Securing Kenya's Prosperity:

The need for a robust Biodiversity Offset Framework

Developed by:

KWCA EarthAcre TERRASOS

With support from:

MULAGO

Securing Kenya's Prosperity

The need for a robust Biodiversity Offset Framework

July 2026

Terrasos · EarthAcre · Kenya Wildlife Conservancies Association (KWCA)

Technical Team

Terrasos: Mariana Sarmiento, Juanita López-Peláez, Lina Aristizabal, Gabriela Casallas, Susana Espinosa

Layout design *Angie Ortiz*

KWCA: Dickson Kaelo, Gladys Warigia

EarthAcre: Viraj Sikand, Elizabeth Gitari-Mitaru, Lydia Zemke

With The Support Of Mulago Foundation

Peer Reviewed By

Economic Policy Innovation Center (EPIC), Stockholm Environment Institute (SEI)

Suggested citation

Terrasos, KWCA & EarthAcre. (2026). Securing Kenya's Prosperity: The need for a robust Biodiversity Offset Framework.

CONTENT

List of Tables

List of Figures

Acknowledgments

We extend our sincere gratitude to all who contributed to the development of this report. We particularly thank The Economic Policy Innovation Center (EPIC) and Stockholm Environment Institute (SEI) for their contributions as peer reviewers. Their technical insights, constructive feedback, and thorough review have been invaluable in refining the analysis and recommendations presented in this document.

TERRASOS

Acronyms

Acronym	Meaning
AfDB	African Development Bank
BBOP	Business and Biodiversity Offsets Programme
BETA	Bottom-Up Economic Transformation Agenda
CBD	Convention on Biological Diversity
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EPIC	Economic Policy Innovation Center
ESG	Environmental, Social and Governance
ESS	Environmental and Social Standards
FPIC	Free, Prior and Informed Consent
GDP	Gross Domestic Product
GESIP	Green Economy Strategy and Implementation Plan
GSSB+	Green, Social, Sustainability, Blue, and Sustainability-Linked Bonds
IFC	International Finance Corporation
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
ISS	Integrated Safeguard System
IUCN	International Union for Conservation of Nature
KBA / KBAs	Key Biodiversity Areas
KFS	Kenya Forest Service
KNBS	Kenya National Bureau of Statistics
KSh	Kenyan Shilling
KWS	Kenya Wildlife Service
KWCA	Kenya Wildlife Conservancies Association
MoECCF	Ministry of Environment, Climate Change and Forestry
MoTW	Ministry of Tourism and Wildlife
MTP IV	Fourth Medium-Term Plan
NBSAP	National Biodiversity Strategy and Action Plan
NDC	Nationally Determined Contribution
NEMA	National Environment Management Authority
NBCM	National Biodiversity Coordination Mechanism
NG	Net Gain
NNL	No Net Loss
SEI	Stockholm Environment Institute
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

Executive Summary

Aligning Growth with Nature Integrity

This document provides a comprehensive framework to guide Kenya's transition toward sustainable development by integrating biodiversity offsets into national planning.

Kenya's development pathway under Vision 2030 and the Bottom-Up Economic Transformation Agenda (BETA) is driving a significant expansion of infrastructure, energy, mining, transport, and other strategic sectors that are essential for economic growth, job creation and support national development objectives. However, these same activities increasingly interact with ecologically sensitive landscapes and can often generate habitat loss, ecosystem fragmentation, and biodiversity decline, placing increasing pressure on the natural capital that underpins Kenya's economy.

The country risks financing its modern development through the gradual depletion of the very natural assets that sustain long-term economic prosperity.

44%

of Kenya's Gross Domestic Product (GDP) directly depends on nature-based sectors (World Bank, 2025)

70%

of national employment is linked to ecosystem-dependent activities such as agriculture, tourism, water supply, and energy (Government of Kenya, 2016).

Biodiversity loss in Kenya has escalated into a **severe fiscal, developmental, and macroeconomic risk** that threatens long-term national stability and community resilience. Therefore, there is a growing need to ensure that economic growth is accompanied by effective measures to safeguard the natural capital that underpins long-term and sustainable development.

Biodiversity offsets represent a strategic market solution to reconcile economic expansion with ecological integrity. As demonstrated by established regulatory frameworks in countries like United Kingdom, Australia, the United States and Colombia among others, high-integrity offsets transition the financial burden of conservation from the public sector to private capital, and unlock predictable financing for national conservation priorities by requiring developers to internalize the full environmental cost of their operations (OECD, 2016; 2025).

Offsets apply only after a project has fully considered all efforts to avoid, minimize, and restore on-site damage according to the mitigation hierarchy. Their objective is to achieve No Net Loss (NNL) and preferably a Net Gain (NG) of biodiversity on the ground. In that sense, biodiversity offsets incentivize far more avoidance of nature impacts that developers figure out how to do themselves in order to reduce costs since the start of the project, integrating the total economic value of biodiversity into developers' decision-making, without requiring the Government to directly finance or implement the corresponding conservation actions. (OECD, 2016; 2025).

[1] No Net Loss refers to ensuring that a project does not reduce biodiversity levels as the final ecological state has to be equivalent to the state before the project. Net Gain, as a preferred outcome, refers to when conservation actions deliver measurable gains that exceed the residual biodiversity impacts of a project, resulting in an improvement to biodiversity on the ground.

Currently, the lack of a policy to align economic growth with nature integrity creates a series of risks that threaten Kenya's macroeconomic stability:

Identified Risks

Risk 1. Accumulation of unfunded public liabilities: Residual biodiversity impacts do not disappear when they are not compensated; they are transferred from project developers to the Government and the public. The KWS budget gap illustrates this structural pressure: in fiscal year 2024, KWS was allocated KSh 9.3 billion against an operational requirement of KSh 19.8 billion (Government of Kenya, National Treasury, 2024). Furthermore, as ecosystem degradation continues to undermine the natural capital that supports Kenya's economy, continued degradation will directly weaken nature-dependent sectors highly or very highly reliant on ecosystem services such as tourism, agriculture, water supply, energy, and infrastructure resilience, among others, that together contribute to the 44% of Kenya's GDP (World Bank, 2025).

Risk 2. Economic and Development Risks: Kenya's infrastructure, energy, mining, and transport expansion is increasingly intersecting with Key Biodiversity Areas (KBAs), water towers, wildlife corridors, protected landscapes, and other ecologically sensitive areas. This pressure is already visible: 31 out of Kenya's 58 KBAs are in an "unfavorable" condition, driven by habitat fragmentation, human-wildlife conflict, pollution, and land-use change (Government of Kenya, 2026). Continued degradation of ecological infrastructure increases economic and social fragility by weakening essential ecosystem services. This raises costs for nature-dependent sectors, affects employment and livelihoods.

Risk 3. Limited Investor Alignment and Capital Access: International finance is increasingly integrating nature-related risks, robust environmental safeguards, No Net Loss or Net Gain expectations, and measurable environmental performance into investment decisions. The absence of a credible, results-based domestic offset framework threatens Kenya's future access to global sustainable capital markets. This affects both project finance through:

Standards such as:

as the World Bank Environmental and Social Standards, IFC Performance Standards, and AfDB Integrated Safeguard System.

Sustainable Finance instruments such as:

Green, Social, Sustainability, Blue, and Sustainability-Linked bonds (GSSB+).

The Opportunity:
Current Enabling Regulatory and Policy Framework

Kenya already has a legal and policy foundation to integrate biodiversity offsets, mainly through EMCA, the EIA Regulations, and existing biodiversity and development commitments.

EMCA and the EIA system: The EMCA and its EIA Regulations already require projects to assess and manage environmental impacts through mitigation measures. This provides the main regulatory entry point to strengthen the mitigation hierarchy and introduce offsets for residual biodiversity impacts.

Development policy alignment: Kenya's policy and legislative framework, including Vision 2030, the Fourth Medium-Term Plan (MTP IV 2023–2027), BETA, the National Environment Policy, the Wildlife Strategy 2030, and the Green Economy Strategy and Implementation Plan (GESIP 2016-2030) link economic development with sustainable natural resource management and ecosystem integrity.

International commitments: Kenya’s biodiversity and climate commitments reinforce the use of offsets, especially the updated NBSAP targets, which identify biodiversity offsets under National Target 14 and 15 as a mechanism to achieve No Net Loss and generate conservation revenue.

However, this framework lacks focus on outcomes. **It does not yet translate these mandates into binding requirements for residual biodiversity impacts.** So, projects can comply with EIA procedures and still produce residual biodiversity impacts that result in net biodiversity loss because there is no enforceable mechanism explicitly requiring No Net Loss or Net Gain. To capitalize on the existing baseline and bridge the outcome gap without a complete legislative overhaul, the country should prioritize four core strategic actions:

Mandate the mitigation hierarchy:

Update the EIA Regulations under EMCA act of 1999 to require avoidance, minimization, restoration, and offsets as legally binding activities from early project design.

Establish a clear institutional architecture for offset implementation:

Define a coordinated governance framework with clearly separated roles and responsibilities across relevant public institutions to ensure that biodiversity offsets can be planned, approved, implemented, monitored and verified.

Establish high-integrity technical standards:

Define and require all offsets to meet clear criteria on permanence, ecological equivalence, social safeguards, long-term financing, monitoring, and verification. This encompasses developing a unified methodology to ensure that the trade-off between loss and gain of biodiversity is measurable and verifiable.

Enable pilot scalable implementation mechanisms:

Allow habitat banks to aggregate offset obligations from high-impact sectors and channel finance toward priority areas for nature conservation and restoration.

Purpose and Target Audience

The purpose of this analysis is to support discussion on why biodiversity offsets should be incorporated into Kenya's regulatory framework, particularly through its environmental assessment and biodiversity governance systems. It is intended for a variety of stakeholders involved in development planning, biodiversity conservation, and sectoral regulation, including:

Government Ministries

- The Ministry of Environment, Climate Change and Forestry
- The Ministry of Tourism and Wildlife
- The Ministry of Energy and Petroleum
- The Ministry of Roads and Transport
- The Ministry of Mining, Blue Economy and Maritime Affairs
- The Ministry of Agriculture and Livestock Development
- The National Treasury and Economic Planning

Environmental and Natural Resource Management Institutions and Coordination Mechanisms:

- National Environmental Management Authority
- Kenya Wildlife Service
- Kenya Forest Service
- National Biodiversity Coordination Mechanism.

Financing Institutions, NGOs, academia, research institutions and development partner along with other actors contributing to Kenya's biodiversity finance and environmental governance agenda.

Securing Kenya's Prosperity: **The need for a robust Biodiversity Offset Framework**

Introduction

Kenya's development ambitions are accelerating fast. The pursuit of the Bottom-Up Economic Transformation Agenda (BETA) and Vision 2030 demands an unprecedented expansion of infrastructure, primarily in the energy and transport sectors, alongside sustained growth in extractive industries. What makes this particularly consequential is where Kenya's economy is rooted:

44%

of Gross Domestic Product (GDP) depends on nature-based sectors and ecosystem services (World Bank, 2025)

70%

of employment is tied to agriculture, tourism, water supply, and energy (Government of Kenya, 2016).

In structural terms, Kenya is funding its development by depleting the ecosystems that support all life, growth and sustainability of the country. Consequently, biodiversity loss is not merely an externalized cost or a financial risk, but a severe fiscal, developmental, and social risk; it represents a fundamental fracture in the country's socio-ecological fabric, directly undermining collective well-being, community resilience, and economic national stability.

Kenya's policy gap in managing environmental impacts

As the country scales up investments in roads, railways, energy plants, and mining infrastructure, these will inevitably overlap with Key Biodiversity Areas (KBAs), water towers, wildlife corridors, and critical marine areas, creating largely irreversible impacts if they are not purposefully avoided (Finer, 2019; Oduk & Manegene, 2024). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has consistently identified infrastructure expansion, land-use change, and extractive activities as major drivers of biodiversity loss worldwide (IPBES, 2024; IPBES, 2026). Along with this situation, Kenya's most recent National Report to the Convention on Biological Diversity (CBD), states that 31 out of 58 Key Biodiversity Areas (KBAs) are currently in an "unfavorable" condition. It also states invasive alien species, chemical pollution, habitat fragmentation and human-wildlife conflict as the main drivers for biodiversity loss acceleration (Government of Kenya, 2026).

This document sets out the rationale for incorporating biodiversity offsets into Kenya's regulatory framework as a necessary tool to address the environmental consequences of development, and close an urgent policy gap:

> **At present, Kenya lacks a binding regulatory mechanism that requires development projects to compensate for residual biodiversity losses they cause.**

The Environmental Management and Coordination Act (EMCA), which governs environmental impact assessment in Kenya, focuses on procedural compliance rather than ecological outcomes. As a result, projects may meet legal requirements and still generate net biodiversity loss if mitigation measures are not ecologically equivalent to what was lost. This creates ecological costs that will accumulate in the public sphere while developers are not held financially accountable for the biodiversity impacts they leave behind.

Fiscal and Structural Risks

When biodiversity impacts are not addressed, they ultimately create public costs that shift from the developer's balance sheet to the Government's. They appear through increased restoration needs and declining ecosystem services, accumulating as unfunded public liabilities that progressively erode fiscal space and long-term economic resilience. Kenya's Seventh National Report presented to the CBD estimates a US$5 billion gap to achieve national conservation goals due to fragmented coordination and limited bankable project pipeline (Government of Kenya, 2026). This highlights the scale of Kenya's long-term biodiversity financing challenge.

The unfunded biodiversity impacts are also mirrored at the institutional level: the Ministry of Environment, Climate Change and Forestry (MoECCF) and The Ministry of Tourism and Wildlife (MoTW) both face significant financing gaps against their strategic plans toward the advancement of international commitments: KSh 144 billion and KSh 139 billion, respectively (MoECCF; MoTW, 2023). The Kenya Wildlife Service (KWS) illustrates this most clearly: in FY 2024, it received KSh 9.3 billion against an estimated operational requirement of KSh 19.8 billion, leaving a funding gap of approximately KSh 10.5 billion. These situations represent a structural deficit that reflects ecological costs being systematically transferred to the public sector (National Treasury, 2024)

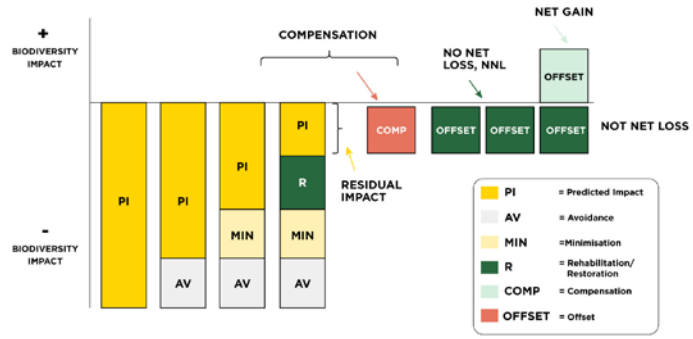
The risk, however, extends beyond conservation budgets. Ecosystem degradation directly undermines the sectors that depend on it. For example, degraded water catchments raise input costs for agriculture and energy, loss of natural protection systems increases exposure to floods and droughts, and declining ecosystem health erodes the tourism revenues that depend on intact wildlife and coastal environments. This broader fiscal exposure remains largely unaccounted for in public financial planning and has the potential to structurally weaken key pillars of Kenya's economy (World Bank, 2025).

[2] The Seventh National Report does not establish the designated currency in which this amount should be understood. Under the authors estimation this amount could refer to US dollars currency

Offsets as a Strategic Solution

Biodiversity offsets are the policy instrument designed to close this gap. They are measurable conservation outcomes generated by actions that compensate -or surpass- significant residual biodiversity impacts. As the final step in the mitigation hierarchy, offsets apply only after a project has fully considered efforts to avoid, minimize, and restore on-site environmental damage (World Bank, 2016; BBOP, 2009), with the goal of achieving No Net Loss (NNL), and preferably, a Net Gain (NG) of biodiversity on the ground, with respect to previous species composition, habitat structure, or ecosystem function (BBOP, 2009).

Figure 1. Mitigation hierarchy framework



Source: Adopted from BBOP (2013)

Biodiversity offsets are not a substitute for prevention, but a mechanism for addressing impacts that remain after all reasonable mitigation has been applied. Used properly, offsets can reduce pressure on public budgets, support a net-gain approach, and operationalize "the polluter pays principle" in a way that is both credible and enforceable.

Offset mechanisms can help reconcile two national priorities that are currently in tension: expanding infrastructure to deliver the national goals and expectations expressed in policy frameworks like BETA and Vision 2030, while also safeguarding the ecological systems that underpin much of the country's economy, well-being and employment. By requiring developers to compensate for residual impacts, offsets can help ensure that today's high-impact projects do not leave behind a lasting deficit in Kenya's natural capital. If well designed, they can provide legal certainty for developers, unlock predictable private finance for conservation, ease the Government's fiscal burden, and generate measurable benefits for both nature and local communities (IUCN, 2025; World Bank, 2016).

Why Kenya Must Act Now

Four converging factors make this the critical moment to incorporate biodiversity offsets into Kenya's regulatory architecture:

1 Existing Institutional Entry Points

Kenya's current environmental regulatory and institutional framework provides a clear baseline but remains under-operationalized for offset tracking and compliance.

2 International Alignment

The updated National Biodiversity Targets, presented to the CBD, explicitly identify biodiversity offsets in National Targets 14 and 15 as a mechanism to achieve No Net Loss and generate conservation revenue.

3 Escalating Fiscal Urgency

Infrastructure investment is generating irreversible ecological costs faster than public budgets can absorb them, compounding Government liabilities.

4 Global Capital Access

A global shift by investors, ESG frameworks, and development finance institutions toward nature-positive standards makes a credible domestic offset framework essential for continued access to international finance.

[3] The mitigation hierarchy is a sequential framework for managing biodiversity impacts from development projects. It requires project proponents to first avoid impacts where possible, then minimize unavoidable impacts, restore or rehabilitate affected areas, and only then offset significant residual impacts through measurable conservation outcomes. Under this framework, offsets may only be considered after all appropriate avoidance, minimization and restoration measures have been applied, and must not be used to justify avoidable biodiversity loss (IUCN, 2016)

Report Structure
To achieve the document's main purpose, supporting discussion on why biodiversity offsets should be incorporated into Kenya's regulatory framework, the analysis is structured into five main parts:

Section 1

The Hidden Cost of Unmitigated Biodiversity Impacts

Details Kenya's macroeconomic dependence on natural capital and the economic sectors at risk.

Section 2

Biodiversity Offsets as a Strategic Market Solution

Explains what are Biodiversity Offsets, their implementation pathways and value generation in economic, environmental and social dimensions.

Section 3

Kenya's Enabling Framework

Assesses the domestic legal, policy, and institutional enabling points that can support the incorporation of biodiversity offsets into Kenya's environmental governance framework.

Section 4

How to design High Integrity Biodiversity Offsets for Kenya

Defines the minimum technical integrity conditions (additionality, permanence, and equivalence) that biodiversity offset should follow and presents scalable mechanisms to achieve it like habitat banks.

Section 5

Strategic Recommendations

Proposes a concrete regulatory, institutional, and technical roadmap to operationalize the framework.

1.

The Hidden Cost of **Unmitigated Biodiversity Impacts**

Natural Capital as Kenya's Backbone for Economic Growth

Kenya's status as a megadiverse country underscores the deep connection between its biodiversity and socio-economic development (IUCN, 2023). Forests, savannahs, wetlands, and coastal zones provide critical ecosystem services—like water security and climate regulation—that generate 44% of Kenya's GDP (World Bank, 2025) and sustain 70% of national employment (Government of Kenya, 2016). Today, this natural capital anchors a massive pipeline of economic expansion, catalyzed by the new National Infrastructure Fund (NIF) Act. The NIF aims to mobilize KSh5 trillion (US$ 38.6 billion) for mega-dams and tens of thousands of kilometers of new roads (Forbes, 2026).

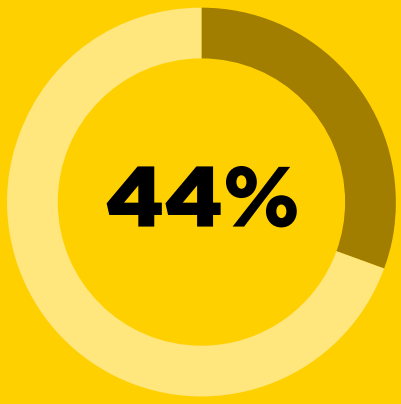
However, by aggressively expanding into the landscape, these projects actively degrade the natural assets required for their own long-term success, creating a feedback loop of escalating economic and ecological risk.

A closer look illustrates this dynamic. According to the Economic Survey of Kenya National Bureau of Statistics, agriculture, forestry, and fishing contribute 22.5% of GDP and anchor livelihoods far beyond formal employment, with over 40% of sectoral activity reliant on ecosystem services (Kenya National Bureau of Statistics [KNBS], 2025; World Bank, 2025). Nature-based tourism accounts for 63% of attraction-based tourism value and depends directly on coral reefs, mangroves, and wildlife ecosystems (World Bank, 2025). Furthermore, the construction sector — 6.3% of GDP and over 233,000 jobs — depends on freshwater provisioning and soil stabilization for its operations (KNBS, 2025; Ledec, 2016). Additionally, Kenya's renewable energy system, where 91% of electricity comes from geothermal, hydro, wind, and solar, requires direct intersection with sensitive ecosystems, creating biodiversity impacts in the very landscapes that sustain it (KNBS, 2025). As shown in Figure 2, Kenya's main growth sectors are heavily dependent on natural capital, but are also the drivers of its degradation. This creates a structural policy challenge: without mechanisms to internalize and compensate for residual biodiversity impacts, economic growth can progressively erode the ecological systems that make that growth possible.

Figure 2. Kenya's Economic Dependence On Natural Capital

National Economic Dependence

GDP COMPOSITION (Nature dependence)



Nature-Dependent Sectors (44%)

Nearly half of the national economy reiies on resource-based sectors and services like water provision, flood protection, and climate regulation.

Other Sectors (56%)

70% Of total employment linked to Natural resources


Agriculture


Construction


Tourism & Wildlife


Fishing & Coastal

Livelihoods across the nation are anchored in the environment, including formal and informal roles in agriculture, fishing, and tourism.

CONSTRUCTION AND LINEAR INFRASTRUCTURE

6,3% CONTRIBUTION TO NATIONAL GDP

The sector is a primary driver of investment, with housing (33.1%) and transport infrastructure (13.1%) leading the flow.

OVER 233,000 PERSONS EMPLOYED (2024 Data)

Based on 2024 data, this sector represents a significant portion of formal employment and infrastructure development.

KEY FINDING: ESSENTIAL ECOSYSTEM DEPENDENCIES AND IMPACTS

Projects depend on fresh water for concrete and raw materials like wood, while structural safety relies on oil stabilization and flood regulation services.

ENERGY INFRASTRUCTURE

91% OF ELECTRICITY GENERATED FROM RENEWABLES

Kenya leads in green energy, with geothermal (44.2%) and hydro (28.9%) as the primary contributors to the grid.

SUPPORTING **22,400+ JOBS**

The renewable energy sector provides specialized employment while driving the nation's transition to a low-carbon economy.

KEY FINDING: BIODIVERSITY RISKS OF INFRASTRUCTURE EXPANSION

Energy delivery systems often intersect with sensitive ecosystems, potentially causing permanent biodiversity impacts that threaten natural capital.

Source: Elaborated by the author based on data from the World Bank (Nature's Bottom Line: The Economic and Financial Costs of Ecosystem Degradation in Kenya), the Kenya National Bureau of Statistics (Economic Survey 2025), and the Government of Kenya (Green Economy Strategy and Implementation Plan 2016-2030)

The Development **and Nature Trade Off**

Strategic economic sectors and large-scale projects in Kenya are central to economic growth and national development objectives. Nevertheless, scientific evidence shows that these projects also generate significant residual impacts on biodiversity that cannot be avoided and fully mitigated on-site. Laurance et al (2015) explain that infrastructure and extractive industries expansion —such as roads, mining, and fossil fuel projects— can trigger a wide range of environmental impacts, including habitat conversion and ecological fragmentation. Dams construction, in particular, causes major disruptions to the biological and hydrological dynamics of free-flowing rivers which leads to loss of riverine habitats and fish biomass, endemic species extinction, as well as affecting the food security of river dependent communities (Jones & Bull, 2020; Lees et al, 2016; Akindele & I.I. Indabawa, 2016). Evidence from linear infrastructure further illustrates these impacts. A study on a planned 20 km highway in the UK found significant losses in ecosystem services, including food and habitat provision, carbon storage, and nutrient retention (Zawadzka et al., 2017). Similarly, proximity to infrastructure has been shown to reduce wildlife abundance, with average declines **of 25% for birds and 50% for mammals** compared to undisturbed conditions (Torres et al., 2016).

As shown, infrastructure expansion, land-use change, and extractive activities are among the primary drivers of ecosystem degradation globally (IPBES, 2019; World Bank, 2021). This creates a structural development trade-off in which strategic sectors drive economic growth while imposing significant ecological costs which are treated as externalities, and accumulate as hidden, unfunded liabilities for the State, progressively undermining economic stability (Dasgupta, 2021). As ecological systems degrade, the State will be compelled to absorb both the direct fiscal burden and the indirect economic losses associated with reduced productivity and increased climate risk exposure.

In Kenya, this dynamic is particularly pronounced given the spatial overlap between infrastructure expansion and ecologically sensitive areas, including water towers, wildlife corridors, and Key Biodiversity Areas (World Bank, 2025). For example, geothermal energy development is heavily concentrated in ecologically sensitive areas like the Rift Valley, most notably, within protected landscapes such as Hell's Gate National Park. These cause habitat fragmentation (total destruction in some cases), soil erosion, loss of flora, change in migration routes and facilitate the spread of invasive species (ELC & KenGen, 2024; Shortall et al., 2015; Rotich et al., 2024). Similarly, linear projects such as the Standard Gauge Railway disrupt critical ecological connectivity and alter essential natural processes, including hydrological flows, seed dispersal, and pollination pathways, all of which are vital for ecosystem resilience (IUCN, 2023).

Table 1. Kenya's growth sectors dependence and impact on Natural Capital

Sector	GDP Contribution	Dependency on Natural Capital	Expected Biodiversity Footprint
Agriculture & Agro-industry	KSh 3.65 trillion (USD 24–25 bn) Largest nature-dependent sector, anchoring rural livelihoods and national productivity.	**Very High:** Surface water, groundwater, rainfall, pollination, soil quality, soil fertility, climate regulation, biotic resources (timber).	**Very High:** Land use change, vegetation clearing, pesticide/fertiliser use, soil erosion, water abstraction, deforestation, illegal logging.
Construction (Roads & Rail included)	KSh 1.03 trillion (USD 6.5–7 bn) Strategic sector supporting industrial growth and national energy security.	**Medium to High:** Minerals (ballast, stone, sand), timber, surface water, flood and storm protection, water flow maintenance.	**High:** Habitat fragmentation or clearing, mining of river sand, land use change/conversion, waste generation, soil/water pollutants.
Tourism	KSh 255 billion (USD 1.6 bn) Core driver of economic expansion and connectivity under Vision 2030.	**High to Very High:** Wildlife, scenic landscapes, coastal ecosystems, coral reefs, cultural services	**Moderate to High:** Infrastructure development, human-wildlife conflict, waste generation, wildlife disturbance.
Electricity supply (Energy infrastructure included)	KSh 290 billion (USD 1.8–2.0 bn) Major foreign exchange generator linked to nature-based assets.	**High to Very High:** Surface water (river flow), water cycle regulation, forested catchments, geothermal reservoir stability, land for infrastructure.	**High:** Changes to water systems, land disturbance from infrastructure, and localized pollution that can affect ecosystems over time.
Extractives & Mining	KSh 109 billion (USD 0.7–0.8 bn) Emerging sector with high growth potential under national development plans.	**Medium to High:** Mineral deposits, surface water, groundwater, soil stability, climate regulation.	**Very High:** Land degradation, depletion of reserves, soil and water pollution, toxic chemical leaching.

Source: Own elaboration based on data from the Kenya National Bureau of Statistics (2025) combined with the World Bank's Nature's Bottom Line: The Economic and Financial Costs of Ecosystem Degradation in Kenya (2025) and sectoral biodiversity impact analyses drawn from Environmental and Social Impact Assessments (ESIAs) of strategic national projects (SGR Phase 2B, Olkaria II Geothermal Plant, and Kwale Mineral Sands).

As noted earlier, unmanaged biodiversity loss does not disappear; it accumulates as hidden fiscal exposure for the State. Against this backdrop, Kenya faces two further interrelated risks. First, continued degradation of ecological infrastructure increases systemic economic and social fragility because decline of ecosystem services like water regulation, soil stability, pollination, flood protection, and ecosystem resilience raise operational costs for agriculture, energy, tourism, infrastructure, and impact employment for all nature-dependent sectors. Over time, these pressures can redirect public resources toward emergency response, subsidies, restoration, and support to vulnerable sectors, placing additional pressure on fiscal consolidation and reducing the State's capacity to finance long-term development priorities (Ochola, 2025).

Second, the absence of a credible biodiversity offset framework can become a barrier to capital access. Global financial markets, development finance institutions, and multilateral development banks are increasingly integrating nature-related risks, environmental safeguards, and No Net Loss or Net Gain of biodiversity expectations into lending and investment decisions (Park and Noh, 2018; Meneses et al., 2024; He et al., 2013). This applies both to project finance governed by standards such as the IFC Performance Standards, the World Bank Environmental and Social Standards, and the African Development Bank Integrated Safeguard System, and to sustainability-linked instruments such as Green, Social, Sustainability, Blue, and Sustainability-Linked bonds (GSSB+). Kenya's pioneering participation in certified green bond markets (Choi & Ondabu, 2025) shows the relevance of this financing pathway; however, continued access to this growing class of finance will increasingly depend on the country's ability to demonstrate credible, measurable, and enforceable environmental performance.

Integrating biodiversity offsets into Kenya's regulatory architecture would create a practical mechanism to internalize the costs of residual biodiversity impacts, and to reduce hidden fiscal exposure while strengthening the long-term viability of nature-dependent sectors. At the same time, it would enhance the country's investment profile by aligning domestic practices with an increasingly nature-conscious global economy.

Figure 3. Government's hidden liability for environmental impacts

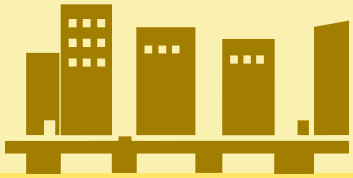
Government's hidden liability for environmental impacts

Two paths from the same starting point — what happens to the State's balance sheet depends on how nature is managed.

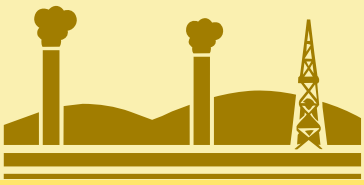
ECONOMIC INFRASTRUCTURE GROWTH

INFRASTRUCTURE PROJECT

DEVELOPMENT EXPANSION



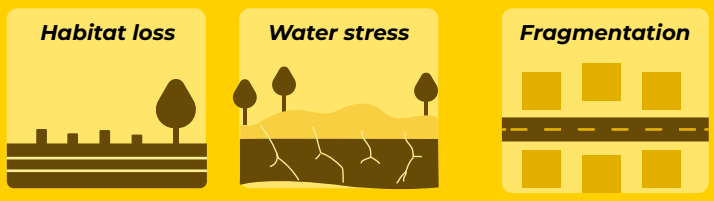
ENERGY & EXTRACTIVES



TWO PATHS FORWARD — DEPENDING ON HOW NATURE IS MANAGED

WITHOUT ECOLOGICAL INFRASTRUCTURE

residual impacts not mitigated



WITH ECOLOGICAL INFRASTRUCTURE

residual impacts compensated through offsets and restoration

HIDDEN LIABILITY COSTS

Costs the State absorbs:

- Remediation and disaster relief
- KWS & conservation deficit (KSh 10.5B)
- Lost agricultural and tourism output
- Higher cost of capital, sovereign-rating risk

ECONOMIC FRAGILITY

RESILIENCE BENEFITS & FISCAL EFFICIENCY

Value the State preserves:

- Population resilience (70% nature-linked jobs)
- Built-asset protection (longer capex life)
- Climate adaptation (NDC, water towers)
- Fiscal efficiency & access to GSSB+ green finance

ECONOMIC RESILIENCE

44% of GDP nature-dependent
World Bank, 2025

70% of jobs nature-linked
Government of Kenya, 2016

KSh 10.5B KWS funding deficit
National Treasury, 2024

2.75M ha restoration target
MTP IV, GoK

Source: Authors' elaboration based on fiscal and sectoral data from the Kenya National Bureau of Statistics, Economic Survey 2025, and the Strategic Plans of the Ministry of Environment, Climate Change and Forestry (MoECCF) and the Ministry of Tourism and Wildlife (MoTW).

2.

Biodiversity Offsets as **a Strategic Market Solution**

What are Biodiversity Offsets?

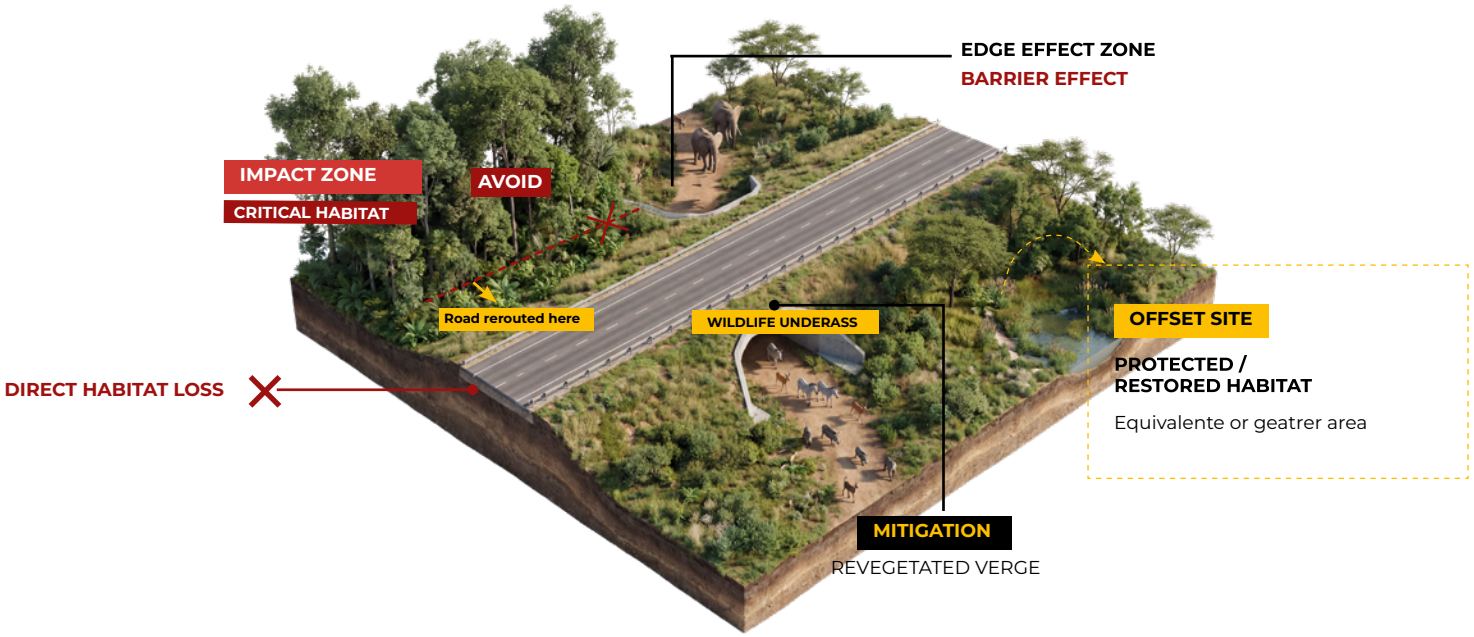
Biodiversity offsets are the final step of the mitigation hierarchy, applied only after a project has considered measures to avoid, minimize, and restore on-site damage. As a results-based instrument, they generate measurable conservation outcomes: verified gains in species composition, habitat condition, or ecosystem function that compensate for residual impacts and deliver No Net Loss (NNL) or Net Gain (NG) of biodiversity (World Bank, 2016; BBOP, 2009).

In this sense, offsets are not a license to damage biodiversity. They are a tool for managing residual impacts that genuinely cannot be avoided, minimized, or restored on-site. Their purpose is to ensure that those impacts are objectively quantified and balanced, or preferably exceeded, through verifiable, additional, ecologically equivalent, and long-term conservation outcomes elsewhere. To achieve this, biodiversity offsets employ specific, verifiable metrics to quantify the biodiversity lost at the development footprint and ensure that an equivalent or greater amount of biodiversity is restored, enhanced, or protected at the offset site.

Figure 4. Biodiversity Offsets in Practice: Maintaining Habitat Connectivity

Biodiversity Offsets for Road Construction

Practical example



1 AVOID

Reroute road away from critical habitats and wildlife corridors.

2 MINIMIZE

Narrow verge clearing, build underpasses and wildlife crossings.

3 RESTORE

Revegetate road verges and rehabilitate disturbed land on-site.

4 OFFSET

Reroute road away from critical habitats and wildlife corridors.

For Kenya, offsets can serve as the missing link between infrastructure expansion and ecological integrity. By requiring developers to finance measurable conservation outcomes, the instrument ensures that high-impact projects do not leave a permanent deficit in natural capital, enabling both companies and the Government to internalize the environmental costs of development.

Box 1.
Biodiversity offsets in energy development

Kenya's energy sector is closely tied to the condition of its natural capital, with geothermal and hydropower accounting for a significant share of the national electricity mix. Both sources depend directly on the availability and regulation of freshwater: hydropower relies on stable and predictable river flows, while geothermal facilities require substantial water inputs for cooling processes and steam condensation.

The Olkaria II Geothermal Power Plant illustrates how these dependencies materialize. Located within Hell's Gate National Park, its ESIA identifies impacts including vegetation clearing, habitat disturbance, disrupted wildlife movement, and soil erosion. These impacts are not only environmental but operational and financial, as they can reduce generation capacity and increase system vulnerability to climate variability.

On-site mitigation measures are necessary but often insufficient to address broader landscape-level pressures, such as watershed degradation, water abstraction, and cumulative ecosystem stress in areas like the Lake Naivasha basin. Biodiversity offsets can help address these residual impacts by financing the restoration and long-term conservation of ecologically equivalent habitats within the same landscape. For geothermal projects, this could include habitat restoration, wildlife connectivity measures, reforestation, erosion control, and improved watershed management to protect both biodiversity and the natural systems that energy production depends on.

Biodiversity Offsets
Implementation Pathways

In practice, offsets can be delivered through different implementation pathways. To make biodiversity offsets enforceable and credible, the choice of pathway should depend on the nature and scale of residual impacts, the ecological outcomes required, and the level of assurance needed to secure long-term, measurable biodiversity results. Delivery mechanisms may include: implementing the offset directly, contracting or partnering with specialized conservation actors, using habitat banks, or paying into an approved public or third-party fund responsible for delivering offset outcomes. Regardless of the pathway selected, the relevant test should be whether the mechanism can deliver the required biodiversity outcome assuring that these can be quantified, measured and verified.

Table 2. Offset Implementation Pathways

Delivery mechanism	How it works	Main value	Risks	Risk mitigation measures
Direct implementation by the developer	The project developer designs, finances, implements, and monitors the offset directly.	Gives the developer full control over compliance and alignment with project-specific impacts.	Weak ecological outcomes if the developer lacks conservation expertise or adequate long-term management.	Require independent technical oversight, clear governance functions and performance indicators, and long-term management plans.
Partnership with specialized conservation actors	The developer contracts or partners with NGOs, conservation organizations, community institutions, or technical operators to deliver the offset.	Transfers technical implementation to actors with conservation expertise and local knowledge.	Fragmented responsibilities, weak accountability, or insufficient long-term financing.	Establish clear contractual roles, governance arrangements, monitoring requirements, and secure long-term funding mechanisms.
Habitat banks	Pre-established conservation/ restoration areas generate verified biodiversity gains that developers can buy as “credits” and use to meet offset obligations.	Reduces uncertainty, combines obligations from different projects, enables landscape-scale conservation, and can deliver outcomes before impacts occur	Under an unclear regulatory framework, there could be weak ecological equivalence, inadequate verification, or insufficient demand. Premature credit issuance before verified biodiversity gains are achieved.	Apply robust biodiversity metrics, independent verification, transparent registries, and clear regulatory requirements. Define a credits release schedule tied to predefined ecological and management milestones.
Payment into an approved public or third-party fund	The developer pays into a regulated fund responsible for financing and delivering offset outcomes.	Can pool resources from multiple projects and direct finance toward national or landscape-level conservation priorities.	Lack of transparency or traceability, payments becoming disconnected from measurable biodiversity outcomes and political pressure to keep fees and mitigation ratios low	Implement strong governance standards for rule setting and fund management, transparent reporting, independent audits, and outcome-based monitoring systems. Require full-cost pricing, including long-term stewardship and a risk premium, with automatic inflation adjustments and regular cost reviews.

Source: Elaborated by the authors based on the biodiversity offset delivery mechanisms outlined by the OECD (Scaling Up Biodiversity-Positive Incentives, 2025; Biodiversity Offsets: Effective Design and Implementation, 2016), the World Bank (Biodiversity Offsets: A User Guide, 2016), and Terrasos (Clarifying the Role of Biodiversity Credits or Units in Policy Compliance Frameworks).

The first three delivery mechanisms (direct implementation, partnerships with specialized conservation actors, and habitat banks) offer stronger accountability because they keep the offset obligation connected to a defined conservation intervention, a responsible implementing actor, and easily measurable biodiversity outcomes.

By contrast, payment into a public or third-party fund can be effective in pooling resources and financing larger-scale conservation actions. However, it may weaken the connection between a developer's residual impact and the specific biodiversity outcome required for compliance. In such cases, the payment risks becoming a general conservation contribution rather than a result-based offset that directly compensates for the ecological impacts caused.

Without strong risk mitigation measures, fund payments could cover only existing financing gaps in already established protected or conservation areas. If resources are directed only to the management of existing areas, the mechanism would risk substituting, rather than complementing, public conservation budgets. It would also limit the creation of new conservation areas or additional restoration actions capable of generating measurable and additional biodiversity gains. To prevent this, fund offset programs could ensure that no more than half of their funding is directed toward the management of existing underfunded protected areas, prioritizing the protection and restoration of new unprotected landscapes to ensure genuine additionality and avoid net habitat loss.

Therefore, fund-based mechanisms should only qualify as valid offsets when they finance additional, traceable, independently verified, and outcome-based conservation actions that result in ecological equivalent outcomes.

Overall, different pathways can contribute to achieving positive biodiversity net gains when well designed: applying high integrity principles, acknowledging and mitigating all the identified risks, and providing measurable, quantified and verifiable results. It is essential to consider the development of clear and high integrity standards that explain how to achieve the results and a consolidated registry that tracks positive outcomes, so governments and the public can see how obligations are being met.

In sum, when governed by robust quality standards, biodiversity offsets move beyond a compliance requirement and become a practical tool to generate value across economic, environmental, and social dimensions. Rather than treating biodiversity loss as an unavoidable side effect of development, biodiversity offsets become powerful engines for generating comprehensive value across multiple dimensions allowing governments to actively manage and redirect that impact into long-term gains.

Table 3. Strategic Value Generated by Biodiversity Offsets

Dimension	Value generated	How offsets create this value
Economic value	Internalize the environmental cost of development	Internalize the environmental cost of development Offsets require developers to assume financial responsibility for significant residual biodiversity impacts, instead of transferring those costs to the Government or local communities.
	Strengthen the mitigation hierarchy	By assigning a cost to residual impacts, offsets create an incentive for developers to avoid, minimize, and restore impacts from the earliest stages of project design.
	Mobilize private finance for conservation	Offsets shift part of the conservation finance burden from public budgets to the actors generating the impact, creating a more predictable flow of private capital into biodiversity management.
Environmental value	Achieve No Net Loss or Net Gain	Offsets aim to compensate for residual biodiversity losses through measurable conservation outcomes, with No Net Loss as the minimum objective and Net Gain as the preferred outcome.
	Move beyond isolated compensation actions	Well-designed offset frameworks can aggregate obligations from multiple projects and direct them toward priority ecosystems, improving ecological efficiency and impact.
	Restore and secure critical ecological functions	Offsets can help protect wildlife corridors, restore degraded habitats, strengthen water catchments, and maintain ecosystem functions that support long-term resilience.
Social value	Embed safeguards and participation	High-integrity offsets require community participation, benefit-sharing arrangements, Free, Prior and Informed Consent (FPIC) where applicable, and transparent governance mechanisms.
	Generate local livelihood opportunities	Offset implementation can support employment in restoration, conservation management, monitoring, and ecological stewardship.
	Strengthen community-linked conservation	By connecting conservation finance with local actors, offsets can support knowledge exchange, income diversification, and long-term community participation in biodiversity management.

Box 2.
Biodiversity Offsets in Linear Infrastructure (Roads & Rail)

Kenya's ambitious linear transport infrastructure (LTI) projects, such as the Standard Gauge Railway (SGR) and the LAPSSET corridor, are critical flagships under Vision 2030 aimed at enhancing regional connectivity and economic growth. However, due to their scale and spatial footprint, these projects often generate significant biodiversity impacts, including habitat fragmentation, land conversion, loss of ecological connectivity, and pollution linked to construction and operations(Lai, 2026; Okita-Ouma, 2021). Due to their scale and spatial footprint, these projects typically result in residual impacts that must be addressed.

The Naivasha–Kisumu SGR Phase 2B illustrates this risk. Its ESIA identifies sensitive areas along the route, including the Mau Forest Complex, the Mara River Basin, and the Maasai Mara ecosystem, where the project may cause direct habitat loss, wildlife movement disruption, soil erosion, and localized air pollution (Kenya Railways Corporation [KRC], 2026)

Applying the mitigation hierarchy from early design would help reduce these impacts through route optimization, wildlife underpasses, erosion controls, and post-construction vegetation rehabilitation. These measures reduce the overall impact footprint before offsets are even considered. However, residual impacts—especially fragmentation and disrupted ecological connectivity—are likely to remain. Biodiversity offsets can address these remaining impacts by financing the protection and restoration of wildlife corridors or ecologically equivalent areas that maintain landscape connectivity. This ensures that developers, rather than the Government, bear the cost of compensating unavoidable biodiversity loss.

3.

Kenya's enabling framework **for biodiversity offsets**

Kenya has a strong enabling architecture across its Constitution, development policy framework, sectoral laws and international commitments to build an integral biodiversity offset framework. It does not need to be built from scratch. The main gaps are the lack of operational rules, technical standards and institutional coordination needed to translate this framework into measurable, enforceable and long-term biodiversity outcomes.

As shown in Table 4, the Constitution provides a clear mandate for sustainable natural resource management, environmental impact assessment, audit and monitoring. The EMCA and the EMCA Regulations for EIA offer the most direct regulatory entry point for introducing biodiversity offsets for residual impacts as they already set out requirements for environmental assessment, impact management, and biodiversity protection, while the Wildlife Conservation and Management Act provides relevant tools for long-term conservation delivery, including conservancies, management plans, benefit-sharing arrangements and conservation easements. Along with this, Kenya already has an established institutional structure. The Ministry of Environment, Climate Change and Forestry (MoECCF), supported by the National Environment Management Authority (NEMA), provides the institutional anchor for environmental coordination and monitoring compliance following its functions indicated in the Executive Order No. 1 of 2023, while the Ministry of Tourism and Wildlife (MoTW) together with the Kenya Wildlife Service (KWS) play a central role in providing technical expertise for conservation, and specific implementation components of biodiversity offsets.

These instruments are reinforced by Vision 2030, MTP IV, the National Environment Policy, the National Wildlife Strategy 2030, the Green Economy Strategy, Kenya's NDC and the updated NBSAP targets reported to the CBD. (Government of Kenya, 2008, 2013, 2016, 2018, 2020, 2024). Among these, the NBSAP targets explicitly identify biodiversity offsets as a mechanism for achieving No Net Loss (National Targets 14 and 15).

Table 4. Kenya Enabling Framework for Biodiversity Offsets Implementation

Dimension	Key Elements	Level of Enabling	Identified Gap	How to Close the Gap
Constitutional and policy mandate	Constitution: Article 69 mandates sustainable natural resource management, EIA, environmental audit and monitoring. Vision 2030 and MTP IV link environmental sustainability with economic transformation and priority sectors.	**High**	Broad mandate, but no clear obligation to apply the mitigation hierarchy or compensate for residual biodiversity impacts.	Recognize biodiversity offsets as an instrument to operationalize existing constitutional and development policy mandates.
Cross-sector policy mandates	National Environment Policy promotes natural capital valuation and environmental integration in planning. Wildlife Strategy 2030 and GESIP 2016–2030 support ecosystem integrity, conservation incentives, biodiversity mainstreaming, sustainable infrastructure and natural resource management.	**High**	Strong policy basis, but not yet translated into binding offset requirements or sector-level procedures.	Position offsets as a cross-sector tool for integrating biodiversity into infrastructure, energy, mining, transport and land-use planning.
Environmental regulatory entry point	EMCA and the EIA Regulations provide the main framework to identify, assess and manage project impacts. Already require mitigation measures for project impacts.	**Moderate**	EIA rules focus on mitigation, but lack clear requirements to apply the mitigation hierarchy, No Net Loss/Net Gain objectives & ecological equivalence.	Update EIA Regulations and NEMA guidelines to make the mitigation hierarchy mandatory, define when offsets apply and how to implement them (methodologies and clear metrics for evaluating impacts and gains).
Institutional coor-dination	MoECCF, NEMA, MoTW, KWS and the National Biodiversity Coordination Mechanism have relevant environmental, biodiversity and cross-sector mandates for offsets implementation.	**Moderate**	Roles for assessment, approval, supervision, registry management and enforcement of offsets are not defined.	Clarify institutional responsibilities and coordination procedures across relevant authorities

Dimension	Key Elements	Level of Enabling	Identified Gap	How to Close the Gap
Implementation Tools	EMCA and the Wildlife Conservation and Management Act provide relevant legal tools for conservation delivery, including conservancies, management plans, benefit-sharing arrangements and conservation easements across public, private and community land.	**Moderate–High**	Existing conservation tools can support offset delivery, but they are not yet formally structured to secure long-term offset obligations, including permanence, land tenure safeguards, sustainable financing, monitoring and verification.	• Develop High Integrity Technical Standard for the implementation of long-term and verified result offsets within the current regulatory framework . • Leverage existing conservation mechanisms and benefit-sharing arrangements as delivery tools for offsets obligations.
National Conservation Goals	MTP IV identifies restoration and conservation priorities, including degraded rangelands, water towers, mangroves, corridors, conservancies and post-mining rehabilitation.	**Moderate**	No clear mechanism to channel and execute priority conservation and restoration areas.	• Use national restoration and conservation priorities to guide the location of biodiversity offset investments.
International alignment	Kenya's NDC aligns with ecosystem management, resilience-building, No Net Loss and biodiversity finance priorities, and the NBSAP targets update identify biodiversity offsets in Objective 6 as a mechanism to achieve No Net Loss and generate conservation revenue.	**High**	Global commitments are not yet translated into concrete domestic instruments for financing and delivering measurable biodiversity outcomes.	Use biodiversity offsets to support implementation of Kenya's NDC and NBSAP commitments through measurable conservation outcomes and biodiversity finance.

As a result, biodiversity offsets are not an external or disconnected policy innovation, but rather a mechanism that can be embedded within Kenya's existing commitments and legal frameworks. However, its effectiveness will depend on implementation.

Source: Elaborated by the authors based on the Constitution of Kenya, 2010; Kenya Vision 2030; Fourth Medium Term Plan 2023–2027; Environmental Management and Co-ordination Act, 1999 (EMCA); Environmental Impact Assessment and Audit Regulations; National Environment Policy; National Wildlife Strategy 2030; Green Economy Strategy and Implementation Plan 2016–2030; Wildlife Conservation and Management Act; Kenya's Nationally Determined Contribution; and official biodiversity targets and NBSAP update materials.

4.

How to design High-Integrity **Biodiversity Offsets for Kenya**

Kenya's existing policy and legal architecture provides a strong entry point for biodiversity offsets. However, offsets will only deliver effective, credible, and lasting biodiversity outcomes if they are designed and implemented with clear technical requirements.

International practice, including guidance developed by the Business and Biodiversity Offsets Programme (BBOP), the International Union for Conservation of Nature (IUCN), and multilateral development finance institutions, identify core design conditions essential to move from general compensation measures to measurable, verifiable conservation outcomes.

1 Additionality

Offsets must generate conservation gains that would not have occurred in the absence of the intervention. This ensures that offset investments are not simply funding existing or planned conservation activities, but are creating new ecological value. To comply with this, it is essential to establish a clear "baseline" scenario representing the trajectory of the ecosystem without the offset.

For example, if a project developer simply claims to restore or preserve an area that is already legally protected and adequately funded by the Government for this purpose, the offset lacks additionality. However, if an offset provides funds for the active conservation of a severely degraded ecosystem, or provides the critical resources needed to elevate activities in an underfunded protection area, those gains could be considered additional.

Furthermore, additionality requires mitigating the risk of "leakage" by ensuring that protecting or conserving one habitat does not simply displace degradation, land conversion, or unsustainable resource use to another ecologically sensitive area nearby.

2 Permanence

The offset conservation and/or restoration outcomes must be secured over the long term, compensating for at least as long as the time the impact being addressed will occur. This translates to periods of 20 years or more, aiming for perpetuity. To achieve this, offsets must be supported by legal and financial assurances:

- **Legal mechanisms:** Offset sites must be safeguarded against future incompatible land-use changes. This can be achieved through establishment of selected areas as a new conservation area, establishment of the offset project within existing conservation structures including conservancies, long-term community management agreements, conservation easements or covenants, and any other legal instrument that can support the purpose of the land area toward conservation for over 20 years.

- **Financial mechanisms:** Offsets require continuous, active management, with reliable funding over decades. For this reason, developers should be required to provide financial assurances that cover long-term implementation costs, not only initial restoration or establishment costs. Best practices point to the establishment of trust funds, endowment-style mechanisms, or equivalent financial vehicles that can help ensure traceability and long-term availability of resources for the offset site.

3 Ecological equivalence

In order to acquire measurable and verifiable positive results, offsets should conserve the same biodiversity values (e.g. species composition, habitat structure, and ecosystem functions) as those affected by the development project. This "like-for-like" standard ensures that specific ecological communities are not traded away. In this manner, impacts on a critical wetland should not be offset through the restoration of an unrelated dryland forest, because the species, hydrological functions, habitat conditions, and ecosystem services involved are not equivalent.

For example, offsets can be implemented within the same habitat type and, where relevant, within the same watershed or ecological landscape where the residual impacts occur. Along with a clear monitoring framework, these metrics enable accountability and guarantee that the outcomes can be verified over time.

The foundation of achieving true equivalence lies in establishing robust indicators and clearly defining expected biodiversity outcomes. Because no two areas are ecologically identical, objectively evaluating the balance between losses at the development site and gains at the offset site requires defensible and replicable metrics.

Together, these conditions or core principles provide the minimum integrity architecture for biodiversity offsets. Without them, offsets regulations risk becoming weak compensation payments with limited conservation impact. With them, Kenya can transform an enabling policy context into a credible mechanism for managing residual biodiversity impacts, mobilize private finance, and deliver measurable gains for nature and communities.

Habitat Banks: **Recommended pathway for Kenya**

Habitat banks are particularly relevant as a scalable delivery mechanism for Kenya. They are conservation or restoration areas planned, managed, monitored, and verified against defined ecological metrics before offsets are required by developers. International evidence suggests that habitat banks and other advance-delivery mechanisms—where positive biodiversity outcomes are generated and partially verified before impacts occur—tend to deliver more reliable ecological outcomes and faster permitting timelines than bespoke, project-by-project offsets or generic funds (United States Environmental Protection Agency, 2025).

By generating measurable biodiversity gains before development impacts occur, habitat banks give regulators and project developers greater certainty that offset obligations can be met. They also make it possible to combine obligations from different projects and channel finance toward priority ecosystems, where long-term conservation outcomes can be planned, managed, and monitored more effectively.

In Kenya, this opportunity is particularly strong because the country already has an extensive network of community and private conservancies that could provide an initial platform for habitat banks. Conservancies account for around 11% of Kenya's land area, offering established governance arrangements, local management capacity and ecologically valuable landscapes (Government of Kenya, 2026). Subject to clear eligibility, additionality, and permanence criteria, this network could anchor early habitat bank pilots and provide a practical pathway for scaling implementation over time.

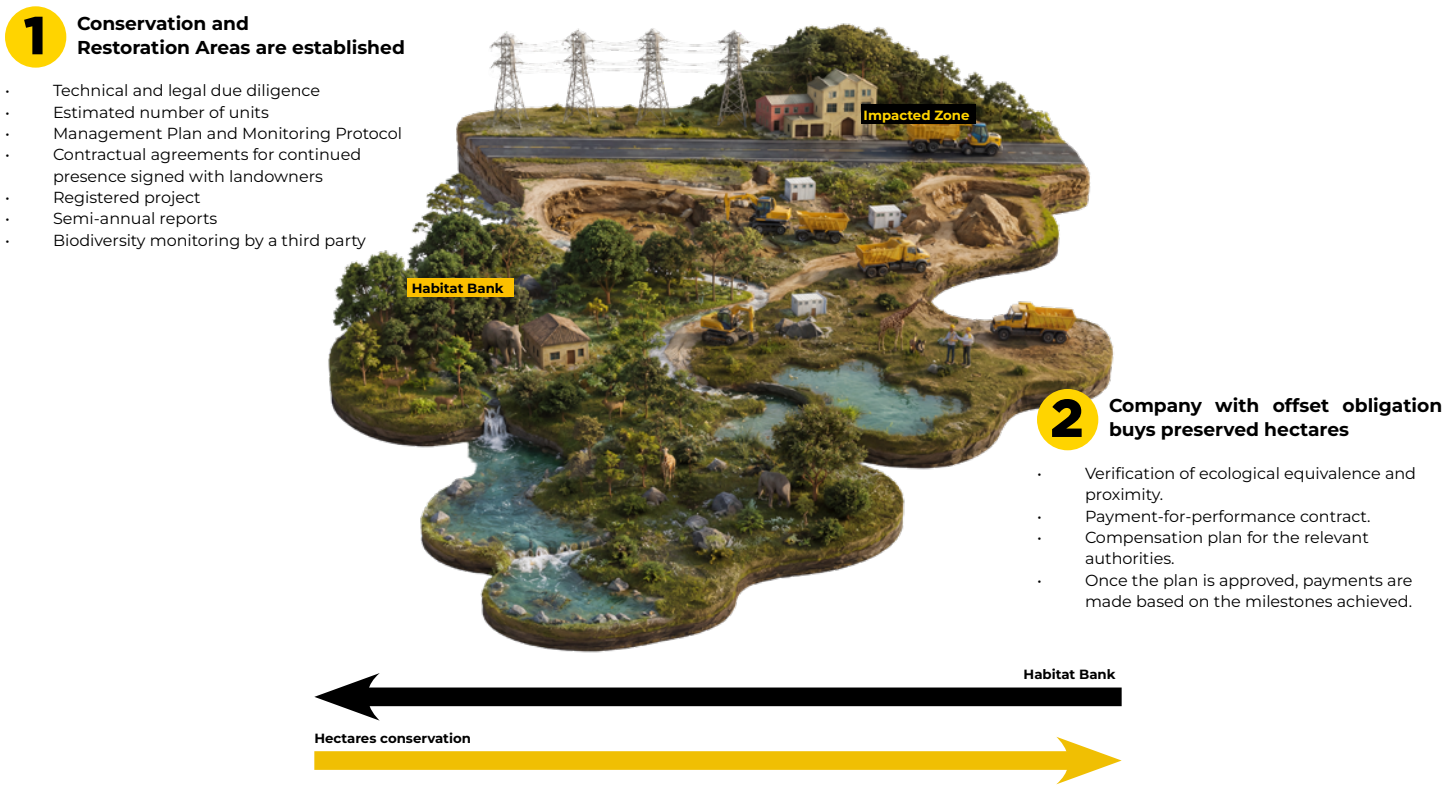
This model can also strengthen the connection between biodiversity offsets and evolving investor expectations. As development finance institutions, ESG standards, and sustainability-linked instruments increasingly require credible and measurable biodiversity outcomes, habitat banks can offer a practical mechanism to demonstrate that in Kenya residual impacts from development projects are being addressed through transparent, long-term, and verifiable conservation actions.

Case study:

Habitat banks as a biodiversity offset mechanism for Solar Energy in Colombia

In 2019, a subsidiary of Enel Green Power initiated the environmental licensing for a 150 MW Solar Park in northern Colombia. After applying the mitigation hierarchy, the project identified residual impacts on the tropical dry forest, an ecosystem under high conservation pressure. Following national regulations, the developer was required to implement a biodiversity offset strategy to ensure long-term ecological outcomes. Instead of traditional "in-house" restoration — which often carries high risks related to land tenure and technical management — the company chose to fulfill its legal obligations through habitat banks. This mechanism allowed the developer to meet the total required offset by utilizing conservation areas across two different strategic sites: “Mata de Lata” and “La Lope.” By combining areas from multiple banks, the developer demonstrated how this modular approach provides the flexibility to satisfy a single legal obligation while transferring technical and restoration risks to a specialized operator.

Figure 5. Habitat banks Operation for offset obligations



The use of habitat banks ensured that the core principles for high-integrity offsets were met. Ecological equivalence was achieved through a strict "like-for-like" approach, as both habitat banks protect and restore the tropical dry forest within the same watershed. This guaranteed that the specific biodiversity values affected by the solar park's construction were directly replaced within the same biogeographic region. Additionality was secured by transforming land previously used for intensive cattle ranching into managed conservation areas, a transition that would not have occurred without the project's investment.

Furthermore, the mechanism provided the necessary legal and financial guarantees for long-term success: the areas are protected by 20-year environmental easements registered on the land titles, and all management and monitoring costs are covered by a long-term trust fund. Its results-based model ensures that compliance is tied to verified ecological milestones, offering a scalable solution for infrastructure development that can be adapted to the Kenyan context to aggregate demand and support large-scale conservation corridors.

© antonytrivet - Magnific.com

Box 3.
Biodiversity Offsets in Mining

Mining is a strategic sector for Kenya's economic transformation, but it is inherently tied to the location of mineral deposits and usually involves significant land disturbance. Even when projects apply good practice through avoidance, minimization, rehabilitation, and mine closure, residual biodiversity impacts often remain, particularly on habitat connectivity, wetlands, and sensitive ecosystems. Mining is globally recognized as a primary arena for applying the mitigation hierarchy, No Net Loss standards, and biodiversity offsets (ICMM, 2005; ICMM & IUCN, 2013; Victurine et al., 2024).

A practical Kenyan example is the Kwale Mineral Sands Operation / South Dune Extension in Kwale County. Its ESIA identifies the project as a large-scale surface mining operation near the Buda Forest Reserve and remnant coastal forest patches within the Coastal Forests of Eastern Africa biodiversity hotspot. The assessment highlights the need to protect critical habitat, rehabilitate mined areas, restore wetlands, and strengthen ecological corridors linking the Gongoni Forest Reserve, wetlands, the Mukurumudzi riparian zone, and the Buda Forest (Base Titanium, 2018).

Although Kenya has several mining-related instruments, they do not fully secure measurable biodiversity gains equivalent to residual mining impacts. Rehabilitation and closure focus mainly on stabilizing and restoring the mined area, while royalties and community development obligations address fiscal and social priorities. A biodiversity offset framework would fill this gap by requiring operators to first avoid sensitive habitats, minimize fragmentation and pollution risks, and rehabilitate mined land. Where residual impacts remain, developers would finance additional, measurable, and long-term conservation outcomes in ecologically appropriate areas.

5.

Strategic Recommendations

Building on Kenya's policy readiness and the growing scale of infrastructure development, the following strategic actions are proposed to operationalize biodiversity offsets as a credible and scalable policy instrument. These recommendations aim to align development with ecological integrity, strengthen environmental governance, and mobilize private finance for nature.

Figure 6. Four recommended pillars for biodiversity offset implementation in Kenya

Strategic roadmap for the operationalization of environmental policy on biodiversity offsets

Institutionalize the mitigation hierarchy & biodiversity offsets	**Biodiversity offsets institutional architecture & roles**	**Offsets high integrity technical standardization**	**Establish implementation pathways and mechanisms**
- Introduce mitigation hierarchy & biodiversity offsets into upcoming policy and legal reforms. - Update EMCA regulations to make mitigation hierarchy mandatory. - Integrate biodiversity offset into NEMA's EIA license conditions. - Incorporate offset requirements into sectoral legislation.	→ - Define a coordinated governance framework with clearly separated roles and responsibilities across relevant public institutions to ensure that biodiversity offsets can be planned, approved, implemented, monitored and verified efficiently, transparently, and without conflicts of interest.	→ Define clear rules for high-integrity offsets in encompassing: • No Net Loss. • Technical Criteria (Permanence Ecological Equivalence and Additionality) Alignment with National Conservation Priorities and Ratio Methodology for offset ratios. • Alignment with National Conservation Priorities. • Methodology for offset ratios.	→ • Develop sector-specific EIA guidelines for high-impact sectors such as energy, linear infrastructure, and mining. • Enable Habitat Banks as a scalable mechanism to deliver verified offset outcomes across these sectors.

1 Institutionalize the mitigation hierarchy and Biodiversity Offsets within national policy and legal frameworks

Rather than requiring a comprehensive legislative review, active and upcoming reforms can be strategically leveraged to embed both the mitigation hierarchy principle and its implementation mechanisms within existing instruments. In this sense, it can be advanced through the following actions:

- Integrate the mitigation hierarchy and Biodiversity Offsets into ongoing reforms, including the National Environment Policy, Wildlife Conservation and Management Act, and the Integrated Ecosystem-Based Conservation Policy under development.

- Introduce a legal definition of biodiversity offsets within the reform of the Wildlife Conservation and Management Act, and require their application for impacts on critical habitats.

- Update the Environmental (Impact Assessment and Audit) Regulations under EMCA to make the mitigation hierarchy mandatory and enforceable from early project design stages.

- Reinforce the integration of biodiversity offsets obligations by anchoring them directly within NEMA's EIA license conditions for projects with significant residual biodiversity impacts. These conditions should make clear that the proponent is responsible for implementing, financing, and maintaining a Biodiversity Offset Plan. They should also require financial guarantees, clear implementation timelines, monitoring, reporting, and independent verification. This would allow NEMA to require corrective action and apply enforcement measures if the proponent fails to comply, including after project transfer, closure, or decommissioning.

- Review and amend sectoral legislation to incorporate offset requirements for large-scale projects in ecologically sensitive areas.

2 Define the institutional architecture and roles for biodiversity offsets governance

Kenya should establish a clear institutional architecture for biodiversity offsets, with defined and appropriately separated responsibilities for regulatory oversight, EIA decision-making, offset delivery (including fund administration if applicable), inter-agency coordination, registry management, Monitoring, Reporting and Verification (MRV), and enforcement. The framework should also establish the administrative procedures connecting these functions across the offset lifecycle, from identifying residual impacts and determining whether an offset is required, to approving biodiversity offsets plans, and tracking and verifying biodiversity outcomes

- **Designate NEMA as the lead regulatory authority for biodiversity offsets.** Within the EIA process, NEMA should establish the administrative procedures for applying the mitigation hierarchy, determine whether significant residual biodiversity impacts require an offset, assess and approve Biodiversity Offset Plans, incorporate offset obligations into EIA license conditions, and oversee and enforce compliance. NEMA should not operate or lead any process covering the management of any biodiversity offset implementation pathway (e.g manage funds, operate habitat banks, or directly implement offsets), in order to preserve a clear separation between regulatory and delivery functions and avoid conflicts of interest.

- **Enable Enable offset delivery through accredited public, private and community-based providers.** Different implementation pathways, including direct implementation, partnerships, conservation funds and habitat banks, should be permitted, provided that all delivery entities meet the same accreditation, ecological performance, financial management and accountability requirements.

- **Empower the National Biodiversity Coordination Mechanism (NBCM) to support inter-institutional coordination and transparency.** The Mechanism should align the roles and decisions of NEMA, wildlife, forestry and other relevant environmental and sectoral authorities; address overlaps in institutional mandates; and ensure that offset implementation supports national biodiversity priorities, and establish transparency tools such as a national biodiversity offsets registry.

- **Designate an independent and technically qualified body to oversee MRV and the national biodiversity offsets registry.** This body should verify reported ecological outcomes, track approved obligations and their delivery status, and publish periodic assessments of the overall performance of biodiversity offsets in Kenya. These assessments should identify verified outcomes, delayed or unmet obligations, and cases of non-compliance, providing government and the public with a clear picture of whether the framework is delivering its intended results.

3 Develop and Establish high-integrity technical standards for biodiversity offsets

Kenya should develop technical standards for biodiversity offsets under the EMCA, to ensure their consistent application across sectors. These standards should be incorporated through an update of the Environmental (Impact Assessment and Audit) Regulations and further supported by NEMA technical guidelines. They should be grounded in the best available scientific evidence, transparent methodologies, and measurable and verifiable biodiversity outcomes. A common technical framework would make the mitigation hierarchy operational in practice, ensure that compensation for residual impacts is credible and results-based, and strengthen confidence among regulators, investors, communities and other stakeholders.

For an offset to be recognized as a valid compliance measure across any sector, it should meet the following mandatory requirements:

- Standardized Definition and Objective: Clearly define biodiversity offsets as measurable conservation outcomes that compensate for residual impacts after the Mitigation Hierarchy has been fully applied. The framework must set No Net Loss (NNL) as the mandatory minimum performance standard, with a strong preference for achieving Net Gain when impacts occur in endangered or threatened ecosystems.

- Core Technical Criteria: Require every offset to demonstrate compliance with the fundamental principles of:

    - **Ecological Equivalence (Like-for-Like)**, requiring that the offset replaces the specific biodiversity values, species, and functions affected by the project
    - **Additionality,** providing evidence that the conservation gains results directly from the offset investment and exceed "business-as-usual" scenarios
    - **Permanence,** requiring that conservation outcomes be legally secured for a minimum of 20 years, and, in all cases, for no less than the duration of the compensated impact. To maintain the land under conservation for this period, the framework should require enforceable legal instruments that remain attached to the site and bind subsequent owners or rights holders if the land is sold, transferred, inherited or used as collateral, regardless of whether the land is public, community-owned, or private. Dedicated financial mechanisms, such as trust funds or other financial guarantees, should also be required to cover long-term management.

- Strategic National Alignment: Require offset locations and interventions to contribute to nationally identified biodiversity priorities, including areas and objectives established under Kenya's NBSAP and relevant conservation and ecological connectivity strategies. This would direct private investment toward outcomes that also support Kenya's commitments under the Global Biodiversity Framework.

- Methodology for Offset Ratios: Establish a standardized system for calculating offset obligations based on ecosystem sensitivity and risk. This involves applying severely adjusted multipliers (e.g., 10:1) for impacts on Key Biodiversity Areas, endangered habitats, or rare ecosystems to account for restoration uncertainty, time lags, and the high ecological value of the lost habitat.

- Metric Standardization: Adopt a common methodology for measuring biodiversity losses and gains. These metrics should consider both the size of the affected area and the ecological condition of the habitat, so that impacts at the development site and gains at the offset site are measured using the same units. This would make it possible to determine objectively whether the required No Net Loss or Net Gain outcome has been achieved.

4 Establish Implementation Pathways and Mechanisms for Biodiversity Offsets

To move beyond policy intent, Kenya should develop sector-specific EIA guidelines detailing how offsets are delivered in practice across priority industries, while also updating NEMA's EIA guidelines to establish standardized mechanisms for biodiversity offsets implementation.

A key element of this approach is enabling the use of aggregated, market-based implementation pathways that can deliver offsets more effectively and at scale, such as habitat banks. Their implementation can be strategically anchored in sectors that are most likely to generate significant residual impacts and, therefore, the strongest conditions for a functioning market:

- **Energy sector:** Kenya's energy sector is central to national development and increasingly depends on infrastructure located in ecologically sensitive landscapes, including geothermal, hydropower, transmission lines and associated access roads. These projects can generate residual impacts such as habitat disturbance, vegetation clearing, disruption of wildlife movement, hydrological alteration and localized ecosystem degradation. Habitat banks can provide a practical mechanism to compensate for these impacts through pre-established, long-term conservation and restoration areas that maintain ecological connectivity, protect equivalent habitats and support watershed functions linked to energy security..

- **Linear infrastructure sector:** Roads, railways, and transmission lines generate some of the most permanent, and predictable biodiversity impacts in Kenya, making them a clear and scalable starting point for offsets implementation under updated EIA guidelines. Habitat banks can serve as the primary compliance mechanism in this sector by aggregating offset demand from multiple projects and directing it toward priority landscapes, enabling large-scale restoration and the maintenance of ecological connectivity. This builds early experience, creates consistent demand, and catalyzes the development of a functioning offset market.

- **Mining sector:** Mining activities are highly site-specific and often generate long-lasting residual impacts, including land degradation, habitat loss, fragmentation, soil disturbance, water pollution risks and pressure on nearby ecosystems. Because these impacts cannot always be fully addressed through rehabilitation or mine closure plans, habitat banks can offer a structured pathway to compensate for remaining biodiversity losses.

References

Akindele, E., & Indabawa, I. (2016). A review of the effects of dams on the hydrology, water quality and invertebrate fauna of some Nigerian freshwaters. Zoologist (The), 13, 28–35. https://doi.org/10.4314/tzool.v13i0

Base Titanium. (2018). Environmental and Social Impact Assessment (ESIA) for the Kwale Mineral Sands Mine Southern Dune Extension. Kwale, Kenya. https://nema.go.ke/wp-content/uploads/2025/03/ESIA_1816-Base-Titanium-South-Dune-Extension-SR-2008-min.pdf

International Council on Mining and Materials (ICMM). Biodiversity Offsets -A Briefing Paper for the Mining Industry. (2005). https://www.ecosystemmarketplace.com/wp-content/uploads/archive/documents/Doc_417.pdf

Business and Biodiversity Offsets Programme (BBOP). (2009). Business, biodiversity offsets and BBOP: An overview. Forest Trends. https://www.forest-trends.org/wp-content/uploads/imported/overview-phase-1-pdf.pdf

Choi, A., & Ondabu, I. (2025). GREEN BONDS AND RENEWABLE ENERGY FINANCING IN KENYA: OPPORTUNITIES AND CHALLENGES. https://www.globalscientificjournal.com/researchpaper/GREEN_BONDS_AND_RENEWABLE_ENERGY_FINANCING_IN_KENYA_OPPORTUNITIES_AND_CHALLENGES.pdf

Dasgupta, P. (2021). The economics of biodiversity: The Dasgupta review. HM Treasury.https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review

ELC & Kenya Electricity Generating Company Plc (KenGen). (2024). Environmental and Social Impact Assessment (ESIA) study for the proposed 140 MW Olkaria II Extension Geothermal Power Plant Project: Final ESIA report. Prepared by ELC Electroconsult S.p.A. and Prof. Jacob K. Kibwage. https://nema.go.ke/wp-content/uploads/2025/03/EIA-2271-SR-3310-KENGEN-min.pdf

Finer, M. (2019, March 8). How Kenya's push for development is threatening its famed wild lands. Yale Environment 360. https://e360.yale.edu/features/how-kenyas-push-for-development-is-threatening-its-prized-wild-lands

Forbes (2026, March 11). Kenya Bets On Infrastructure Fund To Unlock Growth, Curb Debt. Forbes Africa. https://www.forbesafrica.com/current-affairs/2026/03/11/kenya-bets-on-infrastructure-fund-to-unlock-growth-curb-debt

Government of Kenya. (2008). Kenya Vision 2030: The Kenya Vision 2030 development blueprint. https://vision2030.go.ke/

Government of Kenya. (2013). National environment policy, 2013. Ministry of Environment, Water and Natural Resources. https://faolex.fao.org/docs/pdf/ken147906.pdf

Government of Kenya. (2018). National wildlife strategy 2030: A blueprint to transform wildlife conservation in Kenya. Ministry of Tourism and Wildlife. https://ke.chm-cbd.net/sites/ke/files/2024-01/WILDLIFE-STRATEGY2030-ABRIDGED-VERSION-Final-June-12-2018-1.pdf

Government of Kenya. (2020). Kenya's updated nationally determined contribution (NDC). Ministry of Environment and Forestry. https://unfccc.int/sites/default/files/NDC/2022-06/Kenya%27s%20First%20%20NDC%20%28updated%20version%29.pdf

Government of Kenya. (2024). Fourth medium term plan (MTP IV) 2023–2027: Bottom-up economic transformation agenda for inclusive growth. The National Treasury and Economic Planning. https://vision2030.go.ke/wp-content/uploads/2024/03/FINAL-MTP-IV-2023-2027_240320_184046.pdf

He, Y., Tang, Q., & Wang, K. (2013). Carbon disclosure, carbon performance, and cost of capital. China Journal of Accounting Studies, 1(3–4), 190–220. https://doi.org/10.1080/21697221.2014.855976

Jones IL, Bull JW. Major dams and the challenge of achieving “No Net Loss” of biodiversity in the tropics. Sustainable Development. 2020; 28: 435–443. https://doi.org/10.1002/sd.1997

ICMM & IUCN. (2013). Independent report on biodiversity offsets. . https://www.icmm.com/website/publications/pdfs/environmental-stewardship/2013/research_biodiversity-offsets.pdf

IPBES. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES Secretariat. https://doi.org/10.5281/zenodo.3553458

IPBES. (2024). Summary for Policymakers of the Thematic Assessment Report on the Underlying Causes of Biodiversity Loss and the Determinants of Transformative Change and Options for Achieving the 2050 Vision for Biodiversity. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. https://doi.org/10.5281/zenodo.11382230

IPBES. (2026). Summary for Policymakers of the Methodological Assessment Report on the Impact and Dependence of Business on Biodiversity and Nature’s Contributions to People. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. https://doi.org/10.5281/zenodo.15369060

International Union for Conservation of Nature. (IUCN). (2016). IUCN policy on biodiversity offsets. (WCC-2016-Res-059-EN). https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2016_RES_059_EN.pdf

IUCN. (2023). Addressing ecological connectivity in the development of roads, railways and canals. Union for Conservation of Nature https://portals.iucn.org/library/sites/library/files/documents/PATRS-005-En.pdf

IUCN. (2025). The nature-positive goal and the mitigation hierarchy. International Union for Conservation of Nature. https://iucn.org/sites/default/files/2025-10/brief-2-the-nature-positive-goal-and-the-mitigation-hierarchy-look-feel-v4.pdf

Kenya National Bureau of Statistics. (2025). Economic Survey 2025. https://www.knbs.or.ke/wp-content/uploads/2025/05/2025-Economic-Survey.pdf

Kenya Railways Corporation (KRC). (2026). Environmental and Social Impact Assessment (ESIA) study for the proposed construction of the Naivasha-Kisumu Standard Gauge Railway (SGR), Phase 2B and Kisumu Port (including the 8km branch line): Final report. https://nema.go.ke/wp-content/uploads/2026/03/ENVIS-00503-EIA-2446.pdf

Ledec, G. (2016). Biodiversity offsets: A user guide [Guía del usuario para compensaciones de biodiversidad]. World Bank Group. https://documents1.worldbank.org/curated/en/344901481176051661/pdf/110820-WP-BiodiversityOffsetsUserGuideFinalWebRevised-PUBLIC.pdf

Lees, A. C., Peres, C. A., Fearnside, P. M., Schneider, M., & Zuanon, J. A. S. (2016). Hydropower and the future of Amazonian biodiversity. Biodiversity and Conservation, 25(3), 451–466. https://doi.org/10.1007/s10531-016-1072-3

Lai, T. T. T. (2026). Sector-level biodiversity exposure screening for Kenya using the ENCORE framework. Discover Environment, 4(123). https://doi.org/10.1007/s44274-026-00650-2

Laurance, W. F., Peletier-Jellema, A., Geenen, B., Koster, H., Verweij, P., Van Dijck, P., ... & Van Kuijk, M. (2015). Reducing the global environmental impacts of rapid infrastructure expansion. Current Biology, 25(7), R259-R262.

Meneses Cerón, L. Á., van Klyton, A., Rojas, A., & Muñoz, J. (2024). Climate Risk and Its Impact on the Cost of Capital—A Systematic Literature Review. Sustainability, 16(23), 10727. https://doi.org/10.3390/su162310727

Ministry of Tourism and Wildlife (MoTW). (2023). Strategic plan 2023–2027: Transforming tourism and wildlife sector for sustainability, resilience and inclusivity. https://www.tourism.go.ke/wp-content/uploads/2024/12/MOTW-Strategic-Plan-2023-2027-Final-Print.pdf

Ministry of Environment, Climate Change and Forestry (MoECCF). (2023). Strategic Plan 2023–2027. https://faolex.fao.org/docs/pdf/ken231417.pdf

Ochola. (2025). The silent siege: The hidden economic costs of state fragility in Kenya. https://ieakenya.or.ke/blog/the-silent-siege-the-hidden-economic-costs-of-state-fragility-in-kenya/

Oduk, F., & Manegene, S. (2024). National technical review to assess alignment between other effective area-based conservation measures (OECMs) definition and Kenya's existing legislation, policy and implementation frameworks: Final report. Ochieng' Ogola & Company Advocates. https://ke.chm-cbd.net/sites/ke/files/inline-files/Kenya%20OECMs%20Legislative%20Review%20Report%20-%20IUCN%20Submitted%202024.pdf

OECD. (2016). Biodiversity Offsets: Effective Design and Implementation. OECD Publishing, Paris. https://doi.org/10.1787/9789264222519-en

OECD. (2025). Scaling Up Biodiversity-Positive Incentives: Delivering on Target 18 of the Global Biodiversity Framework. OECD Publishing, Paris. https://doi.org/10.1787/19b859ce-en

Okita-Ouma, B., Koskei, M., Tiller, L., Lala, F., King, L., Moller, R., Amin, R., & Douglas-Hamilton, I. (2021). Effectiveness of wildlife underpasses and culverts in connecting elephant habitats: a case study of new railway through Kenya's Tsavo National Parks. African Journal of Ecology, 59(3), 624–640. https://doi.org/10.1111/aje.12873

Park, J., & Noh, J. (2018). Relationship between Climate Change Risk and Cost of Capital. Global Business and Finance Review, 23(2), 66-81. http://doi.org/10.17549/gbfr.2018.23.2.66

Republic of Kenya, The National Treasury and Economic Planning. (2024). Fourth Medium Term Plan 2023–2027: Bottom-Up Economic Transformation Agenda for inclusive growth. State Department for Economic Planning. https://www.planning.go.ke

Rotich, I. K., Chepkirui, H., Musyimi, P. K., & Kipruto, G. (2024). Geothermal energy in Kenya: Evaluating health impacts and environmental challenges. Energy for Sustainable Development, 82, 101522. https://doi.org/10.1016/j.esd.2024.101522

Shortall, R., Davidsdottir, B., & Axelsson, G. (2015). Geothermal energy for sustainable development: A review of sustainability impacts and assessment frameworks. Renewable and Sustainable Energy Reviews, 44, 391-406. https://doi.org/10.1016/j.rser.2014.12.020

Torres, A., Jaeger, J. A. G., & Alonso, J. C. (2016). Assessing large-scale wildlife responses to human infrastructure development. Proceedings of the National Academy of Sciences, 113(30), 8472–8477. https://doi.org/10.1073/pnas.1522488113

United States Environmental Protection Agency. (2025, June 25). Mitigation banks under CWA Section 404. https://www.epa.gov/cwa-404/mitigation-banks-under-cwa-section-404

Victurine, R., Anstee, S., Jones, K. R., Rainey, H., DeGemmis, A., & Crowley, H. (2024). Nature Positive mining: Guidance for a critical transition. PLOS Sustainability and Transformation, 3(12), e0000142.
World Bank. (2016). Biodiversity offsets: A user guide. World Bank Group. https://documents1.worldbank.org/curated/en/344901481176051661/pdf/110820-WP-BiodiversityOffsetsUserGuideFinalWebRevised-PUBLIC.pdf

World Bank. (2021). Unlocking nature-smart development: An approach paper on biodiversity and ecosystem services. World Bank Group. https://documents1.worldbank.org/curated/en/927121625066013258/pdf/Unlocking-Nature-Smart-Development-An-Approach-Paper-on-Biodiversity-and-Ecosystem-Services.pdf

World Bank. (2025). Nature's bottom line: The economic and financial costs of ecosystem degradation in Kenya. https://documents1.worldbank.org/curated/en/099101725150018290/pdf/P179680-5087bd60-20a0-47c9-a68a-533bd035821f.pdf

Zawadzka, J. E., Corstanje, R., Fookes, J., Nichols, J., & Harris, J. (2017). Operationalizing the ecosystems approach: Assessing the environmental impact of major infrastructure development. Ecological Indicators, 78, 75–84. https://doi.org/10.1016/j.ecolind.2017.03.005

TERRASOS

Environmental investments
transforming territories

TERRASOS.CO