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INCLUSIVE GREEN FINANCE (IGF) WORKING GROUP

EMBEDDING BIODIVERSITY CONSIDERATIONS INTO INCLUSIVE GREEN FINANCE POLICIES:

A SUPERVISORY PERSPECTIVE ON INCLUSIVE AND NATURE-POSITIVE FINANCE

France

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SPECIAL REPORT

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Cover photo: Female Tea picker at work in Lipton Plantation, Sri Lanka (Iren Key / Shutterstock)

EXECUTIVE SUMMARY

This report examines the critical link between biodiversity and financial inclusion, particularly for vulnerable populations and small businesses reliant on natural resources. Over half of global GDP is dependent on biodiversity, yet human activities have caused a drastic decline in global biodiversity since the 1970s, putting over a million species at risk. This degradation creates significant physical and transition risks for the financial system, with implications for credit risk, economic stability, and financial inclusion.

The report identifies a vicious cycle: nature degradation exacerbates economic vulnerability for smallholder farmers, fishers, rural communities, and small businesses in developing economies. These groups, often lacking financial access, are disproportionately affected by environmental shocks. Financial institutions, in turn, become even more reluctant to lend to these high-risk sectors, leading to increased financial exclusion. Well-intentioned financial regulations, reporting requirements, and certification schemes, if not carefully designed, can inadvertently worsen this exclusion by raising costs or limiting access to finance for smaller entities.

To break this cycle and foster a virtuous cycle of inclusive green finance, the report stresses the urgent need for a set of policies that bolster nature-positive investment.

The report identifies policy solutions under four pillars of inclusive nature-positive finance and illustrates each with case studies from emerging markets around the world:

1. Incorporate Nature into Public Sector Financial Planning: This involves upgrading national financial inclusion strategies, incorporating inclusive and nature-related indicators into supervisory practice, and enhancing cooperation with public development banks to promote nature-positive investments.

2. Create an Enabling Environment for Nature-Positive Products and Services: Focus should be on developing inclusive payment for ecosystem services schemes, supporting biodiversity credit markets, adopting a test-and-learn approach towards innovative nature-positive financial instruments, and adjusting green taxonomies to reduce the risk of unintended exclusionary consequences.

3. Make Data on Nature and Nature Finance Accessible: This includes leveraging digital technology and building georeferenced digital credit registries for cost-effective biodiversity monitoring and ensuring data accessibility for vulnerable populations and small companies.

4. Bolster Demand-side Drivers of Sustainable Production: This entails harnessing value chains for inclusive investments, promoting the use of digital platform that connect small-scale producers to upscale markets, and fostering a virtuous cycle of higher-value, sustainable production.

By integrating biodiversity concerns into financial policies and fostering innovative, inclusive financial solutions, policymakers can drive both ecological sustainability and financial resilience, particularly for those most dependent on nature.

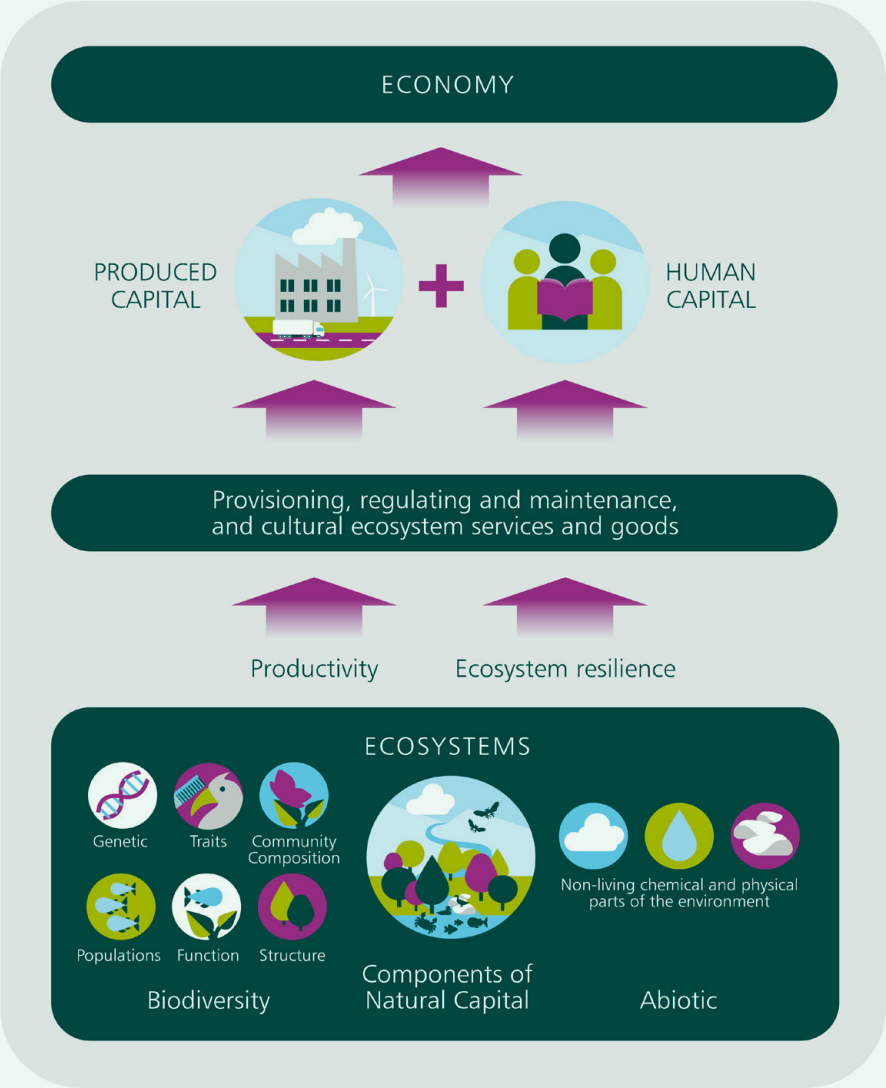
INTRODUCTION: BIODIVERSITY, ECONOMY, AND FINANCE

Economic activity depends on – and often impacts – the natural environment. Natural capital has two main components, namely abiotic capital (including clean water and air) and biodiversity. Over half of global GDP is moderately or highly dependent on it.

While this report focuses on biodiversity in particular, this component is often inseparable from abiotic nature.

Both the problem analysis and recommended solutions of this report encompass all components of nature. Sectors such as agriculture, food systems, forestry, fisheries and construction have the greatest exposure, because they require ecosystem inputs (e.g. pollination, fertile soil, water) (Brasil-Leigh et al., 2024). Sustainable management of these natural resources is crucial for maintaining economic stability and promoting financial inclusion across various sectors.

FIGURE 1. BIODIVERSITY AND THE ECONOMY



Source: Dasgupta, 2021

BOX 1. DEFINITIONS

Biodiversity: Commonly defined according to Article 2 of the Convention on Biology Diversity (1992) as the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

- the diversity of species, that is all different types of plants and animals living on our planet
- the genetic diversity within a species, making a species less vulnerable to (hereditary) diseases; and
- the diversity of ecosystems

Nature: Often defined as "the natural world" (especially its living components and ecosystems). It encompasses both living components (biodiversity, species, ecosystems) and abiotic (non-living) elements – such as soil, water, climate, and geology – on which living systems depend.

Environment (or natural environment) encompasses all biotic and abiotic things occurring naturally, including air, water, climate, and universal physical phenomena. Crucially, in policy and law, the environment is often understood as the larger setting that includes Nature but is not exclusively defined by the complexity of living systems; the natural environment is often contrasted with the built environment (e.g., urban settings or agricultural land conversion).

Ecosystem services: Processes through which ecosystems produce benefits useful to people, akin to economic services. Examples include provision of clean water/air, crop pollination, pest control, and carbon sequestration. These services are the basis of agriculture, fisheries, disaster risk protection and more.

Nature-positive economy: An economy that not only avoids further damage to nature but actively restores and regenerates ecosystems. For example, UNEP describes a nature-positive economy as one that "is regenerative, collaborative and where growth is only valued where it contributes to social progress and environmental protection" (zu Ermgassen et al., 2022). The concept implies reorienting business models and finance so that economic activity builds natural capital.

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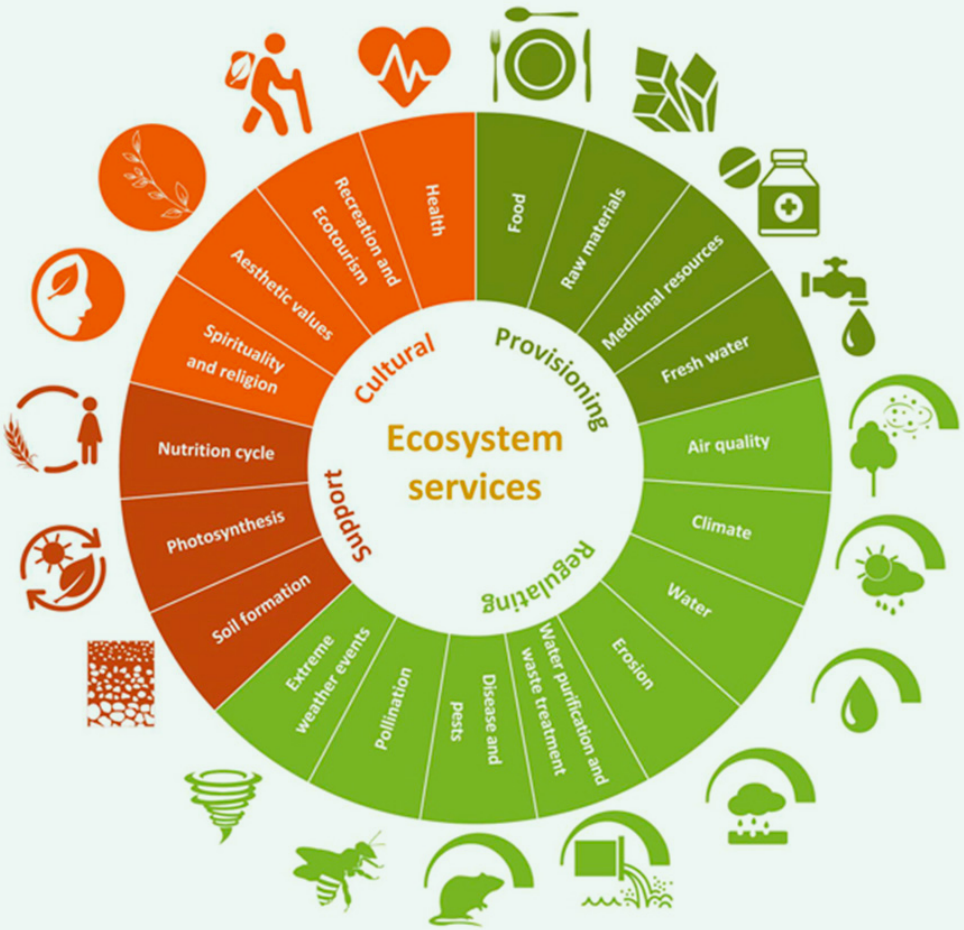
The concept of ecosystem services is useful to map the many connections between our natural environment and the economy. There are four main types of ecosystem services: Provisioning services derive from natural capital stocks, such as water, food, wood, minerals, and medicinal vegetation. Regulating services involve the benefits obtained from the regulation of ecosystem processes, including water and air purification, flood control, and disease regulation. Support services are essential for the maintenance of ecosystem functions, such as photosynthesis and soil formation. Lastly, cultural services provide non-material benefits, including recreational, aesthetic, and spiritual experiences derived from nature (WWF, 2022).

Biodiversity is a critical component of ecosystem services, as it underpins the functionality and resilience of these systems. Rich biodiversity is the basis for intact ecosystems and, hence, for well-functioning, reliable ecosystem services. For instance, soil formation is directly dependent on the richness of soil biodiversity, a massive and varied population of micro-organisms, fungi, insects, and varied plant root structures. These diverse species perform the complex, continuous work of making soil productive: they break down organic matter, cycle essential nutrients like nitrogen and phosphorus, and build soil structure that retains water and prevents erosion. Another classic ecosystem service vital to the global agricultural economy is crop pollination. While various insects, birds, and animals provide this service, the functional resilience of pollination depends on the diversity of these species. If a single pollinator species declines due to habitat loss or pesticide use, a healthy, biodiverse ecosystem ensures other species can compensate. Sustaining biodiversity is essential not only for ecosystem health but also for ensuring the long-term viability of economic systems that rely on these natural services.

FIGURE 2. ECOSYSTEM SERVICES



Source: WWF, 2022

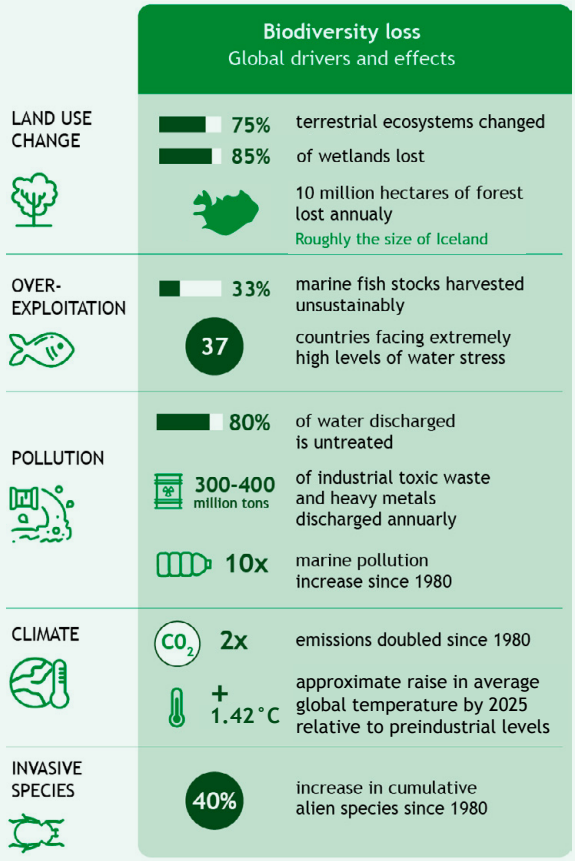
Since the 1970s, monitored wildlife populations have declined by 69% on average across the world. The World Wildlife Fund has developed a Living Planet Index that tracks the relative abundance of wildlife populations over the last 50+ years, using data gathered from almost 32,000 populations of 5,230 terrestrial, freshwater and marine vertebrate species across the planet. Researchers compiling the Index found that wildlife populations have declined by between 63 and 75% (WWF, 2022). If this trend continues, some 20% of species could become extinct within the next several decades, perhaps twice as many by the end of the century (Dasgupta, 2021). According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), a global panel involving over 450 experts, more than one million species face imminent extinction (IPBES, 2019). This alarming trend poses significant risks not only to biodiversity itself but also to the economic systems reliant on these ecosystems for vital services (Kulionis et al., 2024). Immediate and coordinated action is essential to mitigate these threats and promote sustainable practices across industries.

Human activity is a primary driver of biodiversity loss. Population growth, consumption, waste, economic expansion, and unsustainable production methods all push ecosystems beyond their capacity to regenerate. One way to understand how much our demand for ecosystem services exceeds what nature can provide is to think of our ecological footprint. The WWF reports that "In 2020, the world average footprint amounts to 2.5 global hectares per person, compared to 1.6 global hectares of biocapacity." (WWF, 2022). Dasgupta (2021) notes that the ratio of our demand from the biosphere to its regeneration rate increased from 1 in the late 1960s to 1.6 in 2020. In other words, we are in need of more than a planet and a half to sustain our current way of living.

Key drivers of biodiversity loss are:

1. Land, freshwater, sea-use change: loss of habitat, degradation
2. Climate change
3. Pollution: agricultural chemicals, marine plastic waste
4. Resource exploitation: rate of exploitation surpasses natural regeneration capacities
5. Invasive species

FIGURE 3. BIODIVERSITY LOSS: GLOBAL DRIVERS AND EFFECTS



Source: Adapted from Gutierrez et al., 2022

Climate change and nature loss are two distinct but related phenomena. On the one hand, the causes, processes, and effects of nature loss can be clearly distinguished from that of climate change. For example, overfishing, river pollution, or nature degradation due to an invasive species all have very little to do with climate change. On the other hand, climate change and nature loss can reinforce and exacerbate each other. The degradation of nature leads to increased vulnerability to climate impacts, while climate change further accelerates biodiversity loss, creating a vicious cycle that threatens both ecosystems and economies. For example, land with eroded soil is less able to absorb rainwater and thus more susceptible to flooding, which can disrupt agricultural productivity and exacerbate food insecurity (Makhtoumi et al., 2023). Conversely, ocean warming leads to coral bleaching, which in turn threatens the survival of the many species that depend on the health of coral reefs.

Measures to combat climate change can have co-benefits for nature, but trade-offs also exist. Mangrove forests for example do not only capture carbon from the atmosphere and reduce the intensity of storms on the coastline. Restoring them also improves the habitat for many marine species, contributing to biodiversity in coastal regions – and ultimately to the economic benefit of communities that depend on it. However, there are also trade-offs between climate and nature measures. For example, wind turbines can disturb bird populations (and fish populations when installed offshore). Solar panels take up significant amounts of land for each megawatt produced (Almeida et al., 2025a). Solar-powered water pumps slash greenhouse gas emissions in agriculture, but they also drastically reduce the marginal costs of pumping groundwater, which can lead to overuse (Shiferaw, 2021). Minerals such as lithium, cobalt, nickel, and rare earth elements are essential for renewable energy solutions. But deforestation rates are higher where these so-called transition minerals are extracted, compared with those at conventional mining sites (Damania et al., 2025).

International agreements to date have been insufficient to halt biodiversity loss, but efforts are ongoing. In 1992, the Convention on Biological Diversity was established to promote sustainable development and conservation efforts, yet significant challenges remain in achieving its goals (Bayangos et al., 2023). In 2022, signatories of the Convention adopted the Kunming-Montreal Global Biodiversity Framework (GBF), which set a number of goals and targets for 2030 (see Box 2). Parts of the GBF are of relevance to the financial sector in general and financial inclusion in particular. For example, the framework calls on signatories to align financial flows with biodiversity goals, mobilize biodiversity finance, and promote social equity including equitable access, benefit sharing, and protecting the rights of indigenous people and local communities. Yet most countries have not yet incorporated these goals and targets into their financial regulatory and supervisory approach (Gelder et al., 2024).

BOX 2. BIODIVERSITY AGREEMENTS

Convention on Biological Diversity (CBD): A 1992 UN treaty with nearly universal participation. Its three main objectives are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits from genetic resources. The CBD provides the overarching framework for national biodiversity strategies and international targets (Convention on Biological Diversity, 2024).

Global Biodiversity Framework (GBF): Adopted at CBD COP 15 (Kunming–Montreal, December 2022), the GBF sets an ambitious pathway to "a world living in harmony with nature" by 2050. It comprises 4 long-term goals and 23 targets for 2030. Key elements include conserving at least 30% of land and oceans, reducing pollution, eliminating harmful subsidies, and mobilizing biodiversity finance. The GBF's adoption signaled a global commitment to scale up both public and private investment in biodiversity (Kunming-Montreal Global Biodiversity Framework, 2024).

Market and policy failures pose significant obstacles to conserving or restoring global biodiversity. Five key barriers keep the economy locked in unsustainable pathways (see Figure 4): The costs of sustainable practices are often perceived as high, leading to a preference for short-term gains over long-term sustainability. A lack of data and knowledge about biodiversity hinders the formulation of clear goals and pathways. For example, global biodiversity agreements have not yet found a suitable equivalent to global warming goals enshrined in the Paris Agreement of 2015. A lack of capacity constrains the actions of governments and market participants. Moreover, domestic political economy issues favor entrenched stakeholders that profit from unsustainable economic activities. And the lack of clear property rights and market signals can hinder investments in biodiversity conservation. This is particularly the case for global public goods such as healthy oceans and clear air. Addressing these barriers is crucial for aligning financial flows with the objectives of the Global Biodiversity Framework and ensuring a sustainable future for both ecosystems and economies (WB, 2021).

FIGURE 4. KEY MARKET AND POLICY FAILURES THAT PREVENT BIODIVERSITY RESTORATION

Short and long-term tradeoffs	• Nature investment associated with large short-term cost (direct or opportunity costs) for benefits that often materialize only in the long term • Short-term bias in private sector investment, public sector budgeting, and policy (political cicles)
Lack of data and knowledge	• Data gaps related to economic value of biodiversity, risks associated with biodiversity loss • Traceability of impact of various value chains on nature is limited, global trade allows spatial decoupling of consumption from biodiversity loss
Capacity constraints	• Limited understanding of the economic value of biodiversity and its links to development • Capacity constraints in government, financial institutions, and the real economy private sector
Domestic political economy	• Concerns about potential effects of environmental policies on the competitiveness of critical sectors • Influence of vested interests on reform
Global public goods	• Many associated costs and benefits of biodiversity transcend borders • Lack of national incentivess leads to under-provision

Source: WB, 2021

Biodiversity and economic activity are intertwined in a two-way relationship. This interconnectedness is captured by the prudential principle of double materiality, which requires central banks and financial institutions to assess risk from two distinct, yet complementary, perspectives:

- **Financial Materiality (Outside-In):** How the degradation of nature and the resulting loss of ecosystem services impact the firm's financial performance and resilience.

- **Impact Materiality (Inside-Out):** How the firm's activities contribute to nature loss and biodiversity degradation.

The outside-in perspective shows how nature loss and environmental degradation pose risks for the economy. Similar to how financial supervisors today understand the impacts of climate change, the loss of ecosystem services can pose physical and transition risk. Physical risk includes slow-onset loss such as reduced soil fertility and sudden onset events such as a pandemic. For example, a beverage company dependent on clean water sources will see its operations and value directly compromised if its supply is diminished by pollution or scarcity. A loss of ecosystem function can also carry tangible macroeconomic consequences, including a decline in tourism, smaller fish catches and reduced harvests.

Transition risk in turn can arise from shifts in policies, such as the designation of protected areas, or consumer preferences aimed at reducing environmental harm. As a result, the economy could be affected by supply chain disruptions, raw material price volatility, productivity changes, stranded assets, and depreciation in the value of affected assets.

These changes in the real economy in turn affect the financial system. Agricultural firms that default on their loans after an environmental shock contribute to credit risk, which can lead to broader implications for the banking sector and financial stability (Bayangos et al., 2023). Market risk rises when investors react to declining asset values linked to environmental degradation (Barning et al., 2024). And underwriting risk can be driven by increased insurance losses (Alvarez et al., 2025; Ranger et al., 2024). Nature loss also has macro-financial implications, such as a rising risk of inflationary shocks and downturns in economic growth (Gardes-Landolfini et al., 2024; FSB, 2024). For countries heavily dependent on sectors like agriculture, forestry, or tourism, widespread ecosystem degradation can erode the national tax base, increase public spending on disaster relief, and damage the country's creditworthiness. Credit rating agencies are beginning to incorporate these nature-related risks into their sovereign debt assessments, creating a direct link between a nation's ecological health and its cost of borrowing on international markets.

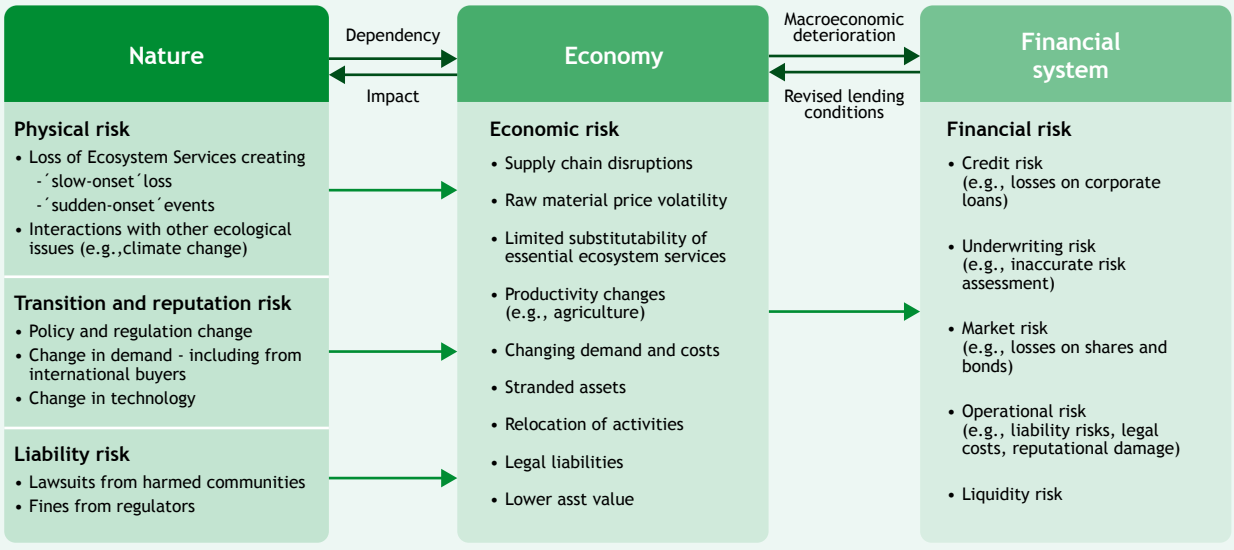
Conversely, the "inside-out" perspective recognizes that financial flows actively contribute to the primary drivers of loss, accelerating the risk exposure. Activities financed by the private sector, such as unsustainable land use change, pollution from agricultural chemicals, or resource exploitation that surpasses natural regeneration capacity, directly cause the habitat loss that threatens species. Companies in the chemicals sector, for example, carry very high environmental risk due to their use or creation of toxic or hazardous byproducts, which in turn pollutes the environment and creates future financial liability for the sector. A comprehensive supervisory approach requires financial institutions to manage both types of risk simultaneously.

The aggregation of these effects may lead to systemic financial risk. Recent advances in understanding the interconnectedness of biodiversity and financial stability highlight the need for a comprehensive approach to mitigate these risks (Van Toor et al., 2020; Svartzman et al., 2021). Addressing nature loss is essential not only for ecological sustainability but also for safeguarding the resilience of the financial system against emerging threats. As such, it is drawing the attention of central banks and financial supervisors to incorporate nature-related risks into their mandate (NGFS, 2024).

Exposures to nature risk are not evenly distributed across the financial system. Certain sectors, particularly those reliant on natural resources, and the financial institutions that serve them, face heightened vulnerability to nature-related risks. Empirical evidence shows that investors already factor in sectoral differences in biodiversity risk exposure in a way that is different from climate risk exposure (Giglio et al., 2025). Financial institutions that predominantly serve firms in commerce and industry in urban areas are expected to be much less affected by the impacts of nature and biodiversity loss compared to those with significant investments in agriculture or fisheries, which are more directly influenced by ecosystem degradation (WB, 2021; Bayangos et al., 2023). Moreover, large financial institutions tend to have a more varied costumer base in terms of sectors and geography, which grants them more resilience to shocks than smaller, local ones. Understanding these variances is crucial for developing targeted strategies to enhance financial resilience amidst environmental challenges.

Biodiversity loss and environmental degradation disproportionately affect women, smallholder farmers, and other vulnerable populations. These groups often rely more directly on natural resources, operate with thinner financial buffers, and face structural barriers in accessing formal finance. Without explicit safeguards, well-intentioned biodiversity-related requirements, such as stricter due-diligence or documentation standards, could inadvertently limit their access to credit or essential financial services.

FIGURE 5. RELATIONS BETWEEN NATURE, THE ECONOMY, AND THE FINANCIAL SYSTEM



Source: Van Toor et al. (2020)

BIODIVERSITY LOSS AND FINANCIAL EXCLUSION RISK

Nature loss is affecting low- and lower-middle income countries more than others. Almost 80% of low-income country residents are exposed to poor air quality, unsafe water, and degraded land, while only 1% of high-income residents are (see Figure 6) (Damania et al., 2025). This evidence challenges the old notion that environmental degradation is an evil but necessary by product of industrialization. In reality, many of the countries most affected by environmental degradation have yet to industrialize.

Environmental degradation is also affecting economic agents at the margins of the financial system more than average. Poor individuals and communities are 75 percent more likely to live in areas where land is degraded (Damania et al. 2025). The impact of nature loss is particularly pronounced among vulnerable populations who depend heavily on natural resources for their livelihoods, such as smallholder farmers, fishers, rural communities, and small companies (micro, small, and medium-sized enterprises or MSME in the jargon) in tourism, particularly in emerging markets and developing economies (EMDEs). This demographic has few opportunities for diversification, limited or no access to financial services, and is more susceptible to the adverse effects of nature degradation.

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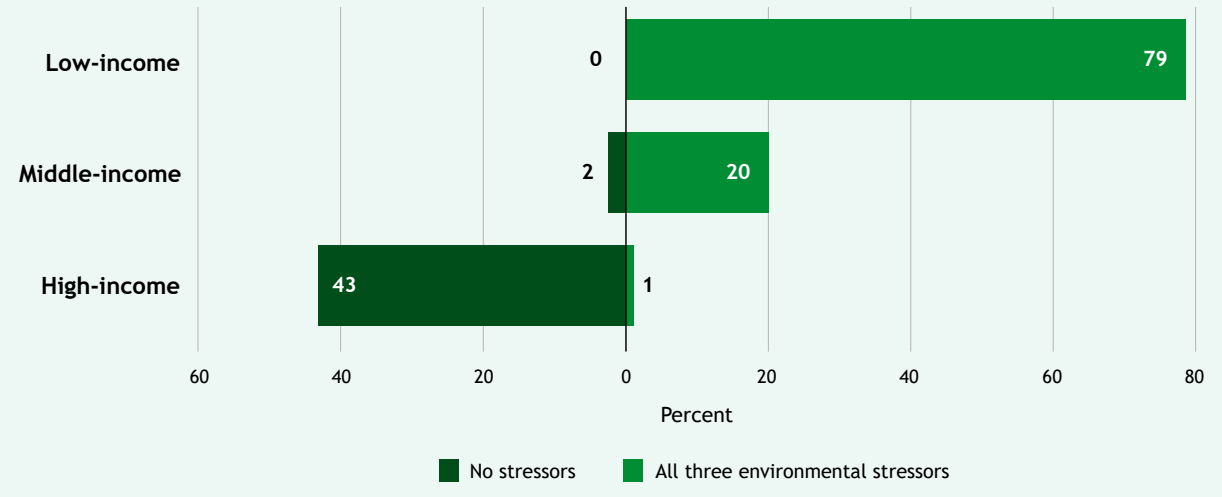
Moreover, households and firms in these sectors have limited adaptive capacity: After a climate or nature shock, multinational corporations can find suppliers elsewhere and tourists can switch to other destinations with relative ease, but local firms and households cannot simply move to a new location. These constraints to adaptive capacity also affect the financial institutions, from banks to insurers and microfinance institutions, that serve them.

FIGURE 6. SHARE OF RESIDENTS EXPOSED TO POOR AIR QUALITY, UNSAFE WATER, AND DEGRADED LAND



Source: Damania et al. (2025)

BOX 3. OVERFISHING AND THE DEMISE OF FISHING COMMUNITIES IN NEWFOUNDLAND

The collapse of cod stocks in Newfoundland exemplifies how environmental degradation can disproportionately impact vulnerable communities reliant on natural resources, exacerbating economic instability. Years of over-fishing in Newfoundland led to a sharp decline in cod population in the 1980s. Modern fishing equipment increased the depth and the area fished, and it led to a rapid rise in by-catch, that is fish that is not commercially valuable but ecologically essential. To address the problem, the Canadian government issued a moratorium on cod fishing in 1992, which was initially meant to last 2 years but was only lifted in 2024, 32 years later. The local economy provided few options of diversification, affecting over 30'000 fishers and fish factory workers, and leading to a rise in regional unemployment to double-digit rates. Financial institutions were reluctant to finance new businesses in a local economy affected by declining asset prices, sluggish demand, and negative growth. The consequence was a mass migration away from Newfoundland. The clear connection between biodiversity loss, economic vulnerability, and the destruction of livelihoods even in a high-income country like Canada serves as a cautionary tale for countries that have less extensive social protection systems in place (Almeida et al., 2025b).

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Nature degradation and biodiversity loss can lead to financial exclusion. Nature-exposed sectors such as agriculture, fisheries, and tourism are subject to high and rising physical risk. They are also vulnerable to transition risk, for example when consumer preferences shift away from agricultural practices deemed harmful, or when the location where firms operate becomes part of a protected conservation area. This is of particular concern for financial institutions in EMDEs, which are highly exposed to businesses that are dependent on ecosystem services (Calice et al., 2023). Almost 2 billion individuals rely on agriculture for their livelihoods, including 70% of the population in Africa and 60% in South Asia. Smallholders are one of the most exposed and crucial groups at the bottom of the economic pyramid (Hara, 2025). Financial institutions choose clients and investment projects based on the associated risk-adjusted returns, and a growing recognition of nature risk may lead to a reluctance to serve households and businesses in nature-exposed sectors.

Insurance premiums and the cost of credit are likely to rise, in some instances to the point of becoming unaffordable. This is especially the case for clients at the margins of the financial system, such as low-income households and small companies. Financial sector retrenchment away from nature-exposed sectors often features as a feedback mechanism in conceptual models of the nexus between nature risk and finance (Gardes-Landolfini et al., 2024; FSB, 2024) (see Figure 5). It is also supported by growing empirical evidence. For example, researchers found a significant correlation between loan pricing and the level of biodiversity exposure of the borrower (Berger et al., 2025). In other words, because lenders price in risk already, borrowers that are more exposed to biodiversity risk face higher interest rates. A 2025 survey of Pakistani microfinance institutions reveals that over a quarter of respondents say that environmental degradation and climate events (including the 2022 floods) have affected their business. Almost 50% of respondents have reduced lending in a particular district/province, 40% have reduced lending to a certain sector (mostly agriculture), and 20% have stopped lending completely (Notta & Zetterli, 2025).

Financial supervisory actions to address nature risk may have unintended exclusionary consequences. Financial supervisors in 25 jurisdictions have incorporated nature risk in their prudential supervisory framework in 2025, up from eight in 2023 (SBFN, 2025b; FSB, 2024). These efforts, while well-intended and potentially key for financial stability and economic sustainability, can inadvertently raise the cost and reduce the availability of financial services (Knaack & Zetterli, 2023) (see Box 4). Financial institutions that are faced with higher risk buffers for exposure to nature risk for example have an incentive to reduce their lending activities in sectors deemed high-risk due to nature-related vulnerabilities (Volz & Knaack, 2023). Strengthened environmental due diligence requirements by supervisory authorities can increase the administrative burden for financial institutions and impose information and verification requests that households, smallholder farmers, and small companies are unable to meet (SBFN, 2025a). A rising cost of finance for firms in nature-exposed sectors such as agriculture may also lead to higher food prices, which could exacerbate food insecurity for vulnerable populations (NGFS, 2021).

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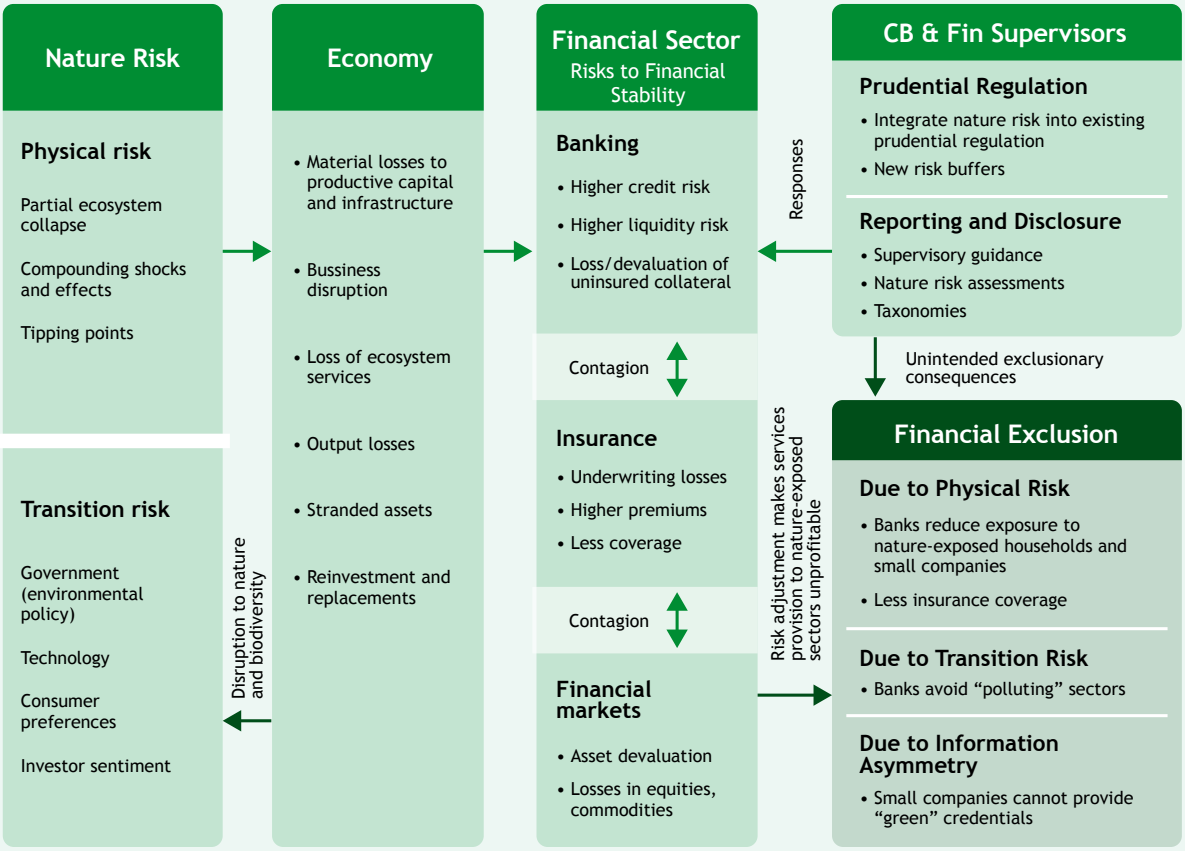
FIGURE 7. NATURE RISK AND THE REDUCED SUPPLY OF FINANCIAL SERVICES



Source: Author

BOX 4. UNINTENDED CONSEQUENCES OF ENVIRONMENTAL RISK REGULATION - THE CASE OF BRAZIL

Brazil's Central Bank has been assessing the adequacy of financial institutions' environmental risk management through onsite examinations and self-assessment questionnaires for almost a decade. Since 2017, the supervisor requires banks to incorporate environmental risks into their capital adequacy assessments (ICAAP). The rules applied only to large banks, respecting the principle of proportionality. Regulation on risk management explicitly included nature and biodiversity in subsequent years, defining environmental risk as the possibility of losses resulting from events related to environment degradation, including the excessive consumption of natural resources.

A World Bank empirical study reveals the unintended consequences of Brazil's regulatory approach. It finds that the 2017 regulation prompted large banks to reduce lending to sectors with high environmental risk, as intended. But smaller banks that were exempt from the regulation started increasing their lending to these sectors, while reducing services to their traditional clients, especially small firms. Greenhouse gas (GHG) emissions did not significantly change across affected sectors. However small firms were disproportionately affected: lending to small firms in environmentally risky sectors declined between 2.7% and 3.1%. Small firms also suffered higher rates of employment loss and bankruptcy — suggesting they had more difficulty accessing credit than before the environmental regulatory changes (Miguel et al., 2022).

Nature and biodiversity certification schemes can have similar adverse implications for financial inclusion. Certifications for eco-friendly farming, sustainable fishing or deforestation-free agriculture do not reduce the costs of green due diligence, they merely shift them from financial institutions to their clients. The cost of certification can be significant for businesses, particularly small enterprises, potentially limiting their access to financial services. For example, smallholder farmers may not be able to afford sustainability certifications (which can cost 10'000 dollars and more with a one-year validity), even when their agricultural practices would comply with the necessary standards (Zhang et al., 2025). However, when combined with access to premium markets, for example via digital marketing platforms that advertise sustainable practices to domestic and international consumers, sustainability certifications can be both affordable and beneficial even for small companies, as the second part of this report will illustrate.

Green taxonomies also raise concerns about unintended exclusionary consequences, especially for small companies. A recent survey by the European Banking Authority revealed that while 4.5% of the overall loan portfolio of banks in the European Union qualify as "green" or taxonomy-aligned, and 11% of mortgages do, the number drops to below 2% for small and medium-sized enterprises, highlighting the challenges they face in accessing green finance (EBA, 2023).

In China, which has developed a taxonomy as early as 2015, the small company share of green loans is below 5%, much lower than for banks' general loan portfolio (IIGF, 2024, PBC, 2025). Many small companies request working capital loans to meet their various financing needs, which do not neatly fit the list of green projects in a taxonomy (Zhang et al., 2025; IFC, 2023b). Moreover, taxonomies may also inadvertently exclude small-scale producers who cannot meet stringent technical screening or do no significant harm criteria to show that their activities are taxonomy-aligned, further entrenching financial inequalities (Dias et al., 2024). Some taxonomies, for example, require third-party verification of sustainable practices or so-called Integrated Farm Management Plans that can be burdensome for smallholders.

BOX 5. THE NATURE DEGRADATION AND POVERTY CYCLE IN SOUTHEAST AFRICA

Nature degradation deepens poverty by reducing the access of rural households and small companies to the natural assets that underpin livelihoods and financial inclusion. Recent studies from Zambia and Malawi show how soil overuse, monocropping, synthetic fertilizer and deforestation are the main drivers of biodiversity loss.

Harmful conventional practices reduce species numbers and impact pollination, natural food chains and clean water provision. Declining harvests, falling fish stocks and shrinking forests directly affect incomes of nature-dependent households, forcing them into short-term coping (unsustainable extraction, distress sales) that further erodes natural capital and creditworthiness (Kaimuri et al., 2025). As degraded land becomes less productive, farmers need to expand their area of cultivation to retain their incomes. But the increased demand drives up land prices, making access to larger cultivation areas unaffordable for smallholder farmers (Almeida et al., 2025b).

More than 75% of the portfolio of Zambia's financial institutions is comprised of counterparties that are dependent on five or more ecosystem services, exposing the financial system as a whole to nature-related risk (Kaimuri et al., 2025). As ecosystem losses reduce predictable cash-flows and raise volatility, smallholder farmers and biodiversity-dependent small companies in particular face higher perceived risk, weaker balance sheets and less collateral – conditions that push them into the "missing middle" where microfinance ticket sizes are too small and commercial banks deem lending too risky (Gutierrez et al., 2022). Gender gaps widen the effect: women-led enterprises – with lower asset ownership, greater time constraints and lower financial literacy – are disproportionately excluded.

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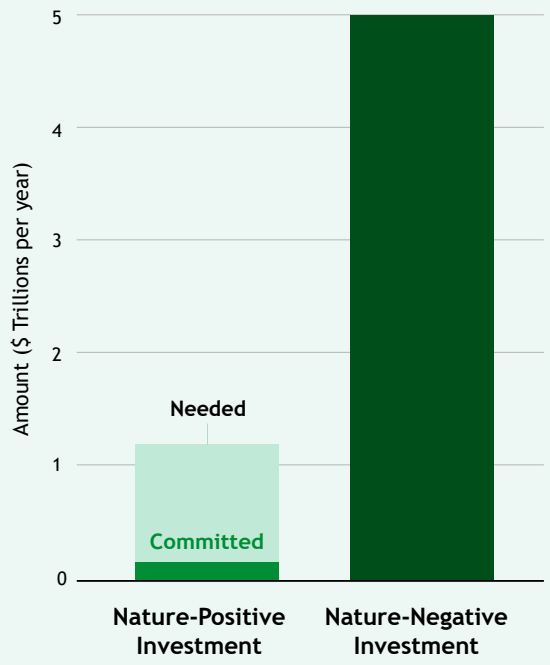
Nature degradation, economic vulnerability, and financial exclusion constitute a vicious cycle. Overexploitation of natural resources, land use change, and pollution due to unsustainable practices leads to nature degradation and loss of biodiversity. This in turn affects the productivity of firms especially in nature-dependent sectors such as fisheries, agriculture, and tourism. Business owners and workers in these sectors need financial services to protect themselves against shocks, invest in sustainable practices, adapt to changing environmental conditions, or to diversify to other, less vulnerable sectors. But firms with declining and volatile output are less likely to secure financing. Financial institutions may increasingly tend to avoid risky clients that are vulnerable to nature shocks. In the absence of affordable financial access, businesses may struggle to implement necessary adaptations or transition to sustainable practices, further perpetuating their vulnerability, environmental degradation, and the cycle of financial exclusion (Volz & Knaack, 2023). To break this cycle, it is essential to implement policies that promote financial inclusion while simultaneously addressing the risks associated with biodiversity loss and environmental degradation.

NATURE-POSITIVE INVESTMENT: DRIVING A VIRTUOUS CYCLE OF INCLUSIVE GREEN FINANCE

Massive public and private sector efforts are needed to close the biodiversity financing gap. Biodiversity finance encompasses all financial flows that contribute to activities that conserve, restore, or avoid negative impacts on biodiversity. The gap between current flows and what is needed to halt and reverse biodiversity loss is estimated at around $711 billion per year (Paulson Institute, 2020; WB, 2023a). According to a more recent estimate, $1.2 trillion of annual investment in direct and nature-adjacent projects by the private sector is required to reverse the decline in natural ecosystems. Less than 3% of this amount (around 35 billion) has been committed at this point. In contrast, the private sector pours at least 5 trillion annually into nature-negative investments, fueling activities that lead to biodiversity loss and environmental degradation (see Figure 8) (WEF, 2025). These numbers, while just estimates, highlight the magnitude of economic misalignment and the scale of the challenge to find synergies between economic, social, and environmental sustainability.

FIGURE 8: NATURE-POSITIVE VS NEGATIVE INVESTMENTS



Source: WEF

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The majority of policy efforts to conserve and restore biodiversity are outside of the purview of financial supervisors and beyond financial inclusion concerns. For example, signatories to the Montreal-Kunming Global Biodiversity Framework have committed to declaring 30% of lands and oceans protected areas that are off limits for economic exploitation by 2030. They are also encouraged to develop and update National Biodiversity Strategy and Action Plans, with the aim of integrating biodiversity considerations into national development strategies. Governments can also issue nature-themed green or blue bonds that specifically target nature positive investments (ICMA, 2025). Debt-for-nature swaps are another attractive sovereign instrument, especially for countries that are solvent but facing liquidity issues (OECD, 2007; Owen, 2022). And governments can dedicate funds to nature-based solutions such as mangrove restoration that protect and restore ecosystems while simultaneously providing societal benefits. This alignment is crucial for fostering a nature-positive economy that supports both ecological sustainability and financial resilience. Financing for such plans and policies can come from bilateral development assistance, support from multilateral development banks, UN agencies, global funds, and philanthropies. But such instruments and policies tend to be outside the purview of financial supervisors, and they often have only a tangential relationship with financial inclusion.

Addressing nature-related risks and opportunities requires central banks and financial supervisors to invoke both their primary and secondary mandates. While maintaining price and financial stability is paramount, many central banks in emerging markets possess broader secondary mandates encompassing financial inclusion, economic development, and advisory support. This broad authority provides an explicit basis for integrating biodiversity considerations into policy frameworks. The policy challenge, however, lies in preventing regulatory efforts designed to mitigate nature risk from unintentionally worsening financial exclusion. Therefore, effective policy interventions must be surgical, using targeted prudential tools and innovative mechanisms to redirect capital towards nature-positive activities while ensuring proportionality for vulnerable segments.

The Alliance for Financial Inclusion (AFI) has identified building blocks for inclusive green finance (IGF) that also apply to nature and biodiversity concerns. These building blocks include the adoption of an IGF strategy, establishing IGF as a priority, classifying IGF compliant conduct, products and services, collecting data on IGF, creating an IGF ecosystem, and building a financial infrastructure for IGF needs and purposes. While much global policy attention in recent years was focused on *climate* change mitigation and adaptation alone, financial supervisors in many EMDEs have always taken a wider view to incorporate environmental and social risk management as a whole. AFI members have included biodiversity concerns in the 2022 update of the Sharm-el-Sheikh Accord on inclusive green finance. That said, nature and biodiversity entail unique opportunities and challenges that merit a thorough revision of existing IGF frameworks to ensure they effectively address potential trade-offs between financial inclusion and biodiversity conservation. This report considers a wide range of inclusive and nature-positive finance actions and opportunities and makes 15 recommendations under four pillars. The following paragraphs will first lay out the rationale behind the policy recommendations, and then clarify the contribution central bankers and financial supervisors can make for each recommendation.

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Pillar 1: Incorporate nature into public sector financial planning

1. Embed biodiversity and nature-positive priorities into NFIS and IGF strategies
2. Expand cooperation with public development banks
3. Apply environmental and social standards tailored for public development banks

Pillar 2: Create an enabling environment for nature-positive products and services

4. Consider unintended exclusionary consequences of taxonomies
5. Foster development of inclusive payment for ecosystem services schemes
6. Support biodiversity credit markets, securitization, and other innovations
7. Adopt a test-and-learn regulatory approach for innovative nature finance products

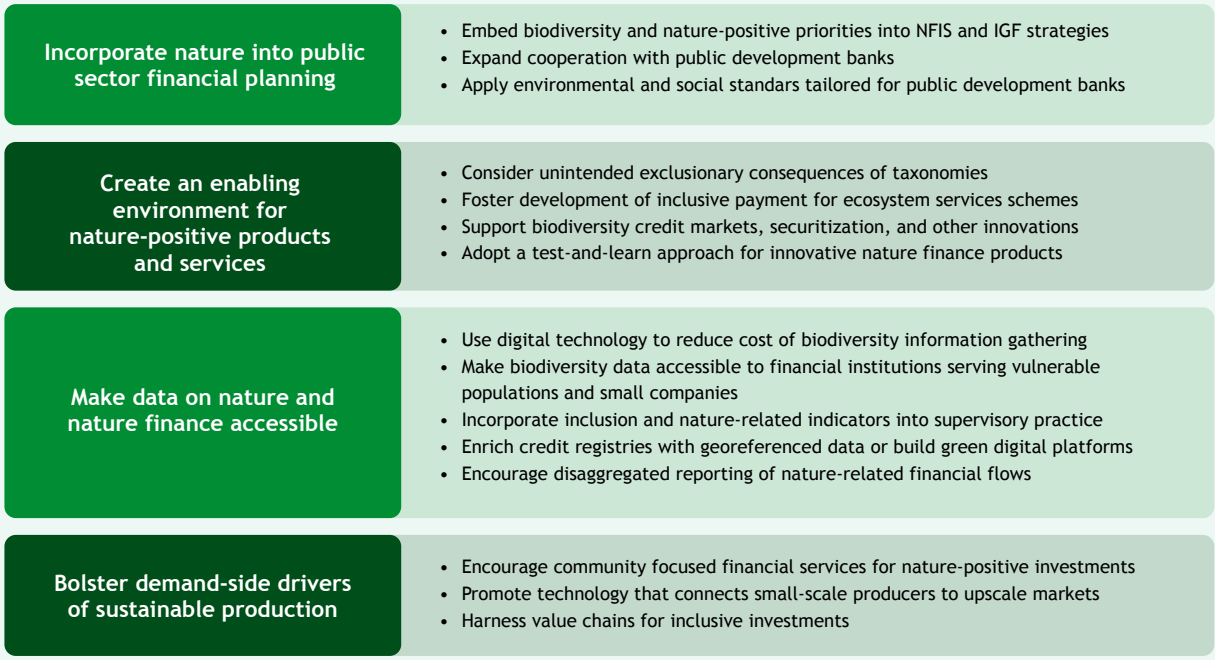
Pillar 3: Make data on nature and nature finance accessible

8. Use digital technology to reduce cost of biodiversity information gathering
9. Make biodiversity data accessible to financial institutions serving vulnerable populations and small companies
10. Incorporate inclusion and nature-related indicators into supervisory practice
11. Enrich credit registries with georeferenced data or build green digital platforms
12. Encourage disaggregated reporting of nature-related financial flows

Pillar 4: Bolster demand-side drivers of sustainable production

13. Encourage community focused financial services for nature-positive investments
14. Promote technology that connects small-scale producers to upscale markets
15. Harness value chains for inclusive investments

FIGURE 9. THE FOUR PILLARS OF NATURE-POSITIVE INCLUSIVE FINANCE AND 15 POLICY RECOMMENDATIONS



Source: Author

INCORPORATE NATURE INTO PUBLIC SECTOR FINANCIAL PLANNING

Financial authorities can revise their national financial inclusion strategies (NFIS) and widen IGF frameworks to incorporate biodiversity concerns. This includes incorporating tangible, nature-positive Key Performance Indicators (KPIs) focused on conservation, restoration, and sustainable resource use from the national biodiversity strategy or other relevant national plans, especially for nature-dependent sectors like sustainable agriculture (e.g., agroforestry) and community-based fisheries. A thorough revision of existing financial inclusion strategies and sectoral policies is important because there are tradeoffs between financial inclusion and economic growth on the one hand and biodiversity on the other. As outlined above, land use patterns and land-use change are critical factors influencing biodiversity loss and economic vulnerability. A key challenge for forest preservation in Uganda for example is habitat degradation and forest fragmentation due to subsistence farming and over-extraction of natural resources (Darwin Initiative, 2024). Conventional agricultural practices such as the use of synthetic fertilizer and pesticides also harm the environment. Over-exploitation of resources is often driven by economic expansion, for example through investment in larger fishing vessels and intensified farming practices. Policymakers contribute to this cycle in the name of poverty reduction, food security, and distributional justice, for example by extending "perverse subsidies" for water, fertilizers, and fuel that encourage unsustainable practices (Dasgupta, 2021). Financial inclusion policies also risk contributing to environmental degradation indirectly. Microcredit for agricultural development is sometimes used to fund activities, such as increases in cultivated land and synthetic fertilizer use that have negative environmental ramifications. Thus, without green lending criteria, conventional small loans can accelerate deforestation or chemical pollution (Lal & Israel, 2006). To foster a more sustainable approach, policymakers must align financial inclusion strategies with biodiversity conservation goals while ensuring that vulnerable populations have access to necessary resources and support. Special attention should be given to small companies and women-led enterprises in nature-dependent sectors, who often face higher cost barriers and lower bargaining power in value chains.

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Greater collaboration with public development banks (PDBs) is essential for developing nature-positive financial inclusion plans and strategies. Agroforestry and restorative agriculture are promising approaches that can enhance biodiversity while supporting financial inclusion. By supporting smallholder farmers with both know-how and the financial means to plant trees on their land, increase crop variety and use organic fertilizers, such programs can enhance on-farm biodiversity, including soil microbes, pollinators, and beneficial insects (Prism, 2025; Smith et al., 2021). Many such nature-based solutions are publicly funded because of the public good character of their benefits, the long lag between investment and returns, or the lack of (additional) cash flow they generate. Here, public development banks can leverage their financial power, granular territorial presence and deep expertise in agriculture to fund and finance nature-positive agricultural practices (Vishnumolakala et al., 2025; Weekes et al., 2025). They can also adjust existing

instruments such as dedicated credit lines and guarantee schemes for smallholder farmers to support nature-positive activities. The International Fund for Agricultural Development, a multilateral fund, reckons that public development banks play a key role in many EMDEs as promoters of rural financial inclusion, and it notes that the Platform of Public Agricultural Development Banks (Agri-PDB, a network of ca. 140 public development banks from 96 countries) can play a useful role in sharing experiences and best practices for integrating biodiversity considerations into financial inclusion efforts (IFAD, 2025). Agroforestry and restorative agriculture require significant capacity building efforts for farmers. Public development banks are well-positioned to provide the necessary training to their clients and help build a pipeline of bankable nature-positive investment project in the process (WB, 2023b).

Financial supervisors can establish robust, transparent environmental and social standards and oversight mechanisms specifically tailored for PDBs. Supervisors can guide PDBs to ensure that investment mandates explicitly include nature-positive outcomes, such as agroforestry or sustainable community tourism, and strictly adhere to financial inclusion principles, preventing mission drift or support for large-scale, nature-negative projects. They can also nudge PDBs to act as exemplary institutions by mandating annual reporting on the dual impacts of their nature-positive portfolios. This reporting should systematically track both biodiversity outcomes (e.g., hectares restored, species diversity protected) and financial inclusion metrics (e.g., outreach to women, small companies, indigenous groups). PDBs play an important role in blended finance, often acting as providers of guarantees or first-loss capital. By mandating strong governance and reporting, the financial supervisor strengthens the credibility of these instruments, which subsequently enhances the ability of private-sector banks to secure favorable prudential treatment when co-financing PDB-backed projects.

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CREATE AN ENABLING ENVIRONMENT FOR NATURE-POSITIVE PRODUCTS AND SERVICES

There is strong interest in using taxonomies to boost green finance, but their effectiveness in channeling funds to vulnerable populations is unclear. This holds true particularly in the field of nature and biodiversity, where the complexity of ecosystems and the variability in local practices may hinder the development of universally applicable standards. Efforts at providing a structured approach for investors and financiers to identify biodiversity finance products have been made by the International Finance Corporation (IFC, 2023a) and the International Capital Market Association (ICMA, 2025), among others. But these classifications remain relatively high-level. More precise definitions of "green" activities are hindered by a lack of knowledge and data. For example, the agricultural section of Thailand's 2025 taxonomy acknowledges that "at present, collecting, analysing and evaluating accurate data on the impact of different practices on key agricultural climate indicators is extremely challenging, not only for individual farmers but also for government agencies" (Thailand Taxonomy: Agricultural Sector, 2025, p. 15). Such difficulties, already significant for assessing climate change impacts, are even more pronounced in the field of biodiversity. And as the previous section of this report indicated, complex technical requirements and verification procedures may have unintended exclusionary consequences, especially for smallholders and small firms.

Alternative ways of creating an enabling environment for innovative inclusive green products and services are available. The following paragraphs provide an overview of four main nature-positive products and services that benefit vulnerable communities, including payment for ecosystem services, community-based wildlife conservation, programs that compensate farmers for retiring agricultural land, and biodiversity credit markets. Financial supervisors can issue guidance to improve the transparency and credibility of these instruments, which in turn helps foster their development and adoption.

Payment for ecosystem services (PES) schemes can be designed to benefit vulnerable communities directly. PES are systems where nature stewards receive payment for furthering biodiversity conservation, hydrological services, and carbon sequestration (Box 6). An example of an innovative financial PES scheme is the recently established Cali Fund for Fair and Equitable Sharing of Benefits from Digital Sequence Information. The fund requires industries benefiting from genetic resource data to contribute a share of their revenues to conservation efforts (UNEP FI, 2025). These schemes could provide essential financial support to vulnerable communities while promoting sustainable practices and enhancing biodiversity conservation efforts (Dasgupta, 2021). But because natural resources in biodiversity-rich areas are often community-owned, strong governance arrangements need to be in place to prevent unfair distribution of proceeds and the perpetuation of gender-based and other inequities (IAPB, 2024).

BOX 6. PAYMENT FOR ECOSYSTEM SERVICES: INCLUSIVE BENEFIT SHARING FOR CLEAN WATER

Payment for ecosystem services (PES) schemes for water channel funds (often from water tariffs or public budgets) to upstream land stewards in order to protect watershed functions. One of the earliest and most famous cases was New York City's Catskills watershed program (launched in the late 1990s), which paid landowners to preserve forested land instead of building an expensive water filtration plant (Kenny, 2006). In the past decade, many EMDEs have developed such programs with explicit poverty- and gender-targeted features. Key trends include:

- **Targeting poor and indigenous areas:** For example, Mexico's national hydrological PES (the PSA-H program) now prioritizes payments in areas of high deforestation risk, poverty and indigenous tenure. Payments are calculated on the average opportunity cost of forest conversion to corn production. The program uses matching funds and local partnerships (even involving water utilities) to extend support into rural watersheds. Its design embeds social safeguards. It "promotes … differentiated attention to indigenous communities" and actively "promotes women's involvement" in project implementation (FAO, 2013). In practice this channels PES money (and technical support) to smallholder and community forestry schemes that secure water flow while supplementing household incomes.
- **Multi-stakeholder water funds:** A growing number of EMDE water funds show how PES can invest in community co-benefits. For instance, Quito's FONAG pools ca. 2% of municipal water revenues into an endowment managed by a public–private board. FONAG explicitly uses these funds for "watershed protection, including supporting the communities that live there" (e.g. by financing restoration on local farms and páramo grasslands) (Conservancy, 2017). Likewise, the Upper Tana–Nairobi Water Fund (Kenya) channels urban water fees into upstream agriculture. Its stated goals include "promoting sustainable food production and increased household incomes in farming communities" in the watershed. These funds blend environmental objectives with direct livelihood benefits for rural households and farmers.

These examples illustrate a clear shift: modern water-related PES in EMDEs are increasingly structured to share benefits with vulnerable populations. By linking payments to poverty hotspots, requiring matching local investment, and enforcing social safeguards, policymakers aim to make watershed conservation also work as a pro-poor development tool. Such co-benefit designs help ensure that rural households, including women and smallholders, gain income and resource rights alongside improved water outcomes.

Financial supervisors can issue specific regulatory guidance for all financial intermediaries involved in managing PES funds to ensure transparency, good governance, and fairness. PES effectiveness and inclusivity are often undermined by governance failures, including unfair benefit distribution, lack of transparency, and adverse self-selection. Guidance from financial supervisors can ensure that payments are reliably generated and targeted based on both ecosystem threat criteria and poverty criteria, enhancing impact and preventing resource capture by local elites. Supervisors can also go further by requiring third-party verification and auditable benefit-sharing plans for any financial products linked to PES schemes. This oversight ensures that the financial benefits flow equitably to the intended beneficiaries—smallholder farmers, indigenous communities, and women-led enterprises—as documented in the PES plan. By stabilizing the reliability and equitable flow of PES income, the supervisory authority allows financial institutions to credibly underwrite these cash flows, transforming them into recognized collateral for financing.

Community-based wildlife conservation has emerged as a vital strategy for integrating local communities into biodiversity preservation efforts. It provides economic incentives that align conservation goals with community livelihoods (Hackel, 1999). By fostering local stewardship over natural resources, these programs can enhance both ecological sustainability and social equity, addressing the dual challenges of biodiversity loss and financial exclusion.

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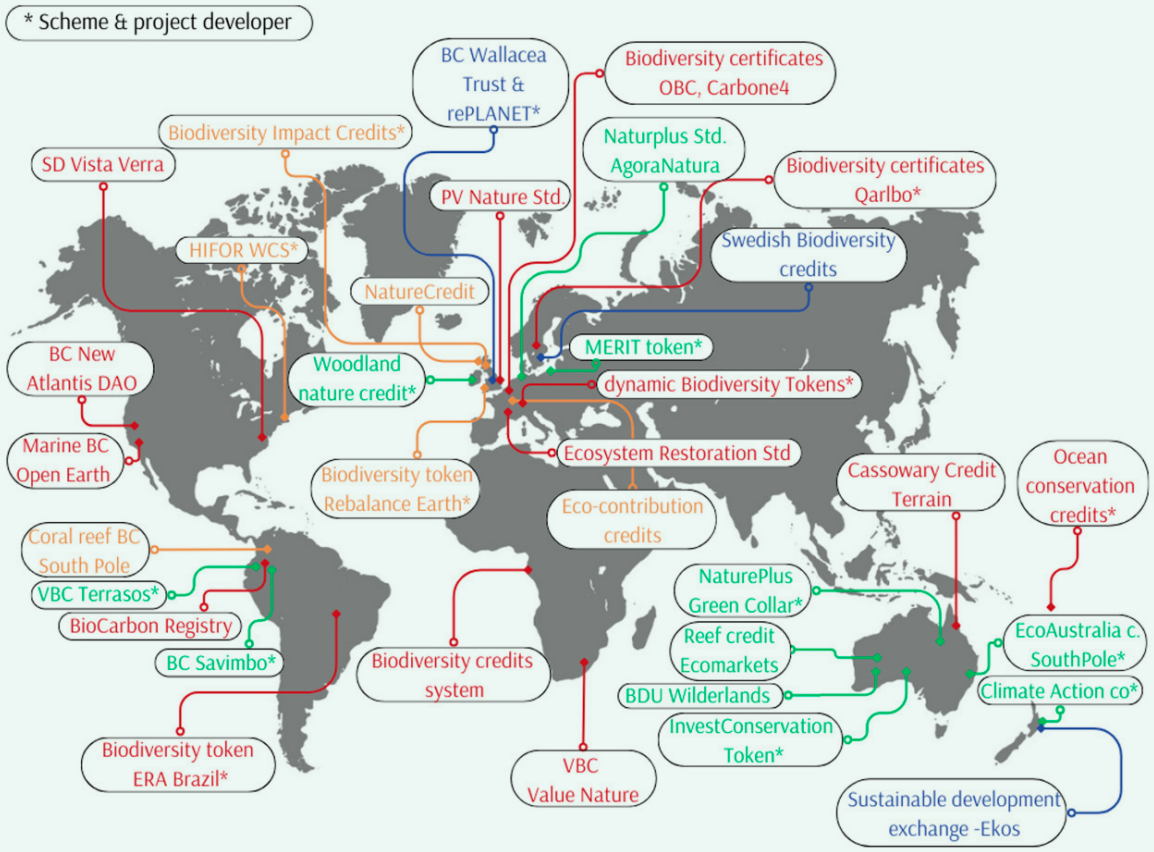
National parks for example generate a revenue stream from tourism – essentially a payment for ecosystem services – that can support local communities and conservation efforts. However, the success of these initiatives often hinges on effective governance structures that ensure equitable benefit-sharing among community members and prevent exploitation by external actors or local elites. Moreover, some national parks have already reached their "carrying capacity", that is the maximum amount of visitors they can sustain without significantly affecting wildlife, which constrains the scalability of such programs (Oduor, 2020).

Programs that compensate farmers for retiring agricultural land can deliver notable environmental gains yet also produce socio-economic trade-offs. In the European Union, the Common Agricultural Policy's greening payments have helped curb biodiversity loss and stabilize farm incomes by incentivizing set-aside and ecological focus, but they have been criticized for high administrative costs, uneven uptake favoring large landholders, and limited additionality in ecosystem services (EU Court of Auditors, 2024). China's Grain-for-Green Program similarly achieved massive reforestation - converting over 15 million hectares to woodland and reducing soil erosion - while bolstering rural livelihood security (Jin & Yabuta, 2024). However, empirical studies reveal that by reducing arable output and income from agriculture, the program has at times suppressed farmers' subjective well-being (You et al., 2022). It also struggles to be economically sustainable, as farmers grow dependent on state support. Moreover, the program's impact on financial inclusion remains complex, as it can inadvertently lead to economic vulnerabilities for smallholder farmers reliant on agricultural outputs (FAO, 2007).

Biodiversity Credits Markets promise to reward nature stewards for their contributions to ecosystem restoration and conservation. Recognized in Target 19 of the Kunming-Montreal Global Biodiversity Framework as an innovative financing mechanism, biodiversity credits have the potential to bridge the biodiversity finance gap by mobilizing additional resources, particularly from the private sector. Building on the experience and infrastructure of carbon markets, voluntary biodiversity markets have emerged in Australia (Chauhan, 2025) and several other jurisdictions (see Figure 10), where companies can buy biodiversity credits to support the conservation and restoration of biodiversity-rich areas (Blarel et al., 2020; Wunder & Palahí, 2024). The World Economic Forum estimates global demand for these credits to rise to $2 billion in 2030 and $69 billion by 2050 (Khatri et al., 2023). However, creating biodiversity credits is more challenging than carbon credits due to difficulties in biodiversity measurement, determining ecological equivalence, the uniqueness of ecosystems, and the irreversibility of species loss (Yirdaw et al., 2023). As land managers and nature stewards, smallholder farmers are integral to fair biodiversity markets. But they often face barriers to participation, including lack of access to information, funding, and technical support (Scaling Biodiversity Credits in Smallholder Farms, 2025).

Financial supervisors can adopt a test-and-learn approach, providing temporary regulatory relief for innovative nature finance products. Complex, innovative financial instruments like PES, biodiversity credits, and nature-backed securitization structures may make a difference in mobilizing private finance, but a complex or uncertain regulatory environment can hinder their adoption. The Central Bank of Kenya famously used "No Objection Letters" and a variety of draft guidelines to increase legal certainty and build market confidence for the development of its mobile money system, M-Pesa (Ndung'u, 2017). Financial supervisors today can adopt a similar experimental approach, testing simplified issuance, disclosure, and data requirements for new instruments, such as reducing the complex documentation often required for securitization, which restricts access for supplier cooperatives. Financial supervisors can also implement targeted prudential incentives to de-risk these innovative assets. This involves granting favorable prudential recognition, such as reduced capital requirements or lower risk weights (under either Pillar 1 or Pillar 2), for financial institutions' exposures that are backed by credible guarantees. These guarantees should be provided by high-quality first-loss providers, such as PDBs, sovereign funds, or verified philanthropies, that agree to absorb initial losses in nature-positive structures. This policy effectively leverages limited public or philanthropic capital to unlock mainstream private finance, a critical strategy for emerging markets where commercial risk appetite is often low.

FIGURE 10. BIODIVERSITY MARKETS AROUND THE WORLD



KEY

- **Fully operational (green):** currently selling credits
- **Pilot, operational (blue):** methodology ready; credits from pilot projects sold
- **Pilot, testing (orange):** methodology released/launched; projects being tested without selling credits
- **In preparation (red):** scheme being developed/consulted

Scheme developers without "*": develop scheme/methods/standards for measuring and issuing credits

Source: Wunder et al., 2025

MAKE DATA ON NATURE AND NATURE FINANCE ACCESSIBLE

More granular and higher-quality data on biodiversity is needed to overcome information asymmetry, inform policy, price natural assets correctly, and boost nature finance. Currently, the cost of monitoring biodiversity is much higher than for climate indicators. Aggregate metrics such as the World Wildlife Fund's Living Planet Index are available (WWF, 2022). The World Business Council for Sustainable Development, the World Economic Forum, Business for Nature, and others have made efforts to develop nature-positive pathways that outline how specific sectors (including agri-food systems, energy, chemicals, cement) can reduce their impact on biodiversity and the environment at large (WWF, 2024). A growing number of companies also report against the evolving guidelines of the Taskforce on Nature-related Financial Disclosures. However, only a small portion of reporting companies actually use targets that are specific, measurable, accepted, realistic, and time-bound (SMART), highlighting data quality issues (zu Ermgassen et al., 2022). Moreover, such efforts focus on large companies and often overlook the needs of smaller enterprises and vulnerable communities.

Financial supervisors can integrate inclusive and nature-related indicators into their supervisory practice. The authorities can issue guidance, clarifying how financial institutions should document precisely how their existing lending portfolios and internal risk management protocols align with the biodiversity goals articulated in the updated NFIS and related national documents. Supervisors can also request financial institutions to report measurable outcomes tied to biodiversity targets, such as the percentage growth of loans supporting (small-scale) regenerative agricultural practices or verified conservation areas.

Remote sensing technology can reduce the cost of monitoring nature and biodiversity. Thanks to rapidly evolving satellite and data processing capabilities, a growing spectrum of nature data is available at global scale and increasing granularity. This includes the ability to monitor deforestation rates, wetlands, soil health, pollution, benthic cover of coastal marine areas, and biodiversity hotspots. A wide variety of remote sensing data is provided for free at the World Bank's Livable Planet Explorer (WB, 2025) and Google's AI-powered AlphaEarth Foundations (Google Deepmind, 2025), among others. However, it is important to note that biodiversity is harder to assess remotely than nature (e.g. water flows, forest cover) in general. At the same time, digital tools that check a GPS location against protected areas are becoming available at low cost. Ensuring that biodiversity data collection and reporting frameworks are accessible and affordable for all stakeholders is essential for fostering inclusive financial systems that support sustainable practices.

BOX 7. A DIGITAL GREEN DATABASE FOR FARMERS: BRAZIL'S GREEN CREDIT BUREAU

The Central Bank of Brazil's Green (rural) Credit Bureau helps financial institutions ensure that no credit flows to farmers or businesses that break environmental rules. By linking government records (like land registries, forest maps and enforcement data) with farm-level, georeferenced information, this credit registry makes it easier for banks to spot cases of illegal deforestation or farming in protected areas. That means lenders can punish environmental offenders with financial exclusion and enforce existing rules more reliably (BCB, 2024 ; Ferrato et al., 2023)

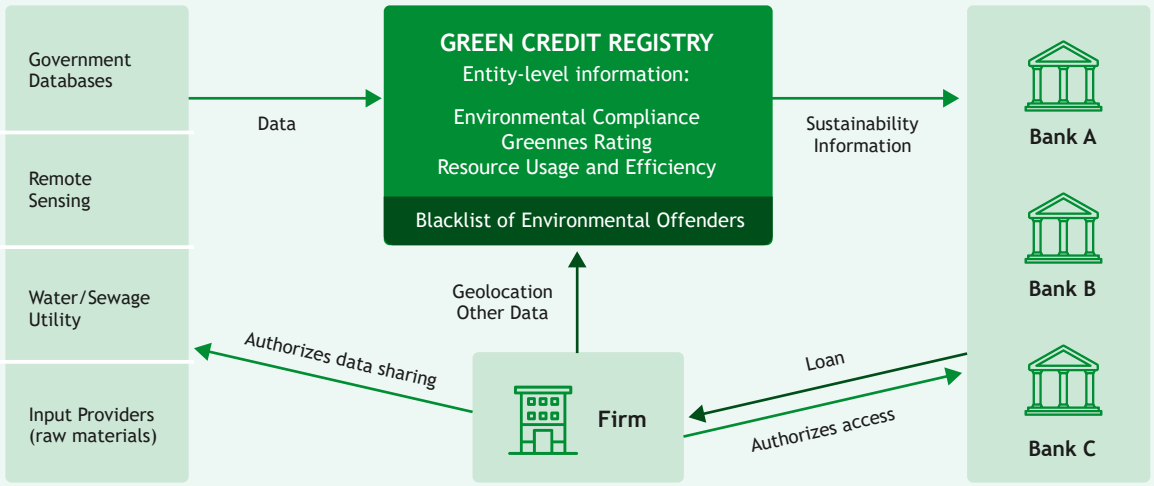
At the same time, this digital green database can open doors to finance for sustainable farmers. By feeding banks and public agencies with farm-level, georeferenced data and transaction histories, the organization helps target subsidized credit lines, input programs, crop insurance and technical-assistance schemes to farmers who meet eligibility rules. To be fair and effective, implementation must include training, safeguards and outreach so that marginalized farmers are not wrongly excluded (Dias et al., 2024).

Financial supervisors can enrich existing credit registries with georeferenced data or build green digital platforms from scratch. Drawing inspiration from the Banco Central do Brasil's successful model (see Box 7), central banks and supervisors can develop and maintain centralized, open-access, georeferenced green credit registries that integrate readily available remote sensing data (e.g., satellite monitoring of deforestation, land use, soil health) and enforcement records to provide automated, low-cost environmental compliance checks for credit applicants. In China, green digital credit registries at municipal level have helped boost green finance for small companies (Knaack, 2025). The Monetary Authority of Singapore has launched Greenprint, a digital green platform that automates sustainability reporting, including for small companies (MAS, n.d.). Georeferenced credit registries allow supervisors and financial institutions to monitor environmental compliance without imposing burdensome due diligence requirements on farmers, fishers, and small companies. They may help small companies meet overseas environmental standards such as the EU Deforestation Directive that conditions their access to supply chains (Sela et al., 2025). Green credit registries can also use georeferenced data – and artificial intelligence – to support sustainable practices, prioritize conservation areas, and support restoration efforts. Central banks must coordinate with other government authorities to make relevant public-sector databases interoperable and available to financial institutions upon consent of prospective borrowers. This not only supports cheaper credit risk assessment but also enables the development of inclusive financial products, such as parametric insurance based on objective, location-specific data.

Digital monitoring of nature finance flows can help improve financial decision-making. It allows financial institutions to identify obstacles to nature-positive inclusive finance and learn from successful cases. Standardized measurements of the inclusive impact of financial flows are still missing. The first step is thus to develop a framework that systematically tracks the volume and destination of nature-positive flows and, crucially, measure the dual outcomes -biodiversity restoration/conservation and financial inclusion – among vulnerable populations. By leveraging technology to track inclusive finance flows and their impacts on biodiversity, financial institutions can enhance transparency and accountability without imposing undue information costs on their clients. Moreover, financial supervisory authorities and policymakers can leverage nature finance flow data to identify areas where greater investment is needed to support sustainable practices and promote inclusivity in nature-positive finance.

Financial supervisors can encourage financial institutions to measure and disclose disaggregated nature finance flows. The authorities can conduct periodic thematic supervisory reviews and leverage existing disclosure requirements to ensure public disclosures include disaggregated data on nature finance to small companies and rural client segments. This ensures accountability and provides the necessary feedback loop to refine national strategies and validate the effectiveness of prudential incentives.

FIGURE 11: GREEN CREDIT REGISTRY



Source: Adapted from Knaack (2025)

BOLSTER DEMAND-SIDE DRIVERS OF SUSTAINABLE PRODUCTION

Successful nature-positive inclusive finance initiatives aim for a triple-bottom line, ensuring economic, social, and environmental sustainability. Financial inclusion projects that only focus on biodiversity conservation may struggle to become economically viable and socially sustainable. This is especially the case because ecosystem services are taken for granted and not fully reflected in economic transactions, leading to below-market returns or zero cash flows. For example, a review of inclusive conservation finance models in Uganda and Tanzania examines how NGOs worked with Village Savings & Loan Associations and Private Forest Owner Associations to combine grant funding and micro-loans to support sustainable forestry practices and engage local communities in wildlife conservation. However, due to the high cost of accurately monitoring biodiversity and the absence of new or improved revenue streams, the projects struggled to scale, remaining highly dependent on grant financing (Darwin Initiative, 2024). Similarly, a review of nature-friendly small companies in Zambia reveals that these enterprises often struggle to balance profitability and environmental sustainability. They frequently become social enterprises that rely predominantly on grants rather than market-based financing (Gutierrez et al., 2022). This highlights the need for integrated approaches that support both financial viability and ecological health.

A clear view of barriers to nature-positive finance, especially for small firms in biodiversity-rich areas, is a good starting point. Small companies face a well-known set of obstacles to accessing finance, including high transaction costs, lack of business records, informality, limited collateral, and lack of financial literacy. Those engaged in biodiversity-sensitive areas, and those involved in environmental conservation and restoration face additional hurdles (see Figure 12). Critical factors include unfavorable risk/return profiles, a long-time horizon for the capitalization of biodiversity investments that clashes with the short-term orientation of financial institutions, difficulties in measuring biodiversity impact, and a lack of assessment frameworks for nature-positive business models. Women and indigenous peoples engaged in nature-positive activities face even greater difficulties. A careful examination of a nature-positive inclusive finance project against these obstacles helps policymakers assess which measures can operate based on market principles, and which will require support from public or philanthropic sources. Integrating gender-responsive and inclusion-sensitive provisions into policy recommendations is therefore critical to ensure that financial sector biodiversity measures do not exacerbate existing inequalities but instead empower underserved groups to participate in, and benefit from, the transition to nature-positive economies.

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FIGURE 12. BARRIERS TO NATURE-POSITIVE FINANCE FOR SMALL COMPANIES

	For (Biodiversity) Small Companies	For Financiers and Funders
Ticket Size	Limited missing middle-scale investments or products available	Lack of tailored financial products to meet investment needs of (biodiversity) enterprises
Risk/Return Profiles	Early-stage enterprises bear higher risks with lower returns, translating to high interest rates	Risk aversion with high return expectations for small companies
Collateral	Lack of collateral, sufficient track record or credit history with scricter borrowing requirements	Perception by banks as risky credit with difficult credit assessment & appraisal
Time Horizon	Longer time horizon for green-biodiversity investments to capitalise	Short-terms orientation of lending & investment cycles hinders investment in growth
Biodiversity models	Lack of monetary indicators for returns on biodiversity business models	Lack of assessment frameworks for green-biodiversity business models
Impact at scale	Internal & market barriers to measuring and scaling impacts	Low levels of biodiversity enterprises with convincing growth trajectory
Human Capital & Skills	Poor financial literacy & awareness of (biodiversity) finance opportunities	Limited resources to tailor technical assistance & financial products
Conducive Ecosystem	Limited skills or expertise with accounting, budgeting and planning capacity	Shallow pipeline for biodiverstiy enterprises, especially in remote areas

Particularly relevant to biodiversity / green enterprises

Source: Gutierrez et al (2022)

A demand-based or value chain approach can help make nature-positive investments more economically sustainable. Supply-side interventions, such as the provision of better crop varieties or the implementation of smart agriculture practices, often fail to have lasting consequences unless they are combined with demand-side measures, particularly market access. Without access to markets that place a premium on quality, demand is lacking for the sustainably produced agricultural products that often entail higher production costs, especially in the short term. This in turn traps farmers and fishers in a low-investment, low-productivity, and low-income cycle that also perpetuates financial exclusion (WB, 2024).

Fisheries programs that combine selective conservation, income diversification, better market access and financial inclusion show promising results. Over exploitation, climate change, and rising levels of marine pollution, including from plastic, continue to push ocean ecosystems towards irreversible and catastrophic tipping points. Coastal communities around the world have depended on small scale and subsistence fisheries for hundreds of years to sustain their livelihoods. But commercial overfishing together with unsustainable conventional practices by local communities threaten the sustainability of these vital resources (WWF, 2022). When fishing communities collectively assign (and enforce) conservation areas, as evidenced in the Seychelles (SeyCCAT, n.d.) and Mozambique for example, they can enhance fish populations and improve overall ecosystem health, thereby securing their livelihoods. Financial services can help households diversify into other sectors such as commerce and invest in technology that enables them to tap into higher-value, sustainable fish markets, both domestic and international (see Box 8).

BOX 8. FINANCIAL SERVICES, COMMUNITY ENGAGEMENT, AND SUSTAINABLE FISHERIES IN MOZAMBIQUE

Viewing Mozambique's mangrove shoreline through a gender lens makes the problem and the solution clear: women fishers - often constrained by strength, time, and social norms - rely on quinia (mosquito nets) and mpapara (drag nets) to harvest shellfish in mangroves because these methods are safer, closer to home and compatible with caregiving duties. This survival strategy, however, accelerates mangrove loss and undermines the very nursery habitats that sustain local catches and household food security.

Financial inclusion and income diversification can convert unsustainable nearshore survival tactics into durable, nature-positive livelihoods. Territorial User Rights for Fishing that legally recognize community-managed areas and reserve no-take zones allow stocks to recover and generate predictable, improved catches that make fishers—women included—more creditworthy.

Complementary measures such as Village Savings and Loan Associations, local daily savings groups known as xitique, rotating credit groups, financial-literacy training, and Technical and Vocational Education and Training build savings histories and financial capability, while seed funding for women-led microenterprises and portable value-chain assets such as solar-powered freezers led to improved service quality and diversification away from fishing (WB, 2019).

Evidence from the Coastal Lifeline project (Rare, 2023) shows these interventions created or revitalized savings clubs (many majority-women), while helping nature recover. Fishermen started catching bigger fish again, and women were able to sell them at higher prices in a wider geographic area, benefiting from the solar freezers and other productive investments.

The promise of increased earnings after nature recovery is the basis of novel financial instruments. For example, blue recovery bonds are designed to provide the necessary upfront capital to pay fishers for a 5-year no-catch period, which allows fish stocks to recover. The bond then uses future cash flows from increased fish catches to repay the principal and the coupon over a 20-year period (PlanetTracker, 2023). So-called Small-scale Fisheries Impact Bonds work in a similar fashion. Private investors provide the capital to fund a compensation program to small-scale fishers in the first few years. Afterwards, outcome funders, such as governments and philanthropies, agree to repay the principal, and also a coupon that is contingent on measurable improvements in ocean biodiversity. This public-private structure provides investment certainty for private investors and greater leverage for public funds, ultimately benefiting both the environment and the livelihoods of fishing communities (Rare, 2025). Several conditions have to be in place for such financial products to work well, including strong governance arrangements to ensure no-catch discipline is enforced and compensation payments are equitably distributed. Another precondition for success is that climate change and other external environmental factors do not jeopardize fish stock recovery.

Digital platforms can help connect smallholder producers with higher-end consumers, providing a marketplace for sustainably produced goods while enhancing their financial inclusion. By leveraging technology, these platforms can broaden market reach, target higher-income segments of domestic and foreign consumer markets, and facilitate access to fair prices for ecologically produced goods, ultimately supporting biodiversity-friendly practices. Recent years have seen a proliferation of mobile platforms that connect farmers directly with individual buyers (see Box 9), and the rise of digital marketing platforms that advertise sustainable practices to domestic and international consumers. These platforms can make certification easier, for example by tagging fish with a corresponding catch area and fishing method. They can also help smallholder producers obtain time and location-specific information about prices, weather, agronomic data, and value-enhancing processing methods. When integrated with financial technology, they can facilitate payments, create data trails, help financial institutions assess the creditworthiness of a client, and ultimately enhance their access to credit and other financial services.

BOX 9. ALIBABA'S TAOBAO LIVE PROGRAM

Alibaba's rural e-commerce and Taobao Live program has helped connect Chinese farmers directly with urban consumers. They use videos, livestreaming and targeted marketing to let producers showcase farming methods, taste and provenance. Taobao Live has opened channels to rural sellers, allowing face-to-face virtual demonstrations and storytelling that increase consumer trust and willingness to pay for higher-quality products (Chou, 2019).

Video and live-stream strategies boost sales and enable premium pricing for differentiated and "green" agricultural products. Platform reports and peer-reviewed studies show livestreaming reduces unsold stock, raises consumer understanding of attributes, and lifts farmer incomes when quality and provenance are effectively communicated. Training, editor tools and short documentaries help farmers present consistent quality cues and brand stories that urban buyers value. More broadly, research finds e-commerce drives "high-quality agricultural development" by expanding markets, modernizing value chains and improving infrastructure and services — mechanisms that underpin farmers' ability to move from commodity markets to value-added niches (Kong et al., 2024) (Shi et al., 2023).

The digital onboarding that accompanies these programs also advances financial inclusion. By transacting on Alibaba's platforms smallholders gain access to digital payments, logistics, order records and, over time, financial services and credit pathways that formalize earnings and reduce reliance on cash and middlemen, helping farmers capture more retail value (IFPRI, 2019). The relatively low barriers to entry for e-commerce also help underprivileged groups such as women and youth. Moreover, there is a biodiversity dividend: premiums for heirloom or regionally distinct crops can make diversified, lower-input systems economically viable, supporting on-farm crop diversity, dietary diversity and agroecological resilience (Jones, 2017). Greater access to higher- paying customers also makes environmental certification (e.g. for organic products) affordable for small-scale producers. Platforms' storytelling tools thus link urban consumption preferences to conservation-friendly farming practices.

Digital platforms are not a panacea. They require complementary investments in logistics, and inclusive training to benefit women and marginalized smallholders. Not all farmers can serve high-value niche markets, so scalability is limited. Moreover, consumer protection and competition regulation is needed to make sure digital platform providers do not reap the lion's share of the profits. Yet digital platforms can combine environmental and economic sustainability, making financial support for nature-positive investments viable without relying on government support.

Financial supervisors can bolster these demand-supported sustainable models by encouraging community-focused financial services. Authorities can give regulatory guidance and encouragement for sustainable crowdfunding, digital platforms, and small-scale impact bonds that benefit vulnerable communities especially in agriculture and aquaculture. Moreover, supervisors can integrate long-term off-take agreements or certification premiums into the supervisory framework, specifically within the Internal Capital Adequacy Assessment Process (ICAAP/Pillar 2). Banks that demonstrate robust methodologies for incorporating these stable cash flows as explicit credit risk mitigants should receive supervisory acknowledgement. By rewarding financial institutions for recognizing the financial resilience inherent in demand-supported sustainable models, supervisory authorities help transform perceived nature-related risk into predictable, financeable cash flow, completing the virtuous cycle.

Supply chain engagement can help improve production practices, data flows, and market access for small companies in nature-dependent sectors. Anchor companies, either located in advanced economy markets or serving them, often have relatively high quality and transparency requirements. For example, European firms that use palm oil are increasingly required to prove that this ingredient is sourced from deforestation-free plantations. By fostering partnerships and providing technical assistance, these anchor firms can help integrate smallholder farmers into more sustainable and profitable value chains (see Box 10). A stable off-taker and the generation of a data trail from sales also help

smallholder farmers to secure financing and improve their bargaining power in the market. By facilitating the integration of smallholders into sustainable supply chains, financial institutions can support resilience and promote biodiversity-friendly practices.

Financial supervisors can incorporate supply chain partnerships into their supervisory framework. They can issue clear, prescriptive supervisory guidance to financial institutions detailing how anchor firm collaboration can be recognized as a quantifiable credit risk mitigant. Specifically, financial institutions should be encouraged to recognize verified long-term off-take agreements and supply chain partnerships as superior collateral compared to traditional physical assets, especially in sectors highly vulnerable to nature shocks. Moreover, supervisors can actively promote the scaling of technology-enabled supply chain finance platforms. These platforms leverage the anchor firm's creditworthiness and real-time transaction data to extend competitive working capital and credit to smallholder producers.

BOX 10. SECURITIZATION AND THE BIOECONOMY: THE LIVING AMAZON MECHANISM

The Living Amazon Mechanism mobilizes capital for a forest-compatible bioeconomy by linking market finance and supply chain partners to smallholder and cooperative production of agroforestry goods in the Amazon (Toimil et al., 2025).

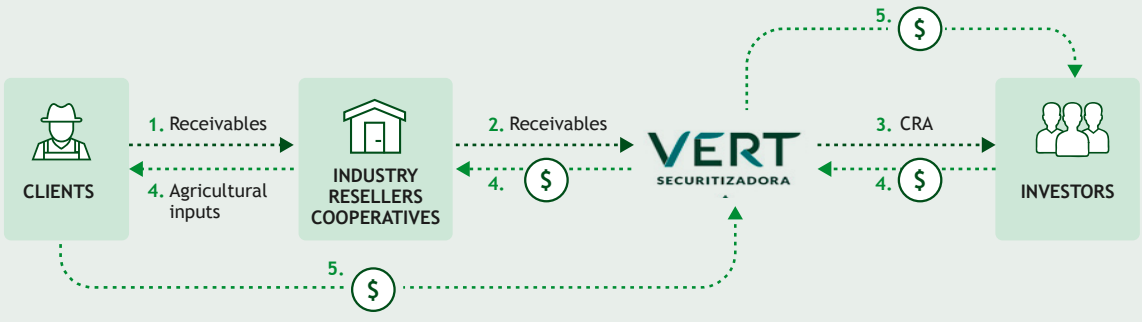
The mechanism features two parts. One is a market-based credit vehicle based on Certificates of Agribusiness Receivables—an asset-backed structure that bundles many small-scale supplier receivables (future income from the harvest) into an investable security (VERT, 2022). The second is a grant-funded facility to build capacity in supplier cooperatives and associations. This blended structure reduces financing costs, offers investor protections and channels below-market working capital to producers of non-timber forest products such as açaí, heart of palm and Brazil nuts.

Anchor buyers in the supply chain matter. Large off-takers can act as first-loss investors and purchase harvests, which sharply lowers investor risk. Natura, a Brazilian cosmetics company, has played exactly this role in early pilots, investing and anchoring off-take commitments that support scale-up.

Implementation challenges are practical and predictable. Recognizing that complex and lengthy documentation often restricts access to Certificates of Agribusiness Receivables, the standard 40-page documents were reduced to fewer than 10 pages. Yet project beneficiaries still faced certain challenges to fully understand requirements and access available funds. Moreover, the low raw returns on some forest products—a natural forest can only sustain around 170 acai palms per hectare without harming biodiversity—mean technical assistance and value-adding investments remain essential to reach bankability without encouraging monocultural simplification of the forest (Freitas et al., 2025).

In sum, securitization can bridge capital markets and supplier communities in the Amazon bioeconomy. But success depends on credible off-takers, sustained capacity building, careful product diversification and safeguards so finance uplifts incomes while protecting forest complexity (Toimil et al., 2025).

FIGURE 12: CERTIFICATES OF AGRIBUSINESS RECEIVABLES



Source: VERT I CRA - Certificates of Agribusiness Receivables

POLICY RECOMMENDATIONS

To effectively address the intertwined challenges of biodiversity loss and financial exclusion, policymakers must prioritize inclusive green finance strategies that align economic incentives with sustainable practices.

Dedicated action is needed to halt the vicious cycle of nature degradation, economic decline, and financial exclusion. Financial institutions and policymakers must collaborate to develop innovative financial products and services that support vulnerable populations while promoting biodiversity conservation. Integrating biodiversity considerations into financial policies is essential for fostering a resilient economy that can withstand environmental challenges while supporting vulnerable communities. Moreover, it can set into motion a virtuous cycle of nature and biodiversity restoration, financial access for nature-positive investment, higher value production, and sustainable economic growth. Ensuring that women, informal microenterprises, and indigenous and community-based producers are meaningfully included is critical to achieving equitable conservation outcomes.

In addition to coordinating with other policymakers, central banks and financial supervisory authorities can take concrete policy steps on their own. An important share of the policy toolkit for biodiversity restoration and nature-positive finance is not in the hands of supervisors, and many actions are only tangentially connected to financial inclusion. There is an obvious need for inter-agency coordination for a coherent national policy approach to a sustainable future. More research and more awareness of the nexus between nature, the economy, financial risk and financial inclusion is also key. Supervisors can take the lead in the policy areas under their purview. The following list summarizes the policy recommendations made in this report and highlights options for central bankers and financial supervisors.

This report makes 15 policy recommendations for nature-positive inclusive finance that focus on enhancing access to financial services for vulnerable populations while promoting biodiversity conservation and sustainable practices. These recommendations aim to connect financial inclusion and ecological sustainability, fostering a resilient economic future:

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Pillar 1: Incorporate nature into public sector financial planning

1. Embed biodiversity and nature-positive priorities into NFIS and IGF strategies
   - Incorporate tangible, nature-positive KPIs, especially for highly nature-dependent sectors
2. Expand cooperation with public development banks
   - Leverage existing tools and capacities for nature-positive investments
   - Build on established client networks and expertise in agriculture to boost capacity building
3. Apply environmental and social standards tailored for public development banks
   - Mandate annual reporting on the dual impact of PDB portfolios on inclusion and biodiversity
   - Use strong governance and reporting requirements to strengthen the credibility and attractiveness of blended nature-positive finance instruments that involve PDBs

Pillar 2: Create an enabling environment for nature-positive products and services

4. Consider unintended exclusionary consequences of taxonomies
   - Tailor technical screening standards and verification requirements to the financial and technical capabilities of small firms and rural households
5. Foster development of inclusive payment for ecosystem services (PES) schemes
   - Issue regulatory guidance for all financial intermediaries involved in managing PES funds, ensuring transparency, good governance, and fairness
6. Support biodiversity credit markets, securitization, and other innovations
   - Implement favorable prudential recognition for exposures to nature-based financial assets that are backed by credible guarantees
7. Adopt a test-and-learn approach to innovative nature finance products
   - Provide temporary regulatory relief, test simplified issuance, disclosure and data requirements

Pillar 3: Make data on nature and nature finance accessible

8. Use digital technology to reduce cost of biodiversity information gathering
   - Obtain geospatial information from remote-sensing global and local providers, in coordination with other government agencies
9. Make biodiversity data accessible to financial institutions serving vulnerable populations and small companies
   - Request financial institutions to report measurable outcomes tied to inclusive finance and biodiversity targets
10. Incorporate inclusion and nature-related indicators into supervisory practice
    - Issue guidance on how to align lending portfolios and internal risk management protocols with inclusion and biodiversity goals
    - Support macroprudential policies that incentivize capital reallocation towards nature-positive, regenerative economic models over extractive ones
11. Enrich existing credit registries with georeferenced biodiversity data
    - Enrich existing registries or establish a new centralized, georeferenced green digital platform that aggregates firm-specific environmental data from government and third-party sources to reduce the cost of due diligence for banks serving small companies
12. Encourage disaggregated reporting of nature-related financial flows
    - Leverage existing reporting and disclosure requirements for financial institutions to obtain environmental information disaggregated by client size and location

Pillar 4: Bolster demand-side drivers of sustainable production

13. Encourage community focused financial services for nature-positive investments
    - Provide regulatory guidance for sustainable crowdfunding and small-scale impact bonds, especially for businesses led by women, youth, and indigenous peoples

14. Promote technology that connects small-scale producers to upscale markets

    - Promote the use of digital platforms that leverage certifications and cash flow data to extend competitive, low-cost credit to small, sustainable firms

15. Harness value chains for inclusive investments

    - Integrate long-term off-take agreements or certification premiums into the supervisory framework
    - Issue clear supervisory guidance to financial institutions detailing how anchor firm collaboration can be recognized as a quantifiable credit risk mitigant

Biodiversity-aligned finance must be proportionate, inclusive, and sensitive to capacity constraints. Countries at differing stages of readiness require differentiated pathways, combining foundational steps for emerging systems with more advanced approaches for mature markets. Ensuring that women-led small companies, rural households, and smallholder farmers are explicitly protected and supported throughout this process will be essential to avoid unintended exclusion. Embedding practical, context-appropriate guidance enables all countries, regardless of institutional size or technical sophistication, to advance toward biodiversity-positive financial systems in a way that is both realistic and equitable. This paper provides a series of practical, near-term actions that regulators and financial institutions can implement immediately. These include establishing simple screening checklists aligned with national biodiversity and environmental priorities, adopting phased supervisory expectations that reflect institutional maturity, and prioritizing high-risk sectors for early monitoring rather than attempting full-spectrum biodiversity reporting from the outset. Smaller financial institutions may begin by integrating basic environmental due-diligence questions into loan assessments, developing lightweight risk-flagging tools, and leveraging publicly available biodiversity maps or datasets. These incremental actions ensure meaningful progress while avoiding undue burden on supervisors and institutions with limited technical capacity.

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