 6.2 develops this. As in Configuration A, instruments may expand, protect, or stabilize the relevant financing envelope depending on design; how the envelope is handled determines whether any such effect translates into outcomes.

The caution is two-sided. Biodiversity implementation challenges should not be read as evidence of a distinctive debt–biodiversity nexus when it is part of broader fiscal compression. And the weaker reverse channel should not be interpreted as meaning biodiversity loss is fiscally irrelevant in these countries: it has real sectoral and regional fiscal consequences in many Configuration B economies. What it does not do is aggregate into a sovereign-scale debt sustainability concern.

Configuration C: Nature Exposed

Countries with high nature-linked exposure but without an elevated interest-to-revenue signal present a different interpretive challenge. In some cases, fiscal space is genuinely available; in others, concessional debt structures, restructuring histories, or external-liquidity constraints may mask underlying fragility. The forward channel is not currently binding in countries where fiscal space is real. The reverse channel may be relevant prospectively in parts of the configuration, because economic structure can expose the sovereign to biodiversity-driven shocks through revenues, contingent liabilities, or long-run productivity.

Persistent under-implementation in these countries usually reflects institutional, governance, or political-economy factors rather than fiscal constraint. Instruments addressing fiscal compression are unlikely to be the principal lever for current implementation gaps. On the reverse side, biodiversity considerations warrant inclusion in forward-looking fiscal analysis and risk assessment, because nature-related exposure may become fiscally material under plausible future trajectories, particularly in small disaster-exposed economies. Where instruments engaging disaster-related fiscal risk are available, including state-contingent

debt clauses, sovereign parametric risk pools, catastrophe bonds, and parametric ecosystem insurance, they engage the reverse channel directly. Headline debt indicators can also understate fragility where debt is concessional or recently restructured, which strengthens the case for forward-looking attention.

The caution is that today's moderate interest-to-revenue ratio is not evidence that biodiversity is macro-irrelevant. It is evidence that the relevance, if any, lies ahead. And current institutional under-implementation should not be misread as fiscal constraint.

Configuration D: Lower Dual Exposure

Neither fiscal constraint nor nature-linked exposure is elevated. The debt–biodiversity relationship examined in this study is not central to implementation outcomes here. Where implementation lags, the binding constraint usually lies elsewhere: institutional capacity, governance arrangements, policy prioritization, harmful subsidies, or data and coordination gaps. The caution is to avoid applying a debt-centered diagnosis to a problem that is not primarily a debt problem.

6.2 Implications for Convention Implementation Planning

Where fiscal compression is the binding constraint, the relevant question is not only whether additional biodiversity finance is mobilized, but whether the implementation capacity it supports can be sustained within a constrained fiscal envelope. This is most directly relevant to Fiscal Stress countries and to Structural Nexus countries where fiscal compression operates alongside reverse-channel exposure.

As Section 3.1 documented, biodiversity expenditure is often weakly protected within budget systems. It is rarely protected by statute. It depends heavily on recurrent costs for monitoring, enforcement, protected-area management, ecological restoration, and institutional coordination. It is spread across ministries and agencies rather than concentrated in a single budget line. It also lacks the political constituencies that defend health, education, pensions, or other high-salience spending categories during consolidation. Under chronic fiscal compression, these characteristics make biodiversity allocations vulnerable to incremental reductions during annual budget cycles and to disproportionate cuts during adjustment episodes. The forward channel therefore does not require crisis or restructuring to bind.

Three observations follow. First, additional resources mobilized through external channels can be offset by domestic reallocations away from biodiversity unless attention is paid to how budget systems treat biodiversity allocations. Where biodiversity expenditure is residual within the budget process, new finance may fill a gap that then reopens in the next budget cycle.

Second, diagnostic visibility into biodiversity expenditure across ministries and levels of government is important for understanding whether implementation conditions are stable or eroding. Sections 2.1 and 5.1, together with Annex A, discuss the uneven state of biodiversity expenditure measurement and the limits of comparability across jurisdictions. The practical implication is that in many countries, the fiscal position of biodiversity implementation remains difficult to observe with precision.

Third, current biodiversity finance flows predominantly through public budgets, while private finance plays a complementary role that varies across country contexts and instruments. Where public fiscal space is constrained, the operating space for many private and blended instruments narrows correspondingly, because many depend on credible public counterparties, sovereign guarantees, concessional layers of capital, or public institutions capable of managing contracts and safeguards. This is an observation about how the current market operates, not a position on the future allocation of effort between public and private sources of finance.

The same logic has prospective relevance for Nature Exposed countries. Where fiscal space is currently available but nature-linked exposure is high, future fiscal compression could emerge if reverse-channel risks become more pronounced or if debt composition shifts. Anticipatory attention to the conditions that

would sustain implementation under future compression is therefore part of the same diagnostic exercise, applied earlier in the risk trajectory.

Box 6.1: Debt Relief: When Is It Most Likely to Matter for Biodiversity Implementation?

Where fiscal compression from debt service is the binding constraint on biodiversity implementation, debt relief that expands fiscal space directly addresses that constraint. This is particularly relevant for Structural Nexus and Fiscal Stress countries with elevated interest-to-revenue burdens, and for countries in or near debt distress. Where debt is chronically unsustainable and servicing obligations compound, debt relief may be necessary to restore the fiscal capacity required to implement Convention commitments.

The relationship between debt relief and implementation outcomes is conditional on additional factors. Fiscal space created through relief is allocated through national budget processes, with biodiversity competing alongside other discretionary spending categories. Institutional capacity affects the extent to which restored fiscal space translates into effective implementation. Revenue constraints may also persist independently of debt-service levels in countries with narrow revenue bases.

Debt relief therefore addresses the principal binding constraint where debt service is compressing fiscal space, but it does not by itself determine biodiversity outcomes. Allocation processes, institutional capacity, and revenue mobilization shape how restored fiscal space translates into Convention implementation. In this sense, debt relief operates as a fiscal lever and is complementary to the broader resource mobilization contemplated under Article 20 of the Convention and Target 19 of the Kunming-Montreal Global Biodiversity Framework.

6.3 Implications for Engagement with Finance Ministries and IFIs

The debt–biodiversity relationship operates partly through macro-fiscal channels that lie outside the traditional remit of environmental authorities. In countries where the relationship is structurally relevant, interpreting implementation constraints may therefore benefit from engagement with finance ministries and international financial institutions.

The analysis does not imply that biodiversity should be incorporated into debt sustainability analysis as a general rule, nor that fiscal frameworks should be redesigned. It clarifies where existing fiscal and debt analysis is informative for understanding implementation feasibility. In Structural Nexus and Nature Exposed contexts, where reverse channels are structurally plausible, macro-fiscal and debt-sustainability assessments that hold nature-related risks constant may understate longer-term vulnerabilities. In Fiscal Stress and Lower Dual Exposure contexts, macro-fiscal engagement is most informative for understanding the forward channel, while the reverse-channel framing adds less explanatory power.

Where reverse channels are relevant, the integration of biodiversity and ecosystem-service flows into mainstream accounting frameworks, including the System of Environmental-Economic Accounting, alongside developments in corporate reporting and prudential risk assessment, provides an enabling condition for aligning fiscal choices and capital allocation with underlying economic dependencies on ecosystems. These developments are documented in Section 2.3.

6.4 Debt-Related Instruments and the Transmission Framework

The transmission channels examined in Sections 3 and 4 condition where debt-related, fiscal-insulation, and risk-transfer instruments are likely to be analytically relevant. Table 6.1 maps principal instrument categories to the transmission framework, including debt-related instruments, mechanisms that protect biodiversity expenditure from fiscal volatility, and arrangements that transfer disaster-related fiscal risk. The mapping is interpretive, not evaluative: it clarifies which instruments are conceptually coherent with which channels and configurations and does not constitute a recommendation.

The categories below cover principal instruments in current use and emerging practice. The set is not exhaustive, and instrument design continues to evolve.

Table 6.1. Debt-Related Instruments Mapped to the Transmission Framework

Instrument	Primary transmission channel addressed	Configurations where analytically coherent	Analytical considerations
Debt-for-nature swaps	Forward (dedicated conservation funding; potential debt-service or fiscal-space gains)	Structural Nexus; selected Fiscal Stress or Nature Exposed cases where debt sustainability, creditor composition, and institutional capacity make the instrument feasible.	Average headline debt reduction is modest relative to comprehensive restructurings; transaction complexity and structuring costs absorb a meaningful share of nominal savings; institutional absorptive capacity within environmental agencies has emerged as a binding constraint in practice (Box 6.2)
Thematic green, blue, and nature bonds	Forward (project-level financing for biodiversity-relevant investments; signaling value in capital markets)	Configurations with market access; selectively in Structural Nexus where market access is preserved	Use-of-proceeds discipline and earmarking constraints; may be constrained where IMF-supported programs include limits on non-concessional external borrowing (Section 3.2); terminology and labelling continue to evolve under emerging market guidance (Box 6.2)
Sustainability-linked sovereign bonds	Forward (potential cost-of-borrowing benefit conditional on verified outcome performance)	Configurations with market access and capacity to specify and verify outcomes	Performance verification and outcome specification challenges; price differential versus conventional bonds remains uncertain in current markets; integrity frameworks developing under the International Capital Market Association (ICMA) Sustainability-Linked Bond Principles (Box 6.2)
State-contingent debt clauses	Fiscal-insulation / risk-amplification channel defers debt service after qualifying shocks, creating fiscal space for emergency response and reducing post-disaster budget compression	High-disaster-exposure economies, especially countries with material debt-service burdens	Do not provide new financing or conservation funding directly; effectiveness depends on trigger design, eligible debt stock, creditor participation, and whether deferred payments meaningfully reduce fiscal pressure after shocks (operational viability demonstrated by Grenada in 2024 after Hurricane Beryl; see Box 6.2)
Sovereign catastrophe bonds, parametric risk	Reverse (cushions disaster-related fiscal pressure and contingent liabilities; may indirectly	High-disaster-exposure economies, particularly SIDS and coastal economies in Structural	Do not directly generate conservation finance unless explicitly linked to natural-asset restoration or resilience

Instrument	Primary transmission channel addressed	Configurations where analytically coherent	Analytical considerations
pools, and parametric ecosystem insurance	protect biodiversity budgets from post-disaster reallocation)	Nexus or Nature Exposed configurations	outcomes; require credible hazard modeling, trigger design, premium affordability, and institutional capacity. Of the instruments in this row, only parametric ecosystem insurance directly insures a natural asset as the protective asset (Quintana Roo Coastal Zone Management Trust precedent); sovereign catastrophe bonds and parametric risk pools, notably the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the Pacific Catastrophe Risk Insurance Company (PCRIC), transfer disaster-related fiscal risk more broadly and do not usually price ecosystem condition directly (Box 6.2)
Conservation Trust Funds	Forward (insulates biodiversity expenditure from short-term fiscal volatility through capitalized endowments)	Any configuration where fiscal volatility threatens implementation continuity	Capitalization requirements; investment income volatility; governance arrangements[64]
Debt restructuring incorporating biodiversity safeguards	Forward: fiscal-space relief; amplification risk where distress increases pressure on safeguards or extraction	Countries in or near debt distress, including Common Framework cases	Current sovereign debt restructuring architecture, including the G20 Common Framework, does not systematically incorporate biodiversity considerations; private creditor coordination affects timeline and conditionality (Section 3.2; Box 3.3)

Note: The instruments above are illustrative of principal categories in current use and emerging practice; the set is not exhaustive, and instrument design continues to evolve

Four points emerge from this mapping. First, no instrument bypasses the underlying fiscal or institutional constraint. Where the binding constraint is institutional or political rather than financial, instruments alone are unlikely to resolve implementation challenges.

Second, instrument relevance varies across the four configurations. Structural Nexus countries are where instruments engaging both fiscal-space relief and nature-related transmission are most analytically relevant. For Fiscal Stress countries, instruments that insulate biodiversity expenditure from fiscal volatility are more relevant than instruments addressing reverse-channel transmission. For Nature Exposed countries, where fiscal constraint is not currently signaled by the interest-to-revenue indicator, instruments addressing fiscal compression are unlikely to be the principal lever unless other indicators reveal masked fragility;

[64]Conservation Finance Alliance, Practice Standards for Conservation Trust Funds (Conservation Finance Alliance, 2020); Bath, P., Guzmán, A., Luján, V., and Mathias, K., Conservation Trust Funds 2020: Global Vision, Local Action (Conservation Finance Alliance, 2020).

instruments engaging disaster-related fiscal risk transfer may be more relevant on reverse-channel grounds. For Lower Dual Exposure countries, debt-related biodiversity instruments are unlikely to be central to implementation challenges.

Third, debt composition remains relevant outside the instrument categories shown in Table 6.1. Resource-backed loans can increase extraction incentives and biodiversity pressure where repayment is linked to commodity exports or resource concessions. They illustrate debt design operating as a forward-channel amplifier of degradation rather than as fiscal-space relief.

Fourth, the current architecture of sovereign debt restructuring, including the G20 Common Framework, does not systematically incorporate biodiversity considerations. Within restructuring processes, coordination among official and private creditors shapes the timeline, scope, and conditionality of debt treatment, with implications for how long fiscal compression persists during distress. As discussed in Section 3.2 and Box 3.3, this is an analytically relevant feature of the restructuring landscape for countries in debt distress with significant biodiversity exposure.

Box 6.2: Practical Conditions for Debt-Related, Fiscal-Insulation, and Risk-Transfer Instruments

Four threads from recent practice illustrate the conditional nature of debt-related, fiscal-insulation, and risk-transfer instruments, and the limits of generalizing across country contexts.

Recent experience with debt-for-nature and related transactions illustrates the constraints under which such operations are typically pursued. They have generally involved extensive structuring, external guarantees, and dedicated trust arrangements, and have been undertaken selectively in countries where debt trajectories are assessed as sustainable. Institutional capacity within environmental agencies can also become a binding constraint, particularly where transactions create performance-linked obligations under conditions of prolonged fiscal compression. Critical assessments have noted that debt reduction achieved through such transactions has typically been modest relative to comprehensive restructurings, and that transaction complexity and costs can absorb a meaningful share of nominal savings.[65]

State-contingent debt clauses occupy a different analytical position. These clauses allow payment deferral following defined shocks, typically natural disasters, without requiring creditor negotiation or triggering default. In 2024, Grenada became the first country to activate a hurricane clause in a government bond, triggering automatic payment deferral after Hurricane Beryl.[66] The activation provides proof-of-concept that contingent clauses can function as designed, freeing short-term fiscal space for disaster response and recovery without increasing net present value losses to creditors. While such clauses do not directly generate conservation finance, they may, in disaster-exposed economies, reduce the fiscal pressure that typically follows major climate events and indirectly protect biodiversity budgets from post-disaster reallocation.

[65]For a critical assessment of debt-for-nature swap outcomes relative to comprehensive debt restructuring, see Debt Justice, *Analysing the Debt-Related Outcomes of Debt-for-Nature Swaps* (London: Debt Justice, May 2025). The briefing reports an average headline debt reduction of approximately 3 percent across the debt-for-nature swaps analyzed (Barbados, Belize, Gabon, and Ecuador), against an average of approximately 21 percent for the five most recent post-pandemic sovereign debt restructurings.
[66]Marc Jones, "Beryl-Battered Grenada Becomes First to Utilise Government Bond Hurricane Clause," Reuters, 19 August 2024; World Bank Treasury, Climate Resilient Debt Clause (CRDC): Product Note (Washington, DC: World Bank, updated November 2024). The CRDC product note explains that the clause allows eligible borrowers to defer principal and interest payments after qualifying disasters, with deferred amounts repaid through subsequent debt service rather than reduced in net present value to creditors.

Sovereign parametric risk pools and parametric ecosystem insurance constitute the most developed instrument categories on the reverse-channel side. Sovereign parametric pools transfer disaster-related fiscal risk through insurance and reinsurance structures, providing rapid liquidity after qualifying events. The Caribbean and Central American facility, CCRIF SPC, and its Pacific counterpart, PCRIC, have operated this model at the sovereign level.[67] Parametric ecosystem insurance extends this logic by insuring the ecosystem itself as a fiscal-protection asset. The Quintana Roo Coastal Zone Management Trust, established in 2018, holds the first parametric policy structured against a coral reef, triggered by tropical cyclone wind speed, with payouts directed to reef restoration and emergency response. The structure has since been extended across the wider Mesoamerican Reef and replicated in Hawai'i. [68] Nature-linked applications remain more developed in parametric reef and coastal ecosystem insurance than in sovereign catastrophe bonds, where the nature-linked category is still emerging.

Market guidance is developing in parallel. The International Capital Market Association's Sustainability-Linked Bond Principles and its 2025 Sustainable Bonds for Nature: A Practitioner's Guide provide integrity frameworks that may improve credibility and reduce transaction costs over time. These developments concern the standards under which nature-related sovereign and other sustainable instruments can be structured, labelled, and verified.69

Across these threads, the diagnostic message is consistent. Instruments do not bypass underlying fiscal and institutional constraints. Their relevance and feasibility depend on structural conditions that vary across countries, and they are best understood as context-specific mechanisms whose coherence with the transmission framework varies by configuration. The instruments discussed here are illustrative of categories in current practice and emerging practice; the set is not exhaustive.

See References for full citations

6.5 Use of Screening and Diagnostic Tools

The screening framework developed in Section 5 identifies structural conditions, not policy performance. Classification signals where the debt–biodiversity relationship is plausibly macro-relevant. It does not say which countries are performing well or poorly.

Indicators require interpretation. Where aggregate natural-capital figures are used as contextual information, they require caution: they may reflect extractive resources rather than biodiversity-relevant ecosystems. The screening framework therefore relies on renewable natural capital, while still requiring judgment about composition and transmission. Moderate interest burdens can also mask fragility where debt is heavily concessional or recently restructured, as the Ethiopia footnote in Section 5.3 illustrates. And country judgment remains essential, as the India case in Box 5.2 illustrates. Screening guides analytical attention; it does not mechanically determine conclusions.

[67]CCRIF SPC, the world's first multi-country sovereign parametric risk pool, has made 82 payouts totaling approximately USD 483 million across member governments in the Caribbean and Central America since its inception in 2007 (CCRIF SPC, current public reporting as of November 2025). Payouts are made within 14 days of qualifying tropical cyclone, earthquake, or excess rainfall events. PCRIC (Pacific Catastrophe Risk Insurance Company), established 2016, provides analogous parametric coverage for Pacific small island states.

[68]The Nature Conservancy, "*Business to the Rescue! Insurance for Reef Restoration*," 8 March 2018; Swiss Re, "*Designing a New Type of Insurance to Protect the Coral Reefs, Economies and the Planet*," 17 May 2022; Jacqueline Wharton, *The MAR Insurance Programme: A Nature-based Solution to Enhance Resilience* (MAR Fund, 2024); The Nature Conservancy, *"Insuring Nature to Ensure a Resilient Future*," updated 26 May 2026.

[69]International Capital Market Association (ICMA), Sustainability-Linked Bond Principles: Voluntary Process Guidelines (ICMA, June 2024); International Capital Market Association (ICMA), Sustainable Bonds for Nature: A Practitioner's Guide (ICMA, June 2025).

Table 6.2. Diagnostic Interpretation of Debt–Biodiversity Constraints by Configuration

Configuration	Dominant binding constraint(s)	How to interpret the debt–biodiversity relationship	Interpretive cautions
Structural Nexus	Fiscal constraint and nature-related macro-fiscal exposure	Both forward (debt constraining implementation) and reverse (biodiversity outcomes affecting fiscal stability) channels may be relevant. Implementation feasibility depends on the interaction between fiscal ceilings and nature-dependent revenues, risk amplification, or productivity effects.	Do not assume that additional finance alone will translate into sustained implementation. Do not treat biodiversity solely as a sectoral issue detached from macro-fiscal conditions.
Fiscal Stress	Fiscal-space compression; limited reverse-channel relevance at sovereign scale	Debt affects biodiversity implementation primarily through general expenditure compression. Biodiversity is constrained alongside other discretionary priorities. Reverse-channel effects are weak at sovereign scale but real at sectoral and regional levels.	Avoid framing biodiversity primarily as a fiscal-stability issue. Do not assume that biodiversity outcomes materially affect debt sustainability in diversified economies.
Nature Exposed	Current debt-service pressure is not indicated by the interest-to-revenue measure; institutional capacity, governance, or policy prioritization may instead be the binding constraints.	Biodiversity outcomes may become macro-relevant over time through revenue, risk, or productivity channels, even where current fiscal indicators appear stable. Reverse-channel relevance is prospective rather than immediate.	Do not interpret implementation gaps as evidence of current fiscal constraint. Do not assume current debt indicators capture future nature-related vulnerability, particularly where debt composition or restructuring history conceals fragility.
Lower Dual Exposure	Constraints not primarily debt-related	The debt–biodiversity relationship examined in this study is unlikely to be macro-relevant. Implementation outcomes are shaped by other institutional or political-economy factors.	Applying debt-centered interpretations risks misdiagnosing constraints. Other diagnostic frameworks are likely to be more informative.

6.6 Summary

The diagnostic framework developed in Sections 3 through 5 yields four interpretive points for implementation under the Convention.

- The debt–biodiversity relationship is two-directional but asymmetric. Debt conditions more frequently and more immediately shape Convention implementation than biodiversity outcomes affect debt sustainability.
- Fiscal compression from debt servicing is the principal channel through which debt sustainability constrains implementation. Institutional capacity, governance, and political prioritization interact with and can amplify this channel and can be independently binding where fiscal space is not currently constrained.
- The reverse relationship operates selectively. Biodiversity outcomes are macro-relevant at sovereign scale in economies with concentrated nature-linked exposure through revenue, risk amplification,

or long-term productivity effects; in other contexts the channel is weaker in aggregate fiscal terms while remaining real at sectoral and regional levels.

- Debt-related and adjacent fiscal instruments (including fiscal-insulation and risk-transfer mechanisms) engage one or both transmission channels. The mapping in Table 6.1 identifies which instruments are coherent with which channels and where they are most analytically relevant; the configurations indicate the country contexts in which each channel binds. No instrument bypasses underlying fiscal or institutional constraints.

Heterogeneity in structural conditions across Parties implies that approaches to resource mobilization under Target 19, including the full set of sources contemplated in the target text, will not operate uniformly across configurations. The prevalence of fiscal compression in low- and lower-middle-income economies underscores the continued relevance of international financial flows and concessional finance referenced in sub-target 19(a) and Article 20 of the Convention. The configurations identified here may help Parties prioritize where deeper country-specific assessment of debt–biodiversity dynamics is most warranted, including in NBSAP development, revision, and reporting under the monitoring framework.

The study's contribution is to clarify where debt sustainability conditions are likely to shape implementation, where biodiversity outcomes may become macro-fiscally relevant, and where other explanations are more informative. Decisions regarding policy responses remain with Parties.

7. CONCLUSION

This study was prepared in response to Decision 16/34: Resource mobilization, which requested an examination of the relationship between debt sustainability and implementation of the Convention on Biological Diversity. Its purpose has been to clarify where and how debt–biodiversity interactions become macro-relevant, where they remain indirect or weak, and how these differences should be interpreted across country contexts.

As the preceding sections establish, the relationship runs in both directions but carries asymmetric weight. The forward channel is the more pervasive: fiscal compression, expenditure constraint, revenue weakness, planning volatility, and institutional capacity shape implementation feasibility across a wide range of Parties. The reverse channel is narrower, becoming material only where nature-dependent revenues, risk amplification, contingent liabilities, long-term productivity effects, or sovereign-risk perceptions transmitted through borrowing costs reach sovereign scale. These reverse pathways remain conditional and do not apply uniformly across Parties.

A central contribution of the study is the diagnostic framework that differentiates country contexts based on fiscal constraint and nature-linked economic exposure. The framework highlights why uniform interpretations are unlikely to be accurate. In some contexts, fiscal ceilings and debt-service pressures are central to implementation feasibility. In others, the binding constraint lies elsewhere: institutional capacity, governance, political prioritization, or sector-specific pressures. Accurate interpretation depends on identifying which constraint binds in practice rather than assuming a single debt–biodiversity pathway.

The study also underscores the importance of judgment in the use of fiscal, debt, and nature-exposure indicators. Common metrics provide useful signals but do not, on their own, determine implementation feasibility or macro-fiscal relevance. The screening framework guides analytical attention to contexts where closer country-specific assessment is warranted, rather than classifying performance or predicting outcomes.

Consistent with its diagnostic mandate, the study does not establish causal relationships between specific debt conditions and biodiversity outcomes. Nor does it evaluate the effectiveness of particular policy instruments, financing mechanisms, or institutional reforms. Its contribution lies in clarifying structural conditions, transmission channels, boundary cases, and the contexts in which debt-related, fiscal-insulation, and risk-transfer instruments are analytically coherent. This helps reduce the risk of misdiagnosis in discussions of debt sustainability and Convention implementation.

The heterogeneity documented here bears directly on how the framework is used. For Parties, it suggests that the first analytical question is not how much additional finance is required, but which constraint binds in the specific country context: the size of the fiscal envelope, the institutional capacity to convert it into delivery, or conditions that lie outside the debt relationship altogether. The study also suggests that consideration of resource mobilization under Target 19 will be more accurate where it distinguishes between these situations than where it treats Parties as facing a common constraint. The relevance of international financial flows and concessional finance referenced in sub-target 19(a) and Article 20 of the Convention will accordingly differ by configuration.

The study takes no negotiating position, endorses no particular proposal, and does not prejudge discussions on resource mobilization or implementation support. Its contribution is to specify the channels through which the debt–biodiversity relationship operates, the structural conditions under which each becomes material, and the contexts in which it does not apply at sovereign scale. The boundary cases are part of that contribution: establishing where debt sustainability is not the binding constraint is as useful to accurate diagnosis as establishing where it is.

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ANNEX A. Empirical Framework, Data Sources, and Methodological Notes

This annex documents the country sample, indicator construction, data sources, and methodological considerations underlying the cross-country diagnostic analysis presented in Section 5. Its purpose is to ensure transparency regarding data provenance, comparability constraints, and interpretive limits, thereby supporting appropriate use of the screening framework developed in the study.

The annex is descriptive and diagnostic. It does not establish causal relationships, define policy benchmarks, or assess country performance.

A.1 Country Sample Selection

The country sample was selected to provide a diverse cross-section of income levels, regions, ecological profiles, and debt conditions. The objective was to ensure that the diagnostic framework is tested across varied national circumstances without implying global extrapolation or representativeness.

Four principles guided selection:

1. *Coverage across regions and income groups.*

The sample includes low-income, lower-middle-income, upper-middle-income, and high-income countries, with representation from Africa, Asia-Pacific, Latin America and the Caribbean, and other regions. Small island developing States, least developed Countries, megadiverse countries, and resource-dependent economies are included to capture structural diversity.

2. *Inclusion of biodiversity-relevant economic structures.*

Given the study's focus on biodiversity implementation, the sample intentionally includes countries with significant natural capital endowments, nature-dependent economic sectors, or exposure to ecosystem-mediated risks, alongside more diversified economies for contrast.

3. *Availability of existing diagnostics.*

Priority was given to countries for which biodiversity expenditure diagnostics, fiscal and debt sustainability analyses, or relevant national reporting to the Convention are available, enabling triangulation of qualitative and quantitative information.

4. *Data availability and comparability.*

Countries were included where consistent macro-fiscal and natural capital data could be obtained from standardized international sources, allowing for systematic cross-country screening using common indicators.

The sample is designed for diagnostic illustration, not for statistical inference or global generalization. Its function is to illuminate patterns, transmission channels, and boundary cases across diverse contexts.

A.2 Fiscal Constraint Indicators

A.2.1 Primary indicator: Interest payments as a share of government revenue

The primary indicator of fiscal constraint is interest payments expressed as a percentage of general government revenue. This measure captures the extent to which debt servicing absorbs the government's revenue envelope and constrains discretionary fiscal space available for biodiversity and other non-protected expenditures.

Interest is measured on a general-government net-interest basis for comparability across the sample. In a small number of economies this understates the gross interest actually paid. Net-creditor economies such as Canada and Norway carry a net-creditor note. Brazil is reported with a gross-interest note: a large gross interest bill of approximately 8 percent of GDP, close to 20 percent of revenue and around a quarter of

expenditure in 2024, nets down to about 15 percent of revenue once interest income on reserves and foreign-exchange swap results are taken into account.

Data are drawn primarily from IMF World Economic Outlook databases and IMF Article IV consultation reports, supplemented where necessary by World Bank World Development Indicators and national budget documents. Where multiple sources report differing values, IMF estimates are used for consistency.

This indicator is widely used in fiscal surveillance as a practical gauge of budgetary pressure. While no formal threshold defines when interest burdens become binding, higher ratios are commonly interpreted as signaling increasing constraint on fiscal discretion. In this study, the indicator is used for relative screening, not for defining binding limits.

A.2.2 Supplementary fiscal indicators

To contextualize interest-to-revenue ratios, several supplementary indicators are reported:

- General government debt as a share of GDP, drawn from IMF sources. This stock measure provides background context but does not directly capture fiscal pressure.
- IMF–World Bank debt sustainability classifications, where applicable, reflecting forward-looking assessments of debt trajectories and shock sensitivity.
- Government revenue as a share of GDP, providing insight into revenue mobilization capacity and helping interpret interest burdens.

These indicators are considered jointly. None is interpreted in isolation.

A.2.3 Interpretive limitations

Fiscal indicators capture only selected dimensions of constraint. Debt composition, revenue volatility, adjustment dynamics under fiscal consolidation or restructuring, and institutional features all affect how debt conditions translate into implementation constraints. As a result, fiscal indicators serve to guide analytical attention, not to determine conclusions mechanically.

A.3 Nature-Linked Economic Exposure Indicators

A.3.1 Stock indicator: Renewable natural capital as a share of total wealth

The primary stock-based indicator of nature exposure is renewable natural capital expressed as a share of total national wealth, drawn from the World Bank's Changing Wealth of Nations 2024 database.

Natural capital includes cropland, pastureland, forests, fisheries, and protected-area ecosystem service values. Non-renewable natural capital, such as fossil fuels and minerals, is reported separately and interpreted distinctly, as it reflects commodity-price exposure rather than biodiversity-relevant transmission channels.

In some countries, natural capital exceeds 100 percent of total measured wealth. This reflects structural conditions where produced, human, or intangible capital stocks are small or negative, rather than accounting anomalies. Such values indicate high structural dependence on ecosystems and should be interpreted accordingly.

A.3.2 Flow indicators: Nature-dependent sectors

Flow-based indicators capture near-term exposure through the contribution of nature-dependent sectors to economic output:

- Tourism as a share of GDP, using World Travel and Tourism Council data and national accounts.
- Agriculture, forestry, and fisheries as a share of GDP, using World Bank World Development Indicators.

Stock and flow indicators identify overlapping but not identical sets of countries. Both are required for comprehensive screening.

A.3.3 Coverage limitations

Some countries, particularly small island developing States, lack complete natural capital or wealth data under standard parameters. These cases are treated cautiously in quantitative screening and addressed qualitatively where relevant information exists.

A.4 Biodiversity Finance Data

A.4.1 Source hierarchy

Where biodiversity expenditure data are referenced, the study adopts a tiered approach:

- Primary sources: UNDP BIOFIN Biodiversity Expenditure Reviews, which capture biodiversity-relevant spending across government functions using a standardized methodology.
- Secondary sources: Environment or biodiversity ministry budget allocations, used as conservative lower-bound proxies where BIOFIN data are unavailable.

A.4.2 Comparability limitations

Biodiversity expenditure data are not systematically tracked within national accounts. BIOFIN estimates and ministry proxy figures are not directly comparable, and cross-country comparisons should be interpreted with caution. Unlike fiscal indicators, biodiversity spending lacks a globally standardized accounting framework.

A.4.3 Structural data gaps

Available figures often exclude subnational spending in federal systems, spending by non-environment ministries, and private or non-governmental conservation finance. Budget allocations also do not equate to executed expenditure. These limitations reinforce the study's reliance on qualitative interpretation alongside quantitative screening.

A.5 Data Sources Summary

Indicator	Primary Source
Interest payments / revenue	IMF World Economic Outlook; IMF Article IV reports
Debt-to-GDP	IMF World Economic Outlook
Debt sustainability classification	IMF–World Bank Debt Sustainability Framework
Natural capital wealth	World Bank Changing Wealth of Nations 2024
Tourism share of GDP	World Travel and Tourism Council; World Bank WDI
Agriculture, forestry, fisheries share	World Bank World Development Indicators
Biodiversity expenditure	UNDP BIOFIN; national budget documents

A.6 Guidance for Interpretation

Several principles govern interpretation of the screening results:

- *Indicators characterize structural conditions, not performance.*
  Country placement reflects exposure to fiscal constraint and nature-linked economic structure, not policy effectiveness or implementation quality.
- *Thresholds are heuristic.*
  Indicator ranges are used to organize cross-country variation, not to define precise boundaries or binding limits.
- *Judgment remains essential.*
  Aggregate metrics can misclassify countries where transmission channels operate differently than headline indicators suggest. Country-specific assessment remains necessary.
- *Data limitations counsel caution.*
  Screening results should be interpreted as approximate characterizations subject to revision as data improve, not as definitive classifications.

ANNEX B1: BRAZIL

High Ambition, High Constraint: The Interest-Burden Channel

Upper-middle-income
Market access
Not debt-distressed

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: **~87.3%** Projected 2030: **~99%** Gross interest/revenue: ~20%; net screening ratio: ~15% Net interest/GDP: ~6%	Global species: **15–20%** Protected areas: **~30%** Biomes: Amazon, Cerrado, Atlantic Forest, Pantanal, Caatinga, Pampa	NBSAP: **EPANB 2025–2030** Targets/actions: 25 / 234 Ministries involved: Multi-ministerial implementation framework ICMS Ecológico: 17 states

1. Why The Brazil Case Is Instructive

Brazil combines globally significant biodiversity assets with persistent macro-fiscal constraint, despite continued market access and absence of formal debt distress. The country contains ecosystems of planetary importance while operating under a high and rising debt burden with elevated interest costs. Brazil illustrates how chronic fiscal pressure, rather than crisis dynamics, can shape biodiversity implementation in upper-middle-income economies with substantial institutional capacity. The post-2023 renewal of biodiversity ambition under broadly similar macro-fiscal conditions further illustrates that debt conditions do not mechanically determine biodiversity policy direction; political choices, institutional mandates, and executive prioritization remain central.

2. Macroeconomic and Fiscal Context

General government gross debt stood at approximately 87.3 percent of GDP in 2024 and is projected to rise toward 99 percent by 2030 under current policies. Gross interest payments absorb close to 20 percent of general government revenue and around a quarter of total expenditure, among the highest interest burdens for upper-middle-income economies. On the general-government net-interest basis used for cross-country screening the ratio is about 15 percent of revenue, corresponding to net interest of roughly 6 percent of GDP, because interest income on reserves and foreign-exchange swap results net down a large gross interest bill. The gross bill is the more relevant measure of the fiscal claim competing with discretionary expenditure, while the net figure preserves comparability across the sample. The IMF's 2025 Article IV consultation identifies elevated public debt and spending rigidities as constraints that crowd out priority investment and reduce fiscal flexibility. Adjustment has occurred primarily through compression of discretionary expenditure, leaving environment- and biodiversity-related spending exposed within annual budget processes.

3. Biodiversity Importance and Implementation Architecture

Brazil contains an estimated 15–20 percent of global terrestrial biodiversity, with high endemism across multiple biomes. Biodiversity policy involves multiple federal ministries, autonomous agencies, subnational governments, and dedicated fiscal instruments including ecological fiscal transfers (ICMS Ecológico) operational in 17 states. BIOFIN expenditure reviews estimate biodiversity-related public spending at around 0.1 percent of GDP, with financing gaps of three to six times current allocations. Biodiversity expenditure is largely discretionary, distributed across multiple budget lines, and not ring-fenced within the fiscal framework.

4. Debt Sustainability → Implementation Transmission Channel

Brazil illustrates the fiscal compression channel. High and persistent debt service obligations narrow discretionary fiscal space and expose biodiversity implementation to competition for resources within the budget envelope. The channel operates continuously and shapes implementation capacity even in the absence of formal debt distress. Between 2019 and 2022, environmental governance weakened and enforcement capacity declined in the context of tight fiscal conditions alongside shifts in policy priorities, with discretionary environmental budgets particularly exposed. Interest burdens form part of the fiscal context in which biodiversity institutions operate; institutional design and political commitment shape how this context translates into implementation outcomes.

5. Policy Ambition Under Fiscal Constraint

Since 2023, Brazil has demonstrated renewed political commitment to biodiversity. The EPANB 2025–2030, established by Decree No. 12,485 of 3 June 2025 and formalized by Ordinance GM/MMA No. 1,519 of 25 November 2025, includes 234 actions distributed across 50 federal ministries and entities, with 25 National Biodiversity Targets recommended by CONABIO Resolution No. 9 of 28 November 2024 and aligned with the Kunming–Montreal Global Biodiversity Framework. A national financing strategy is scheduled for development by end-2026 under Target 19. Biodiversity-relevant spending remains within the discretionary budget envelope and exposed to annual negotiations and consolidation pressures. Complementary instruments, including EcoInvest Brasil for blended finance with currency-risk mitigation, the National Policy on Payments for Environmental Services, and environmental and land-tenure conditionality in rural credit through CAR, extend implementation capacity but do not substitute for predictable public funding for core public-good functions.

6. Implications for Implementation of the Convention

Brazil illustrates a strategic-financing constraint: renewed political ambition must be converted into sustained implementation capacity within a budget system shaped by high interest costs, expenditure rigidities, and consolidation pressures. The fiscal compression channel operates through persistent pressure on discretionary fiscal space rather than acute crisis, shaping the scale, predictability, and fiscal anchoring of implementation even where political commitment is genuine. This case highlights how debt sustainability conditions can shape biodiversity implementation in structurally important economies without triggering formal debt distress.

Full citations appear in the References section.

ANNEX B2: SOUTH AFRICA

Chronic Constraint and Institutional Adaptation

Upper-middle-income
Market access
Not debt-distressed

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~77.9% Trajectory: Stabilizing Interest/revenue: ~19% general government; ~21% main-budget revenue Primary balance: Surplus	Hotspots: 3 Known species: >95,000 Protected areas: ~8% terrestrial Biomes: 9	NBSAP: 2015–2025 Key agencies: SANBI, SANParks DFFE budget 2025/26: R9.08 bn (~0.35% national appropriation) Innovations: Stewardship, offsets

1. Why The South Africa Case Is Instructive

South Africa combines globally significant biodiversity assets with persistent macro-fiscal constraint, despite continued market access and absence of formal debt distress. The country hosts three globally recognized biodiversity hotspots (the Cape Floristic Region, Succulent Karoo, and Maputaland-Pondoland-Albany) while operating under high debt and interest burdens. South Africa illustrates how chronic fiscal pressure can shape biodiversity implementation in an upper-middle-income economy with sophisticated environmental governance, and how institutional adaptation operates under sustained constraint. The case is particularly informative for understanding how the fiscal compression channel manifests through delivery adaptation rather than abrupt retrenchment.

2. Macroeconomic and Fiscal Context

South Africa retains market access, issues predominantly domestic debt in local currency, and is not subject to IMF program conditionality. General government gross debt is estimated at approximately 77.9 percent of GDP in 2025/26 and is projected to stabilize for the first time since 2008. Interest payments absorb approximately 19 percent of general government revenue, near the upper edge of the study's screening band. On the narrower main budget revenue basis reported by the National Treasury the ratio is close to 21 percent; on either basis South Africa carries one of the higher interest burdens among upper-middle-income economies. The November 2025 Medium-Term Budget Policy Statement marks a potential fiscal inflection point with the first primary surplus since 2008. The IMF's December 2025 staff concluding statement notes that, absent additional fiscal reforms, the projected primary surplus may be insufficient to stabilize public debt over the medium term. The fiscal framework does not protect expenditure composition; adjustment falls disproportionately on discretionary spending, including environment-related budgets.

3. Biodiversity Importance and Implementation Architecture

South Africa hosts exceptional biodiversity across nine biomes, with high endemism and globally significant ecosystems. Protected area coverage stands at approximately 8 percent of terrestrial area, supplemented by biodiversity stewardship on private and communal land. Public biodiversity expenditure represents approximately 0.93 percent of consolidated government expenditure on the BIOFIN historical baseline, with near-zero real growth projected over the medium term. The Department of Forestry, Fisheries and the Environment's 2025/26 allocation of R9.08 billion represents approximately 0.35 percent of national appropriation, a real decrease from the previous year. Implementation relies on dedicated institutions including SANBI, SANParks, and provincial agencies, alongside stewardship programs and offset arrangements.

4. Debt Sustainability → Implementation Transmission Channels

South Africa illustrates the fiscal compression channel operating through multiple complementary mechanisms. Budgetary compression sustains pressure on discretionary fiscal space, with biodiversity-related expenditure exposed within the discretionary envelope. Instrument substitution shifts implementation from direct public expenditure toward offsets, stewardship arrangements, and own-revenue models, shifting part of implementation toward non-budgetary and co-financing mechanisms while maintaining policy alignment. Governance load-shifting renders implementation more coordination-intensive and less spending-intensive, with objectives enforced procedurally rather than through dedicated fiscal expenditure. Budget volatility undermines enforcement capacity and long-term planning. These mechanisms operate through persistent pressure on discretionary fiscal space rather than acute crisis, shaping the scale, predictability, and fiscal anchoring of implementation.

5. Institutional Adaptation Under Fiscal Constraint

South Africa's biodiversity governance has adapted to sustained fiscal pressure through functional substitution. Where direct public investment is constrained, biodiversity outcomes are pursued through regulatory instruments, biodiversity stewardship on private and communal land, biodiversity-economy strategies, offset mechanisms, and own-revenue models including the SANParks framework, which generates over half of that agency's revenue from tourism and concessions. In June 2025, DFFE framed its financing approach "in the face of budget cuts" and reported that its biodiversity-economy investment portal had spotlighted 59 bankable projects intended to mobilize green finance. These adaptations extend implementation capacity under constraint, but their reach is uneven: they are most applicable where tourism assets, private-land stewardship opportunities, user fees, or regulatory obligations can support implementation,

and less able to substitute for predictable public funding for enforcement, monitoring, ecological management, and the conservation of non-revenue-generating ecosystems.

6. Implications for implementation of the Convention

South Africa illustrates a delivery-adaptation constraint: an established biodiversity architecture remains active while sustained budget pressure has progressively shifted implementation toward stewardship, regulatory tools, biodiversity-economy strategies, protected-area management models, and offset mechanisms. The fiscal compression channel operates through persistent pressure on discretionary fiscal space rather than crisis dynamics, shaping the scale, predictability, and fiscal anchoring of implementation. This case highlights how debt sustainability conditions can shape biodiversity implementation through compositional pressure on expenditure even where political commitment persists and institutional adaptation continues.

Full citations appear in the References section.

ANNEX B3: GHANA

Restructuring, Extractive Pressure, and Bidirectional Transmission

Lower-middle-income
G20 Common Framework
Post-restructuring

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~88% (2022 peak) Debt sustainability target: NPV of public debt/GDP toward 55% IMF ECF: USD 3 billion Eurobond haircut: ~37%	Hotspot: Guinean Forests Historical forest loss: ~80% Protected areas: ~14–15% Severe mining-related contamination affecting major river systems	NBSAP: Targets submitted 2024 BIOFIN: Launched April 2025 L.I. 2462: Passed 2022, repealed 2025 Cocoa decline: ~50%

1. Why The Ghana Case Is Instructive

Ghana provides the clearest real-time illustration of bidirectional debt–biodiversity dynamics. During the 2022–2025 period of debt distress, severe fiscal pressures coincided with changes in environmental governance and enforcement, while biodiversity-relevant shocks fed back into export earnings and fiscal stability. Ghana demonstrates that biodiversity implementation challenges cannot be attributed solely to weak institutions; the country has an established NBSAP, SDG-linked budget tagging, and launched BIOFIN during restructuring.

2. Macroeconomic and Fiscal Context

Ghana's recent debt restructuring required treatment under the G20 Common Framework. Public debt peaked at approximately 88 percent of GDP in 2022; market access was lost, and external debt service suspended. An IMF Extended Credit Facility of USD 3 billion was approved in May 2023, followed by a domestic debt exchange of approximately USD 15 billion and a Eurobond exchange involving a 37 percent haircut on USD 13 billion. By March 2025, debt-to-GDP had declined to approximately 55 percent. However, this improvement did not translate into restored fiscal space for discretionary spending; the post-restructuring path remains characterized by tight expenditure ceilings under IMF conditionality.

3. Biodiversity Importance and Implementation Architecture

Ghana lies within the Guinean Forests, a biodiversity hotspot spanning tropical forests, savannah woodlands, wetlands, and a coastal zone. Historical deforestation has been severe, with original forest cover reduced by an estimated 80 percent. Protected area coverage stands at approximately 14–15 percent of national territory, but the binding constraint is management effectiveness and enforcement capacity rather than spatial designation. Key pressures include illegal artisanal mining, cocoa expansion, logging, and pollution. Ghana submitted national targets aligned with the KMGBF in August 2024 and launched BIOFIN in April 2025, yet these advances have not insulated biodiversity from fiscal consolidation.

4. Transmission Channels

Ghana presents evidence consistent with bidirectional transmission. During the debt-crisis and restructuring period, severe fiscal stress coincided with reduced enforcement capacity and regulatory changes that expanded permitted activity in forest reserves, consistent with the study's proposed debt-to-biodiversity channel. Legislative Instrument 2462, passed in 2022, permitted mining in forest reserves. As of September 2024, reports indicated that roughly 60 percent of Ghana’s water bodies had been affected by galamsey-related pollution. In February 2025, the Minister for Lands and Natural Resources reported to Parliament that 44 of Ghana’s 288 forest reserves were under serious attack by illegal miners. The biodiversity-to-debt channel operated through cocoa production collapse (from approximately 1.04 million metric tonnes in 2020/21 to approximately 530,000 metric tonnes in 2023/24, a roughly 50 percent decline), estimated forward-contract revenue losses of approximately USD 1.335 billion, increased water treatment costs, and emerging EU Deforestation Regulation market access risks.

5. Crisis-Driven Regulatory Reversal

The passage and repeal of L.I. 2462 illustrates a critical asymmetry. The change in environmental governance and regulatory approaches occurred rapidly during a period of severe fiscal and debt stress; its subsequent reversal followed sustained civil-society and political pressure. The temporal coincidence is consistent with the study's crisis political-economy mechanism, but does not by itself establish causation. During this period, forest reserves were extensively degraded and watersheds contaminated. Ghana demonstrates that the weakening of environmental governance during economic crisis can impose costs that persist well beyond the crisis itself, and that successful debt restructuring can coincide with continued environmental degradation.

6. Implications for implementation of the Convention

Ghana illustrates plausible bidirectional transmission channels between debt dynamics and biodiversity outcomes. It shows that debt restructuring alone does not restore fiscal space for biodiversity implementation, while biodiversity strategies lacking fiscal anchoring remain vulnerable during macroeconomic shocks. The case suggests that the Common Framework does not expressly provide for continuity of biodiversity-related safeguards during restructuring. The case illustrates why the relationship between debt and Convention

implementation is a structural determinant of feasible biodiversity commitments. Ghana illustrates risks that may also arise in other biodiversity-rich countries under acute debt stress.

Full citations appear in the References section

ANNEX B4: ETHIOPIA

Prolonged Restructuring, Revenue Constraints, and Biodiversity Implementation Challenges

Low-income
G20 Common Framework
In debt distress

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~42% Revenue/GDP: ~9.2% IMF ECF: USD 3.4 billion Eurobond default: Dec 2023	Hotspots: 2 Protected areas: ~14% Plant species: ~6,000–7,000 Coffee center of origin	NBSAP: 2025–2030 (GBF-aligned) Restructuring: 4+ years Official-creditor AIP: March 2025 Restructuring status (July 2026): OCC MoU completed; bilateral implementation under way

1. Why The Ethiopia Case Is Instructive

Ethiopia anchors the debt-distressed, low-income end of the study's country spectrum. One of Africa's most biodiverse countries, hosting two global biodiversity hotspots, Ethiopia is simultaneously navigating acute debt distress and prolonged restructuring under the G20 Common Framework. Ethiopia requested treatment in February 2021 and remains in restructuring more than five years later. The case illustrates how severe fiscal compression, foreign exchange scarcity, and prolonged restructuring uncertainty constrain biodiversity implementation even in a policy-capable state with high environmental stakes.

2. Macroeconomic and Fiscal Context

Ethiopia is assessed by the IMF as being in debt distress. The country defaulted on its Eurobond coupon in 2023 and is undergoing restructuring under the G20 Common Framework. Although public debt of approximately 42 percent of GDP appears moderate, Ethiopia's capacity to service that debt is constrained by a narrow revenue base. Government revenue stood at approximately 9.2 percent of GDP in FY2024/25, among the lowest ratios globally. At this level of revenue mobilization, even relatively modest debt-service payments can absorb a substantial share of government resources: debt service equivalent to 2–3 percent of GDP would, illustratively, correspond to roughly 22–33 percent of government revenue. An IMF Extended Credit Facility of USD 3.4 billion was approved in July 2024. Under the programme, new public and publicly guaranteed external financing is generally required to be concessional, with a zero ceiling on new non-concessional borrowing subject to specified exceptions. These borrowing constraints narrow the range of market-rate sovereign financing options available for biodiversity-related purposes.

3. Biodiversity Importance and Implementation Architecture

Ethiopia contains portions of the Eastern Afromontane and Horn of Africa biodiversity hotspots and is a center of origin for globally significant crops including coffee. Protected area coverage stands at approximately 14 percent of national territory, but the binding constraint is management effectiveness and financing adequacy rather than spatial designation. Ethiopia's updated NBSAP (2025–2030) is aligned with the KMGBF but lacks a fully costed implementation plan or protected fiscal envelope. In the absence of safeguarded budget lines, biodiversity remains vulnerable in annual negotiations.

4. Transmission Channels

Ethiopia's debt-biodiversity transmission includes a potentially important foreign-exchange channel alongside fiscal compression. Export concentration in primary commodities and chronic FX shortages may increase incentives for export-oriented production and natural-resource extraction, while also constraining access to imported inputs used in conservation and environmental management. Charcoal production, forest pressure, and agricultural expansion intensified during a period also characterized by conflict, drought, macroeconomic stress, and prolonged restructuring uncertainty. These patterns are consistent with a plausible pathway through which FX scarcity can amplify pressure on natural assets, but the evidence used here does not establish a direct causal chain from FX scarcity to deforestation or demonstrate that biodiversity assets provide measurable balance-of-payments relief.

5. Prolonged Restructuring and Planning Uncertainty

Ethiopia's restructuring has been among the most prolonged under the Common Framework. An Agreement in Principle on official-creditor treatment was reached in March 2025, followed by a Memorandum of Understanding in July 2025, with signatures from all Official Creditor Committee members completed by December 2025. As reported in the IMF's July 2026 fifth review, three OCC members had subsequently signed bilateral implementation agreements and agreements with three additional members were expected shortly. An Agreement in Principle was also in place with three major commercial creditors on terms comparable to the OCC treatment, while discussions with other commercial creditors, including Eurobond holders, remained ongoing. The restructuring was therefore continuing to advance but had not yet been completed. This extended process has had significant opportunity costs: fiscal baselines remain uncertain, medium-term budget planning is constrained, and multi-year conservation programs become difficult to commit to. Environmental agencies face incentives to prioritize short-term operational continuity over longer-term ecosystem management objectives.

6. Implications for implementation of the Convention

Ethiopia demonstrates that biodiversity implementation under acute debt distress faces fundamentally different constraints than under chronic but stable fiscal pressure. Very low revenue mobilization can make moderate debt ratios binding; prolonged restructuring can disrupt planning and may intensify pressures on natural assets; programme-related borrowing limits narrow the range of market-rate sovereign financing options. This case illustrates why debt-distressed countries may require differentiated implementation pathways and financing instruments compatible with adjustment contexts. Ecological degradation occurring during prolonged restructuring may be costly or impossible to reverse, underscoring the value of considering biodiversity implications within debt-restructuring processes.

Full citations appear in the References section.

ANNEX B5: BANGLADESH

Revenue Constraint, Climate Exposure, and Structural Fiscal Ceiling

Lower-middle-income
IMF ECF/EFF + RSF
Moderate debt distress risk

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~41% (FY25) Revenue + grants: ~8.0% of GDP Tax revenue: 6.9% (FY25); 7.4% (FY24) Interest payments: ~2.3% GDP / ~28% revenue DSA risk: Low → Moderate (2025)	Sundarbans: world's largest mangrove Renewable natural capital: ~26% of wealth Protected areas: ~4–5% (WDPA) Climate Risk Index: top 10	NBSAP: 2016–2021 (update pending) BIOFIN Umbrella Programme: launched May 2025 Climate budget tagging: operational IMF RSF: USD 1.4 billion (2023)

1. Why The Bangladesh Case Is Instructive

Bangladesh combines high dependence on natural capital with structurally low revenue, rising debt service pressures, and extreme climate exposure. The case illustrates how biodiversity implementation can be constrained not by acute debt distress or institutional fragility, but by persistent fiscal rigidity. The binding constraint is functionally fiscal: low revenue mobilization turns moderate debt service into a structural ceiling on discretionary spending, even where headline debt ratios do not indicate distress.

2. Macroeconomic and Fiscal Context

Public and publicly guaranteed debt stood at approximately 41 percent of GDP in FY25, moderate by international standards. Revenue and grants amounted to approximately 8.0 percent of GDP, among the lowest globally. Tax revenue fell from 7.4 percent of GDP in FY24 to 6.9 percent in FY25, reflecting structural revenue weakness compounded by cyclical shocks including weakened compliance, public unrest, and disruption at the revenue authority. Interest payments of approximately 2.3 percent of GDP absorb approximately 28 percent of revenue and grants. The IMF and World Bank moved Bangladesh from low to moderate risk of debt distress in 2025. The IMF program approved in January 2023, including a USD 1.4 billion Resilience and Sustainability Facility, places limits and conditionality on new external borrowing; projected new borrowing includes semi-concessional financing but no commercial-term borrowing.

3. Biodiversity Importance and Implementation Architecture

Bangladesh hosts globally significant ecosystems including the Sundarbans, extensive wetlands, and the Ganges-Brahmaputra-Meghna delta. Renewable natural capital accounts for approximately 26 percent of national wealth (CWON 2024), dominated by agricultural land at around 24.5 percent of total wealth. Population dependence on ecosystem services for livelihoods, nutrition, and disaster buffering remains exceptionally high. Bangladesh's sovereign-scale indicators place it in Configuration B under the Section 5 framework. Terrestrial protected area coverage is approximately 4–5 percent, low relative to ecological significance.

The biodiversity finance architecture is at an earlier institutional stage than the climate equivalent. The Climate Fiscal Framework (2014) and climate budget tagging have been operational for over a decade, with further development under the IMF Resilience and Sustainability Facility. The BIOFIN Umbrella Programme launched in May 2025, proposing biodiversity budget tagging, a National Biodiversity Trust Fund, eco-tourism revenue sharing, and payments for ecosystem services. Biodiversity spending remains fragmented and unprotected within annual budget negotiations.

4. Transmission Channels

The transmission channel for Bangladesh operates through revenue constraints rather than the broader fiscal compression that characterizes upper-middle-income economies (see Section 3.3). Three reinforcing mechanisms shape implementation.

First, debt service crowds into a narrow budget envelope, limiting predictable allocations for biodiversity-related public functions, which compete alongside interest payments, subsidies, wages, and social expenditure. Second, low revenue capacity reduces the government's ability to smooth spending through downturns, disasters, and external shocks. Natural-disaster stress tests materially worsen Bangladesh's debt-service-to-revenue indicators. Third, weak domestic revenue capacity increases reliance on external and project-based finance, which may not reliably fund core recurrent costs such as staffing, enforcement, monitoring, and protected-area operations.

5. Climate-Disaster Risk as Fiscal Amplifier

Bangladesh ranks among the world's most climate- and disaster-exposed countries. Floods, cyclones, salinity intrusion, and riverbank erosion impose recurrent fiscal costs through emergency response, reconstruction, and productivity losses. Post-disaster spending financed through budget reallocation or additional borrowing tightens medium-term fiscal space, reducing investment in ecosystem protection. The biodiversity-fiscal-climate relationship in Bangladesh manifests through limited shock-absorption capacity rather than acute debt distress.

6. Implications for implementation of the Convention

Bangladesh illustrates that debt sustainability assessments based on headline debt ratios can understate implementation constraints where revenue mobilization is exceptionally weak. The case shows a structural fiscal ceiling: moderate debt rendered functionally binding by an exceptionally weak revenue base under climate stress. The case shows why debt sustainability and Convention implementation should be interpreted through a revenue lens, not through debt-to-GDP alone. Biodiversity implementation challenges reflect fiscal structure, not policy absence; comprehensive strategies and institutional capacity exist, yet outcomes lag because biodiversity spending is fragmented, unprotected, and residual in budget prioritization.

Full citations appear in the References section.

ANNEX B6: INDIA

Federal Complexity, Fiscal Consolidation, and Scale

Lower-middle-income
Market access
Not debt-distressed

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~82–84% Interest/revenue: ~24% general government; central budget: ~25% of expenditure / ~37% of revenue receipts	Hotspots: 4 of 36 global Global species: 7–8% Protected areas: ~5.3% Forest-dependent: 275 million	NBSAP: Updated 2024 MoEFCC: ~0.07% of expenditure NBSAP need: Rs 81,665 cr/year States/UTs: 28 + 8

1. Why The India Case Is Instructive

India demonstrates how chronic fiscal pressure, federal governance complexity, and scale can constrain biodiversity outcomes even in a policy-capable, market-access economy. As the world's most populous country, one of 17 megadiverse nations, and the fifth-largest economy, India's scale and biodiversity endowment make its trajectory consequential for global progress against the Kunming-Montreal Global Biodiversity Framework. Implementation challenges cannot be attributed to insolvency or macroeconomic instability; instead, India illustrates how high but sustainable debt, elevated interest burdens, and intergovernmental coordination costs interact to shape implementation capacity.

2. Macroeconomic and Fiscal Context

India retains market access, issues predominantly domestic local-currency debt, and is not subject to IMF conditionality. General government gross debt is approximately 82 percent of GDP, assessed as sustainable. However, interest payments absorb approximately 24 percent of general government revenue; on the narrower central budget the share of revenue receipts is higher. The binding issue is thus compression of discretionary fiscal space. Fiscal consolidation policy reinforces this: the medium-term framework protects capital expenditure while constraining revenue expenditure. Because biodiversity management is overwhelmingly recurrent, it falls within the expenditure category being constrained.

3. Biodiversity Importance and Implementation Architecture

India harbors approximately 7–8 percent of recorded global species within 2.4 percent of global land area, spanning four biodiversity hotspots. The protected area network covers approximately 5.3 percent of national territory. Approximately 275 million people depend on forests for livelihoods, embedding biodiversity management within complex social trade-offs. The updated NBSAP is aligned with the KMGBF and involves 21 central ministries; implementation is estimated to require approximately Rs 81,665 crore annually through 2030. However, the NBSAP does not establish a protected fiscal envelope, and implementation depends on annual budget negotiations within multiple ministries.

4. Transmission Channels

The debt-to-biodiversity channel operates through interest-driven discretionary squeeze and revenue-biased consolidation that disadvantage recurrent conservation costs. The Ministry of Environment, Forest and Climate Change accounts for approximately 0.07 percent of Union government expenditure. Capacity constraints compound fiscal pressure: state forest departments report significant staff vacancies affecting enforcement and monitoring. Federal coordination costs filter fiscal resources through varied subnational capacities; 28 states and 8 union territories share environmental jurisdiction, with wide variation in administrative effectiveness. Climate shocks trigger fiscal reallocation, amplifying biodiversity stress.

5. Federal Fiscal Architecture and Subnational Variation

India’s federal system is central to biodiversity outcomes. The Finance Commission’s inclusion of forest cover in horizontal devolution potentially channels substantial resources to forest-rich states; however, transfers are not earmarked for conservation, reward existing stock rather than outcomes, and exclude non-forest ecosystems. Observed variation in biodiversity outcomes across states reflects differences in administrative capacity, political prioritization, and economic structure. Targeted institutional design can overcome fiscal pressure selectively. Species-focused programs such as tiger conservation have delivered measurable outcomes but such models may not be scalable across all domains.

6. Implications for implementation of the Convention

India demonstrates that biodiversity implementation challenges are not confined to debt-distressed or low-capacity states. Even in a large, policy-capable economy, debt sustainability conditions, through interest burdens, fiscal consolidation strategies, and intergovernmental dynamics, can materially constrain implementation of the Convention. Fiscal constraint is a necessary but not sufficient explanation; debt sustainability conditions biodiversity implementation through interaction with institutional design and governance capacity. The case underscores that scale and federal complexity amplify implementation risk, requiring analysis beyond aggregate fiscal indicators.

Full citations appear in the References section.

ANNEX B7: PERU

Low Debt, High Disaster Risk, and Decentralized Fragmentation

Upper-middle-income
Market access
Not debt-distressed

Fiscal Position	Biodiversity Profile	Implementation Status
Debt/GDP: ~32–34%	Megadiverse: ~10% global species	NBSAP: GBF update submitted
Reserves: ~27% of GDP	Hotspot: Tropical Andes	Regions: 26 + 1,800 municipalities
Fiscal deficit: 3.5% (2024)	Protected areas: ~17.9%	Subnational spending: ~40%
El Niño losses: up to 11.6% GDP	Biosphere reserves: 7	

1. Why The Peru Case Is Instructive

Peru demonstrates that low debt and strong macroeconomic buffers do not insulate biodiversity implementation from binding constraints. As a megadiverse country with relatively low public debt, sustained market access, and sizeable international reserves, Peru nonetheless faces persistent biodiversity implementation challenges despite substantial recent growth in environmental sector budgets. Implementation challenges cannot be attributed to debt distress or institutional collapse; instead, Peru illustrates how political-legal environment, enforcement gaps against illegal-economy drivers operating outside the conservation budget, coordination complexity in deeply decentralized governance, and a resource-dependent economic structure can constrain biodiversity outcomes in fiscally strong, policy-capable states.

2. Macroeconomic and Fiscal Context

Peru's public debt of approximately 32–34 percent of GDP (2023–2024) remains well below upper-middle-income peers. The debt profile is largely domestic and local-currency denominated, and international reserves exceed 27 percent of GDP (2024). Yet fiscal strength coexists with persistent constraints. The 2024 fiscal deficit of 3.5 percent of GDP exceeded the target under Peru's fiscal responsibility framework. Infrastructure gaps, social protection demands, subnational transfer obligations, disaster response costs, and quasi-fiscal support for Petroperu all compete within a crowded discretionary envelope. Biodiversity spending, lacking statutory protection, remains exposed to deprioritization in annual budget negotiations.

3. Biodiversity Importance and Implementation Architecture

Peru ranks among the world's most biodiverse countries, hosting approximately 10 percent of global species within the Tropical Andes hotspot. The national protected area system (SINANPE), covers approximately 17.9 percent of terrestrial territory; including private and communal conservation areas (ACPs), regional conservation areas, and other effective area-based conservation measures, total terrestrial coverage approaches 22 percent. Peru submitted its updated NBSAP to the CBD Secretariat in October 2024, aligned with the Kunming–Montreal Global Biodiversity Framework and structured around five strategic objectives, 29 targets, and 143 actions. However, the strategy is not yet fiscally anchored: there is no protected multi-year budget envelope dedicated to NBSAP implementation, and the financing commitments associated with specific targets remain indicative rather than legally binding. Peru's 2021 Sovereign Sustainable Bond Framework, under which multiple tranches have been issued, includes biodiversity-relevant eligible categories (natural resource management, marine protected areas, sustainable agriculture) alongside broader green and social uses. Proceeds are not earmarked specifically for biodiversity, but the program illustrates how fiscal headroom and market access can support biodiversity-relevant sovereign finance.

4. Transmission Channels

The principal transmission mechanisms operate largely outside the formal conservation budget. Peru's main deforestation drivers (illegal logging and mining, agricultural expansion associated with illicit economies, and agro-commodity frontier dynamics) are enforcement and political-economy issues rather than budgetary constraints. The political-legal environment shifted further in this direction with Law 31973 of January 2024, amending the Forestry and Wildlife Law, which suspended forest-zoning requirements for enabling titles and exempted certain private agricultural land from classification requirements, in ways critics argued would regularize historical conversion. The Constitutional Court declared the suspension unconstitutional in February 2025, leaving the exemption in place. Climate and disaster shocks add an episodic fiscal compression layer: major El Niño events have generated losses equivalent to 6–12 percent of GDP, with the 2017 coastal event alone causing approximately USD 3 billion in damages. Regional and local governments account for approximately 40 percent of total public spending and around 60 percent of public investment, underscoring the importance of subnational capacity and coordination for biodiversity delivery. Approximately 60 percent of social conflicts in Peru are environmental, frequently linked to extractive activities.

5. Decentralization and Institutional Fragmentation

Fiscal decentralization is one of Peru's most analytically significant features. Since 2002 reforms, 26 regional governments and over 1,800 municipalities share environmental jurisdiction. Subnational environmental expenditure has increased substantially in recent years, alongside a broader expansion in the fiscal role of regional and local governments. However, significant variation in institutional and execution capacity continues across subnational governments. The canon system, which distributes a constitutionally mandated share of natural-resource revenues to producing regions, is a structural feature of Peru's decentralization rather than a discrete policy gap, though it contributes to spatial heterogeneity in environmental resourcing. Coordination across this large set of decentralized entities, with distinct planning cycles and capacities, weakens scale and continuity of biodiversity action, with management effectiveness across protected areas varying accordingly.

6. Implications for implementation of the Convention

Peru demonstrates that fiscal strength measured by debt metrics can mask material implementation constraints. Political-legal environment, enforcement gaps against illegal-economy drivers operating outside the conservation budget, coordination complexity across decentralized governance, and an extractive-dependent development model can bind biodiversity outcomes as tightly as debt distress. Peru’s example shows that biodiversity implementation challenges are not confined to debt-distressed or institutionally fragile states. Even fiscally strong countries with growing environmental sector budgets require differentiated implementation pathways that address legal and regulatory environment, enforcement, coordination effectiveness, and the political economy of extractive interests, beyond aggregate debt and fiscal indicators.

Full citations appear in the References section.

ANNEX B8: BELIZE AND VANUATU

Small Island Developing States and the Reverse Channel: Biodiversity as Macro-Fiscal Asset

	BELIZE	VANUATU
Income classification	Upper-middle-income	Lower-middle-income
Debt/GDP	~61% (down from 103% in 2020)	~45% (external debt distress risk: moderate; overall: high)
Primary transmission channel	Revenue-based: reef → tourism → fiscal receipts	Risk-mitigation: ecosystems → reduced disaster costs
Key ecosystem asset	Belize Barrier Reef (2nd largest globally)	Coral reefs and mangroves (protective infrastructure)
Quantified economic link	Travel and Tourism total contribution: ~40–46% of GDP; reef services: USD 395–559m/year	Avg. disaster loss: 6.6% of GDP/year; TC Pam 2015 led to ~64% of GDP damage and losses
Innovative instrument	2021 Belize debt conversion / Blue Bond: USD 364m; 30% ocean-protection commitment	Community-based marine conservation; ecosystem-based adaptation

1. Why The Paired Study Is Instructive

The main country case studies examine the forward channel: how debt constraints affect biodiversity implementation. This paired case study examines the reverse channel: how biodiversity outcomes affect fiscal performance. Belize and Vanuatu are selected because they represent the two primary reverse-channel mechanisms in particularly clear form. Belize illustrates biodiversity as a revenue-generating asset; Vanuatu illustrates biodiversity as fiscal risk infrastructure. Together, they illustrate how biodiversity can be macro-relevant without being a budget line item.

2. Belize: The Revenue-Based Channel

Belize exemplifies biodiversity as a revenue-generating asset. The Barrier Reef underpins a tourism sector contributing approximately 40–46 percent of GDP. Reef-dependent tourism accounts for 25 percent of tourist activity; ecosystem services from coral reefs and mangroves are valued at USD 395–559 million annually. The transmission channel is relatively direct: reef degradation can reduce tourism demand and spending, with implications for GST receipts, corporate taxes from tourism operators, income taxes from tourism employees, and foreign-exchange earnings. Degradation threatens the foreign exchange earnings required to service external debt and maintain the fixed exchange rate.

The 2021 Blue Bond demonstrates policy recognition of this link. The transaction reduced public debt by 12 percent of GDP while securing USD 180 million for marine conservation over 20 years and committing Belize to protect 30 percent of its ocean by 2026. By linking debt restructuring, conservation funding, and marine protection commitments, the transaction created an institutional connection between fiscal relief and conservation delivery. Belize's debt has fallen from 103 percent of GDP (2020) to approximately 61 percent (2024), alongside record tourism arrivals of 562,405 overnight visitors in 2024.

3. Vanuatu: The Risk-Mitigation Channel

Vanuatu illustrates biodiversity as fiscal risk infrastructure. As one of the world's most hazard-exposed countries, it faces annual average losses estimated at approximately 6.6 percent of GDP from cyclones, earthquakes, and tsunamis under PCRAFI modeling. Cyclones in 2015 and 2020 caused damage and losses of around 60–65 percent of GDP, and the 2023 twin cyclones Judy and Kevin affected roughly two-thirds of the population. Coastal ecosystems provide material protection against storm surge and wave damage. Estimates suggest mangroves can reduce flood damage costs by 5–30 percent.

Ecosystem degradation can create a 'ratchet effect' on debt where disaster shocks increase borrowing for reconstruction, while degradation of protective ecosystems amplifies damage from subsequent shocks. Where recovery is incomplete, debt rises after successive events as protective capacity is progressively lost. Unlike Belize, where the mechanism operates through tourism revenue, Vanuatu illustrates biodiversity loss as a fiscal risk amplifier that increases contingent liabilities and debt volatility.

4. Implications for implementation of the Convention

These cases illustrate that the biodiversity-to-fiscal channel can operate through multiple pathways that are analytically distinct but often mutually reinforcing. For many highly nature-dependent and disaster-exposed SIDS, ecosystem health can be a structural determinant of fiscal sustainability. Debt sustainability assessments should incorporate both the revenue implications of nature-based economic activities and the risk-reduction services of healthy ecosystems. The cases underscore that biodiversity finance can function not merely as an expenditure category, but as investment in an asset base that may generate revenue and reduce fiscal risk.

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