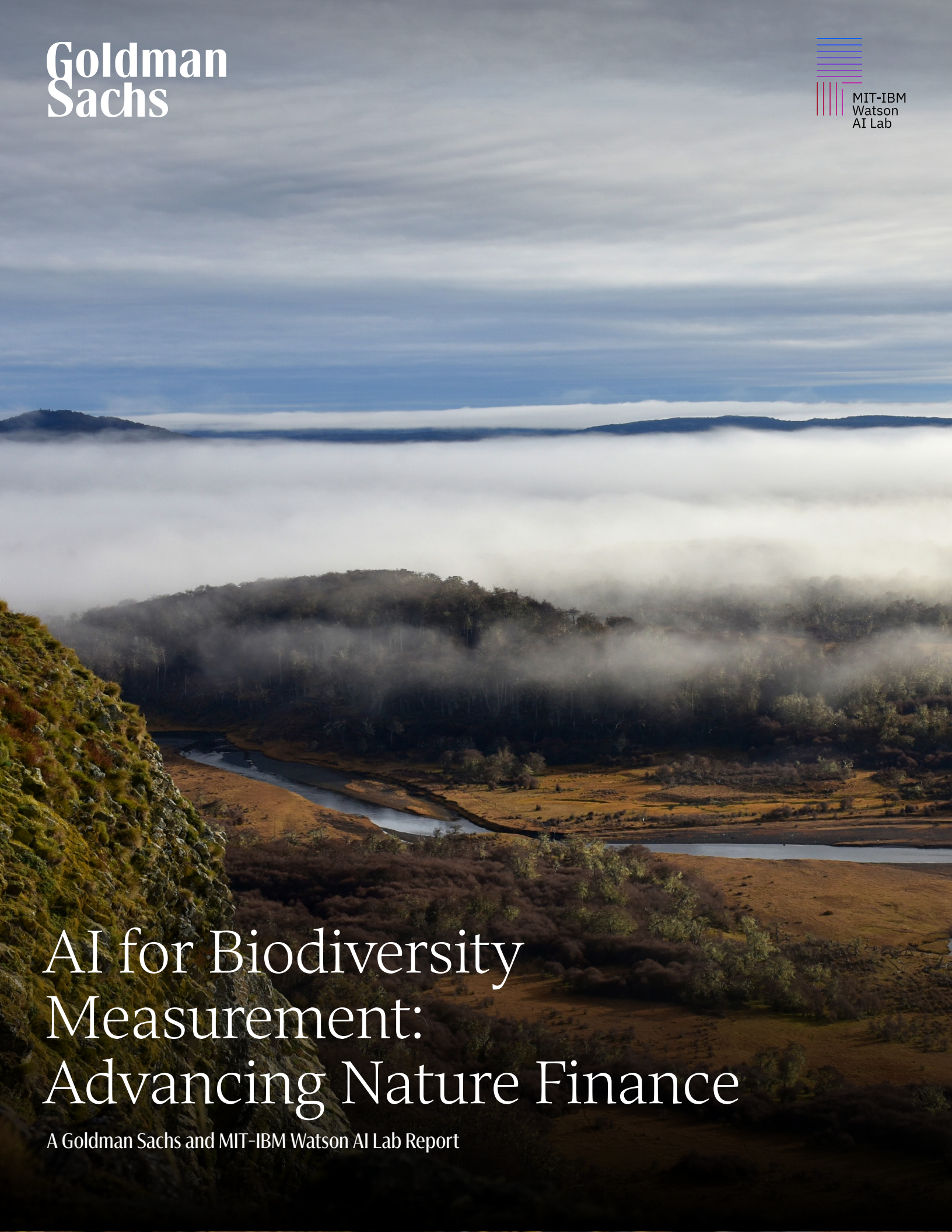
Goldman Sachs

MIT-IBM Watson AI Lab



AI for Biodiversity Measurement: Advancing Nature Finance

A Goldman Sachs and MIT-IBM Watson AI Lab Report

ABOUT THIS REPORT

This report outlines insights and applications identified during Goldman Sachs' membership in the MIT-IBM Watson AI Lab ("the Lab"), exploring how artificial intelligence (AI) can help improve biodiversity measurement. While the power and precision of these AI models continue to evolve, the research demonstrates initial proofs of concept and potential applications: improved biodiversity data can help enhance business, financial, and regulatory decision-making, which could expand risk management capabilities, identify new business opportunities, and support innovative nature-based financial solutions.

Executive Summary

Nature underpins over **$13 trillion** in economic value, representing **12%** of global GDP,[1] yet the nature-related data needed to price risk, direct capital, and scale sustainable finance does not exist at the cost, quality, or speed markets demand. With finance flows to nature-based solutions at roughly **$220 billion** in 2023,[2] a fraction of the **$1.9 trillion** directed toward climate,[3] the gap between ambition and action remains vast, and a key challenge is measurement.

Goldman Sachs joined with the MIT-IBM Watson AI Lab ("the Lab") to investigate how AI could be developed and applied to enhance ecological and biodiversity measurements, combining Goldman Sachs' deep expertise in sustainable finance with the Lab's research capabilities in applied AI engineering and ecological science. The Lab conducted the research, while Goldman Sachs provided financial support and helped to identify where improved biodiversity measurement supports business, financial, and regulatory decision-making, which could identify new business opportunities, support innovative nature-based financial solutions, and expand risk management capabilities.

Key Findings

The Lab conducted three research-stage pilots,[4] demonstrating how AI can improve the ways that nature is measured, with potential implications for capital flows. Each pilot addressed core measurement challenges that corporates and investors face when assessing nature-related risks and opportunities such as coarse resolution, poor reliability, and data gaps, as well as more reliable insights into metrics like species occupancy and land-use change which support ecosystem assessment and investment decision-making.

- **Deep Occupancy Modeling** improved species occupancy estimate reliability by **27% across 16 species**,[5] producing higher-confidence baseline estimates that could potentially support sustainability-linked financial products and may help improve market credibility while reducing manual fieldwork costs
- **Distribution Modeling** paired sparse on-the-ground data with expert knowledge and satellite imagery to map biodiversity where traditional surveys are infeasible, which could enable earlier insight into nature-related risks and dependencies to help inform portfolio and supply chain decisions
- **TerraMind Foundation Model** achieved **95% accuracy in peatland identification,**[6] detecting ~12 hectares of peatland loss from a 2022 wildfire, illustrating how foundation models may support scalable ecosystem monitoring to help promote the integrity of carbon and biodiversity markets

Key Takeaways and Looking Ahead

Together, these insights form a roadmap for advancing tools that can generate tangible value for both markets and nature. The pilots showed how AI can enhance nature data, while reinforcing the importance of human expertise to validate and refine AI models. These findings have implications for markets and could be leveraged to build market infrastructure, drive cost reductions and productivity enhancements for businesses, and help nature finance solutions scale.

All three models are expected to be peer-reviewed and open-sourced—inviting the broader research, conservation, and financial communities to build on these foundations. Beyond innovation, scaling nature finance will also require blended-finance structures, regulatory clarity, and standardized disclosures. Each organization plans to continue supporting nature measurement and markets through complementary research, technology, and financial expertise.

1 PWC: *Managing nature risks: From understanding to action*, April 2023. PWC leverages ENCORE data to rank highly dependent industries.
2 UNEP, *State of Finance for Nature 2026*, January 2026.
3 Climate Policy Initiative, *Global Landscape of Climate Finance 2025*, June 2025.
4 Results, interpretations, and recommendations are subject to refinement as additional data are incorporated or analyses mature. Scientific claims and model outputs will undergo standard peer review in separate, formal publications, and should be treated as provisional until that process is complete. Future engagement is part of an ongoing research phase and does not imply commercialization or integration into Goldman Sachs or IBM products or services.
5 bioRxiv, *Seeing Above and Below the Canopy: Modeling and Interpreting Species Occupancy with Multimodal Habitat Representations*, 2026.
6 arXiv, *Ecological mapping with geospatial foundation models*, 2026.

Introduction

The Evolving Landscape of Nature Finance

Corporates and investors are beginning to integrate nature considerations into how they assess risk and opportunity. While the market remains nascent, several credible signals point to growing momentum. Converting that momentum into scale will require translating ecological outcomes into commercial value. This, in turn, depends on credible, decision-grade insights that inform where to intervene and invest, track performance over time, and link ecological change to business and financial results.

This shift in focus is driven, in part, by the close interconnection between nature and climate. Physical risks like rising temperatures, extreme weather, and water stress are amplifying ecosystem degradation and prompting companies and investors to better understand potential exposures across their supply chains, assets, and revenue streams.

At the same time, these pressures are sharpening interest in where targeted investment in nature can strengthen operational resilience and support long-term value creation. Nature-based solutions, for example, have emerged as a financial mechanism to help restore, protect, and manage land and related ecosystems while generating market-based returns.

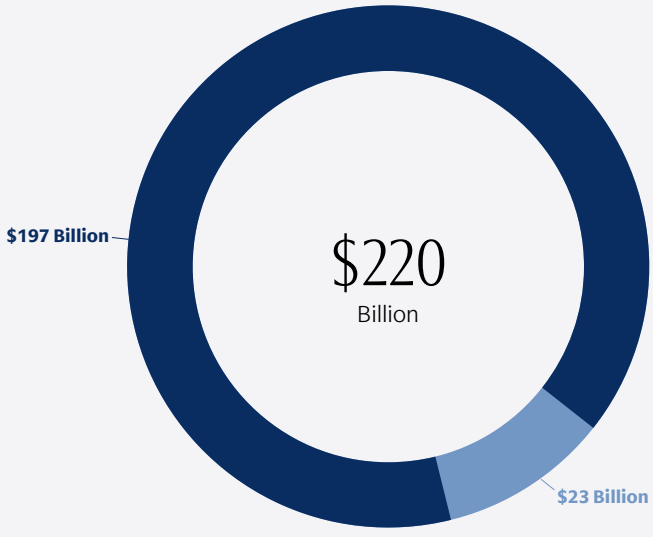
Moreover, companies rely on nature for access to basic materials including water, crops, and timber, among others, that are crucial for their operations and production. To control costs and ensure reliable supply, they are investing in practical steps such as tracking soil health, using water more efficiently, restoring land, and strengthening supplier practices. For instance, the private sector spent over $29 billion producing and procuring certified sustainable commodities in 2024, underscoring the opportunity to invest in nature to enhance production and create value.[1]

Reflecting these opportunities, public and private finance flows to nature-based solutions totaled approximately $220 billion in 2023,[2] a 5% increase from 2022 levels. While nature finance is growing, it remains relatively small compared to overall climate finance, which reached approximately $1.9 trillion in 2023.[3]

Public and Private Finance Flows to Nature-Based Solutions Totaled Approximately $220 Billion in 2023

Public finance
Government expenditure, government and sovereign bonds, Official Development Finance (ODF), and debt-for-nature swaps

Private finance
Biodiversity offsets, payments for ecosystem services, bonds and funds, certified commodity supply chains, nature-based carbon credits, ODF private finance, and philanthropy



Source: UNEP, State of Finance for Nature 2026, January 2026.

1 BloombergNEF: Biodiversity Finance Factbook COP30 edition, November 2025.
2 UNEP, State of Finance for Nature 2026, January 2026.
3 Climate Policy Initiative, Global Landscape of Climate Finance 2025, June 2025.

The Evolving Landscape of Nature Finance (continued)

While a significant portion of nature-related investments have not yet achieved standalone commercial viability and often require public or philanthropic support, several financial mechanisms have begun to scale:

- **Nature-based carbon credits continue to be a leading area of activity.** More than 50 nature-based offtake agreements were recorded in the first half of 2025—over twice the volume observed in the first half of 2024.[1] Ninety-eight percent of voluntary market credits are nature-based, and major buyers are securing multi-year forward agreements to help meet their 2030 carbon removal targets[2]
- **Nature-linked financing is increasing with corporates.** Green and sustainable debt with biodiversity-related potential use of proceeds grew 18% to $36 billion in 2024 from the prior year[3]
- **Mitigation banking is a mature, regulated financial mechanism for habitat restoration.** The US mitigation banking market was established over 40 years ago that supports over 1,800 active mitigation banks,[4] demonstrating long-standing investor interest in biodiversity restoration
- **Water resilience is emerging as a core operational priority.** Recent data shows companies reported $339 billion in potential financial impacts from water-related risks that could be mitigated through approximately $59 billion in expenditures, while identifying $204 billion in combined opportunities, tied to water efficiency, reuse technologies, and resilient supply chains in highly exposed sectors[5]

2X the volume of nature-based offtake agreements recorded in 1H 2025[1]

+18% growth in 2024 biodiversity-related green/sustainable debt[3]

$13T in economic value from agriculture, forestry, fisheries, food and beverage, and construction where nature underpins operations[6]

Beyond dedicated nature-specific financial products, nature underpins the core operations of many businesses across the real economy including agriculture, forestry, fisheries and aquaculture, food and beverage, and construction. Together, these five industries generated more than $13 trillion in economic value, 12% of global GDP,[6] highlighting that nature considerations are relevant to mainstream corporate and investment decision-making.

The ocean, as the world's largest natural ecosystem, underpins over $3 trillion in economic activity, presenting both significant business risks and opportunities.[7] Corporates and governments are increasingly prioritizing the "blue economy," focusing on the sustainable use of ocean resources. This trend is highlighted by the growth of blue bonds—debt instruments with sustainable ocean-related use of proceeds—which reached a cumulative $15 billion in 2025, a fourfold increase from 2021.[8]

While macro-level statistics establish the economic relevance of nature, they are not sufficient to drive capital allocation or operational decisions. Markets scale when corporates and investors can understand how nature-related dependencies and impacts translate into financially significant risks and opportunities across their businesses and portfolios.

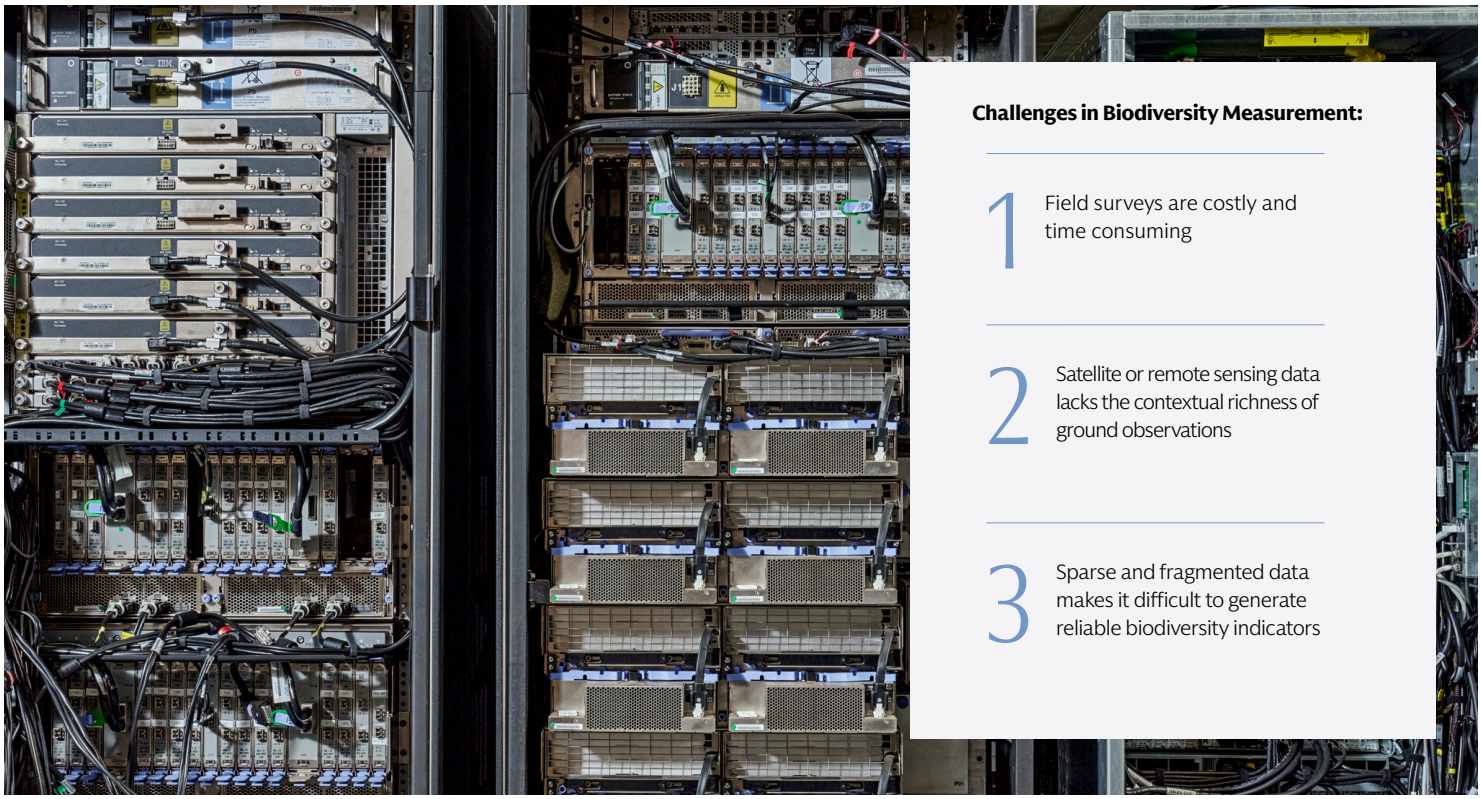
Regulatory initiatives, disclosure frameworks, and investor scrutiny are increasing demand for this insight, yet limitations in biodiversity data quality, reliability, and accessibility remain among the most significant barriers.[9] This biodiversity measurement shortfall—characterized by fragmented baselines, inconsistent indicators, and limited time-series data—has been widely recognized as a structural constraint on effective decision-making and capital allocation.[10] As nature is increasingly considered in risk management, strategy, and financing decisions, decision-makers need robust information.

The pilots address this constraint by demonstrating the potential to improve the consistency and scalability of biodiversity insights using AI, strengthening confidence in underlying data that supports downstream applications increasingly relevant to corporates and investors navigating nature-related risks and opportunities.

1 MSCI: *2025 State of Integrity in the Global Carbon-Credit Market*, September 2025.
2 Carbon Direct: *The 2024 State of the Voluntary Carbon Market*, October 2024.
3 BloombergNEF: *Biodiversity Finance Factbook COP30 edition*, November 2025. Total green and sustainable debt with biodiversity-related potential use of proceeds is divided equally by the number of listed use of proceeds.
4 United States Environmental Protection Agency: *Mitigation Banks under CWA Section 404*, June 2025.
5 CDP: *Internal Water Pricing Unlocks Resilience and Long-term Growth, Reveals New CDP Insights*, September 2025.
6 PWC: *Managing nature risks: From understanding to action*, April 2023. PWC leverages ENCORE data to rank highly dependent industries.
7 World Economic Forum, *The Ocean Economy Imperative: Defining Value, Managing Risk, and Mobilizing Investment*, January 2026.
8 The World Bank, *Seychelles: Introducing the World's First Sovereign Blue Bond*, June 2025.
9 Taskforce on Nature-related Financial Disclosures (TNFD): *Discussion paper – A Landscape Assessment of Nature-related Data and Analytics Availability*, March 2022.
10 PubMed Central: *Developing Biodiversity Baselines to Develop and Implement Future Conservation Targets*, 2023.

Bridging the Biodiversity Data Gap

Current biodiversity measurement approaches remain largely inadequate, making it challenging for companies and investors to assess impacts, track and communicate progress, and effectively direct capital.



Challenges in Biodiversity Measurement:

1. Field surveys are costly and time consuming
2. Satellite or remote sensing data lacks the contextual richness of ground observations
3. Sparse and fragmented data makes it difficult to generate reliable biodiversity indicators

While data limitations are not the only barrier to scaling nature finance, measurement is the foundation.

Barriers to scale	Challenge	How AI and better measurement could help	How this could support financial mechanisms
Uncertain return on investment or commercial viability	Long-dated projects and difficulty in drawing causation between interventions and impact outcomes	Reduce uncertainty through consistent, cost-effective, verifiable measurement	Carbon markets: strengthen verification and additionality claims and reduce cost barriers Nature or water-related bonds: reduce structuring and monitoring complexity
Insufficient market infrastructure	Minimal standardized, decision-useful metrics given local ecosystems' inherent distinctiveness	Enable transparency for financial structuring and disclosure	Mitigation banking: help quantify habitat restoration or protection so credits can be issued and priced more consistently Debt-for-nature swaps: provide clearer evidence that conservation commitments are being met for structuring and monitoring swap agreements
In-depth verification	Monitoring, reporting, and verification is costly and requires expert knowledge to provide analysis	Support more credible baseline assessments, monitoring, and validation	Nature-based solutions project finance: enable ongoing project-level performance tracking

Translating Research to Application

Recognizing the value of enhanced nature and biodiversity data for investors, corporates, and other stakeholders, Goldman Sachs and the MIT-IBM Watson AI Lab explored how AI can improve biodiversity measurement. Combining data from satellites, ground sensors, and experts, the collaboration sought to generate more consistent, decision-useful insights into how ecosystems evolve—with the aim of helping investors and corporates manage their nature exposure and meet their commercial goals.

Over the course of this collaboration, the pilots demonstrated the potential for AI to enhance nature measurement and interpretation. The Lab tested three pilot models, two of which were in Karukinka Natural Park, Chile. The park's vast, remote, and ecologically diverse landscapes provided a real-world testing ground for the Lab to study the types of measurement challenges that corporates and investors struggle with when seeking to assess nature-related risks and opportunities.

The three pilots demonstrate complementary ways AI can strengthen biodiversity measurement. The first two integrate multiple sources of ecological information to improve species-level insights—one prioritizing reliability and resolution, the other expanding coverage efficiently in data-sparse regions—while the third applies a foundation model to generate deeper, scalable insight into ecosystem change following climate-related events.

While these AI models are in research stage, they are expected to be peer-reviewed and open-sourced to support further research and user integration. This section describes the pilots and illustrates how improved species and land-use change data could translate into practical business and financial applications.

Potential Applications

Supporting financial solutions and operations

Baselines and key performance indicators (KPIs) for sustainability-linked financing or enhancements to operational biodiversity assessments in land-intensive sectors with higher confidence levels and lower cost

Enhancing transparency and risk management

Data for biodiversity reporting requirements in jurisdictions adopting International Sustainability Standards Board standards and other disclosure frameworks, as well as enhanced supply chain due diligence for corporates operating in biodiversity-sensitive areas where improved data may lead to better operational performance

Scaling nature-based opportunities

Site selection and verification for nature-based solutions, infrastructure development, and carbon credit projects in a consistent, scalable, and cost-effective manner, increasing credibility in nascent markets

About Karukinka Natural Park

Goldman Sachs partnered with the Wildlife Conservation Society (WCS) to preserve Karukinka Natural Park, a vital part of global biodiversity in Tierra del Fuego, at the southern tip of South America.[1] This unique partnership, established in 2004, leverages the private sector, conservationists, and local communities. Goldman Sachs acquired the substantial tract of land in 2002, later donating it for perpetual conservation. The park, spanning over 735,000 acres, represents one of the most significant contributions of private land for ongoing conservation.

Karukinka protects iconic species like guanacos, condors, flamingos, the highly endangered Culpeo fox, and diverse marine wildlife such as elephant seals and albatrosses. It also contains 80% of Tierra del Fuego's peatlands, a natural carbon sink holding over 290 million tons of carbon dioxide. This pristine ecological park, protected for over 20 years, offers a rich opportunity for forest-to-sea conservation.[2]

1 WCS was not involved in the development of these pilots or the validation of the associated data or findings.
2 All images of Karukinka Natural Park are courtesy of WCS Chile.

Pilot 1: Deep Occupancy Modeling—Enhancing the Resolution and Reliability of Biodiversity Measurement

Insights

Traditional biodiversity surveys rely on experts conducting field observations, which are detailed but limited in scale. In contrast, satellite imagery provides broad coverage but lacks local precision. Where both data sources are available, the Lab's Deep Occupancy Model bridges these approaches by merging camera trap images (on-the-ground data) from across the US with satellite information to estimate where species are present across a landscape.[1,2]

This integrated approach improves the reliability and resolution of species occupancy estimates, by 27% across 16 different species.[2] Species occupancy indicates where and under which environmental conditions species occur, which can be useful for prioritizing conservation measures and species management. In addition, the model identifies habitat characteristics linked to species presence and ecosystem health. These AI-generated descriptions provide the potential for ecological experts to validate and further refine the models.

Impact

Higher-Confidence Baselines and Monitoring

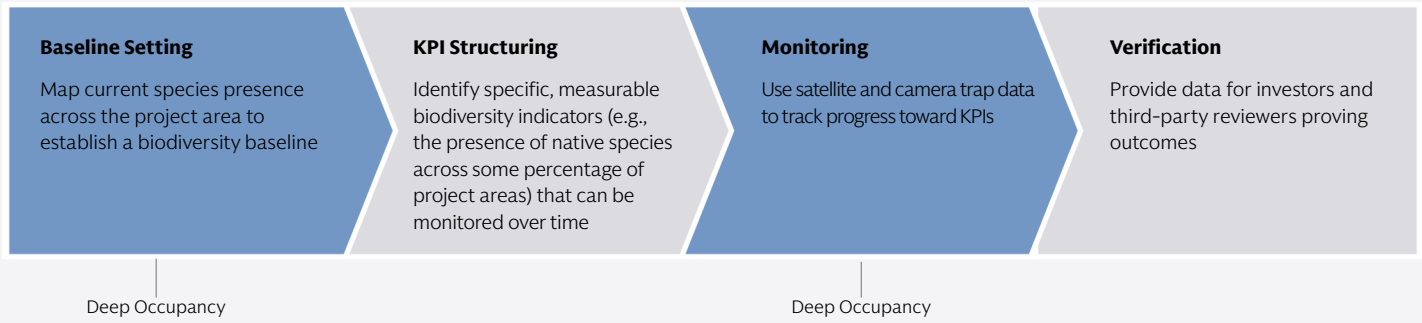
By tracking species across landscapes using AI, practitioners could monitor biodiversity trends with higher confidence. Better measurement of where species live and how their habitats change may help companies and financial institutions establish credible biodiversity baselines, design metrics, and verify outcomes across sustainability-linked financial products and land-intensive sectors. The ability to summarize essential habitat characteristics can help practitioners prioritize the most important areas for preservation and restoration, hopefully improving outcomes.

Potential Applications

Nature-Linked Financing Instruments

In some sustainability-linked bonds or loans, borrowers aim to achieve measurable biodiversity or ecosystem outcomes such as maintaining native species within a given area. Achieving these targets can lower borrowing costs.

The Deep Occupancy Model could help establish credible biodiversity baselines for KPI structuring and provide higher-quality information for ongoing monitoring and verification. This could improve confidence for both issuers and investors, potentially supporting market credibility and pricing transparency.



Consumer and Agriculture Sectors

Companies managing agricultural or forestry operations often conduct biodiversity assessments to balance production with conservation. Integrating AI-enhanced occupancy modeling could help them map habitats at scale, identify optimal areas for conservation or production, and monitor biodiversity impacts, which could ultimately reduce the frequency or cost of manual fieldwork, improve commodity production, and protect long-term asset value.

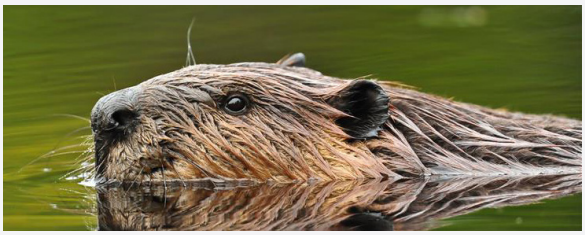
1 Camera trap data was sourced from Wildlife Insights. Satellite data was aggregated across several different sources, including IBM satellite data.
2 bioRxiv, *Seeing Above and Below the Canopy: Modeling and Interpreting Species Occupancy with Multimodal Habitat Representations*, 2026.

Pilot 2: Distribution Modeling—Scaling Coverage in Data-Sparse Regions with Expert Knowledge

Insights

Many regions lack detailed ecological data because sites are hard to access or field surveys are under-resourced. This pilot pairs AI models with expert knowledge of species-habitat relationships to extend biodiversity insights across data-sparse landscapes. It fuses limited species sightings anchoring analyses in real observations, satellite imagery for consistent coverage between sparse points, and expert ecological descriptions linking habitat features to species. The AI produces species distribution maps predicting likely species occurrence and suitable conditions, highlighting patterns of habitat suitability, ecological connectivity, and conservation priorities or risks. Ecologists will then review and adjust predictions, correcting errors and adding on-the-ground context. This human-AI loop could streamline accurate map creation and guide targeted field surveys.

At Karukinka, this will be applied to species like guanacos and invasive beavers. With limited confirmed field data, experts will annotate maps for rigorous evaluation that would otherwise be missing, building trust and supporting practical adoption of AI tools for conservation in data-sparse contexts.



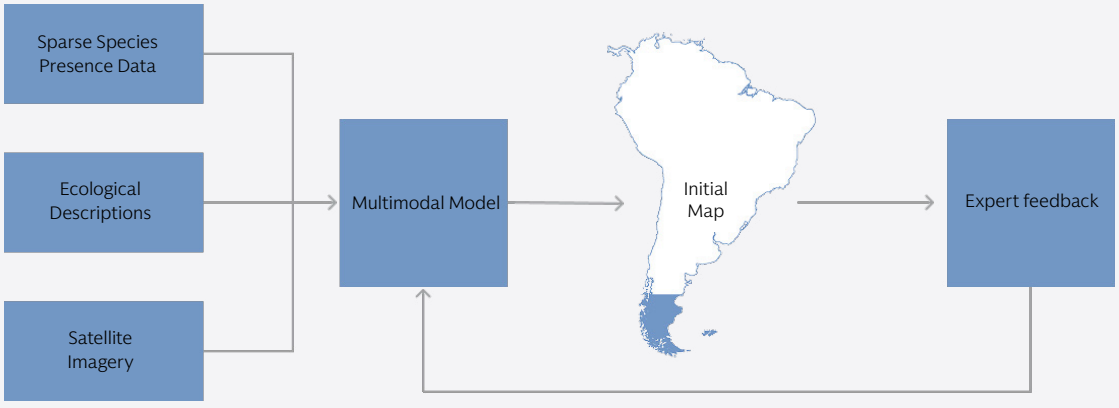
Impact

Filling Coverage Gaps to Improve Cost and Resource Efficiency

This approach fills coverage gaps where traditional surveys are infeasible or too costly. Rather than replacing fieldwork, hybrid human-AI models turn limited data into decision-ready maps that could focus surveys, conservation actions, and monitoring where they matter most. Beyond improving accuracy, the human-AI workflow increases interpretability, strengthens trust, and ensures maps reflect ecological realities missing from sparse training data. For companies and investors, earlier insight into risks and dependencies could help inform portfolio and supply chain decisions before capital allocation or site selection, especially where data are missing or outdated.

Process of Human–AI Species Mapping

Sparse species data, ecological descriptions, and satellite imagery are combined in a multimodal model to generate an initial map predicting where species are likely to be found. Human experts then review these predictions on the map, refining species presence/absence likelihood by updating the map's shading. This iterative feedback loop produces more accurate, locally-grounded species distribution maps in a data-limited region.



Potential Applications

Portfolio-Level Risk Assessment

Financial institutions aligning with the Taskforce on Nature-related Financial Disclosures are seeking to map their portfolio exposure to nature-related risk, but they may experience gaps in data availability from their counterparties. Hybrid AI models could potentially fill gaps in biodiversity data, helping counterparties assess exposure to sensitive ecosystems or nature-dependent sectors more accurately and investors monitor portfolio risks over time. This approach may be particularly useful where consistent, asset-level biodiversity data is unavailable but directional insight is needed to inform decisions.

Regulatory Reporting Requirements

Regulators are increasingly focused on the disclosure of biodiversity impacts across corporate operations and supply chains. While many proposals are early stage and implementation across jurisdiction remains uncertain, companies may need to report on these metrics.[1] Hybrid AI mapping could help identify ecological sensitivity hotspots in company and supplier operations, potentially enhancing data completeness and streamlining risk assessments in a more resource efficient way.

1 Potential requirements include the Corporate Sustainability Report Directive, EU Deforestation Regulation, and those in jurisdictions adopting International Sustainability Standards Board standards, among others.

Pilot 3: Rapid Insight into Peatland Monitoring with *TerraMind*

Insights

Peatlands store nearly one-third of the world's carbon,[1] but are difficult to monitor because their defining features (moisture, soil composition, and carbon content) are largely below ground. This pilot applies *TerraMind*, an IBM–European Space Agency AI foundation model, to generate scalable insight into peatland presence and change using remote sensing data.

By fusing optical and radar satellite data with information on terrain and vegetation state, the model identified peatlands across and beyond Karukinka Natural Park using only a small amount of site-specific training data. The study, which also compared other AI models, found that fusing data from multiple sensors improved accuracy to 95%.[2]

The approach highlights how these AI models can support more consistent, landscape-scale monitoring of ecosystem change in areas where ground data is limited or unavailable – conditions common across large-scale natural landscapes.

This depth of insight is difficult to achieve through traditional measurement approaches and highlights the potential for AI to improve visibility into climate-driven ecosystem impacts.

Impact

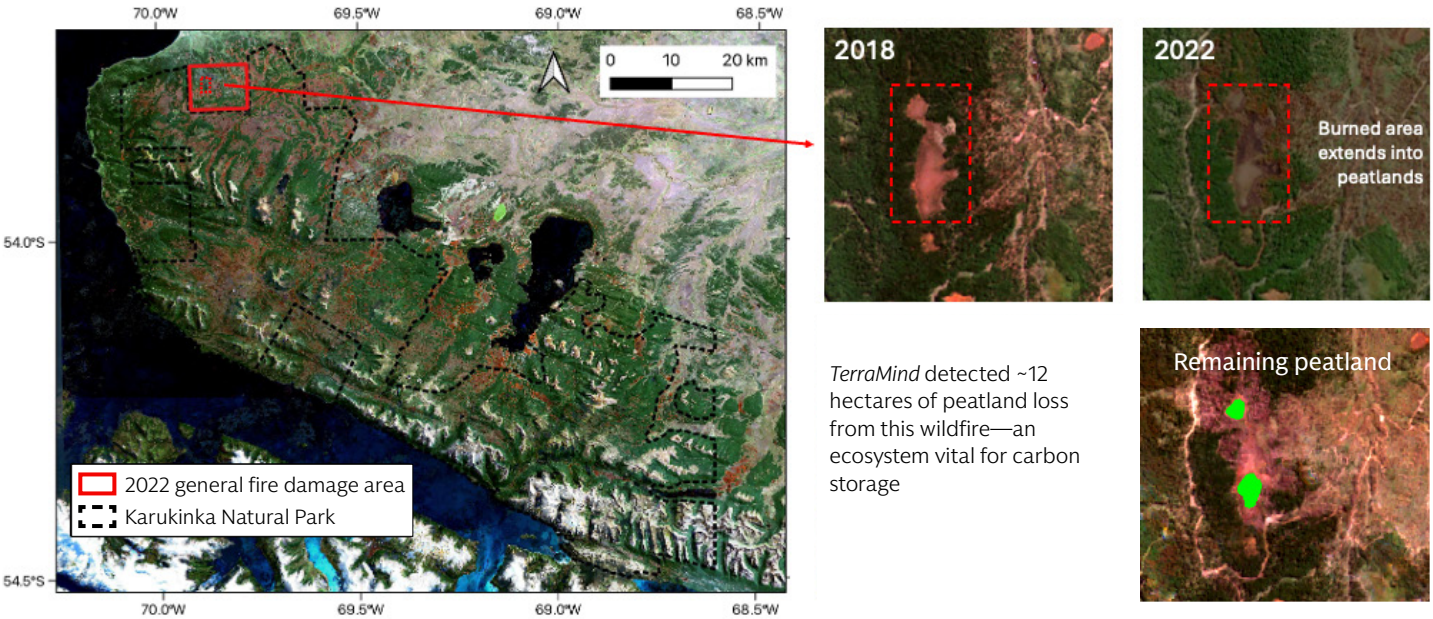
Scalable Insight into Ecosystem Change

This pilot highlights how foundation models can provide deeper insight into ecosystem condition and change, particularly following climate-related events such as wildfires. By detecting land-use change consistently across large geographies, these models may help validate whether conservation, restoration, or protection efforts are holding over time.

Consistent, scalable land-use monitoring could potentially enable both companies and investors to validate environmental performance across large project areas—critical for promoting the integrity of carbon and biodiversity markets. For example, companies or investors managing nature-based or carbon projects, or operating in fire-prone areas, may need to verify that land remains protected or that restoration efforts are working.

TerraMind Detection of Peatland Loss From a 2022 Wildfire

The image on the left shows the fire-damaged area near Karukinka Natural Park. The two pictures on the top right show the same spot but at different times: one from 2018 (before the fire) and one from 2022 (after the fire). TerraMind's peatland model helps us see exactly how much of this valuable natural area was lost. It outlines the peatland that is still intact and also highlights approximately 12 hectares (which is about 30 acres) of peatland that was destroyed by the fire (bottom right).



TerraMind detected ~12 hectares of peatland loss from this wildfire—an ecosystem vital for carbon storage

1 World Economic Forum, *Peatlands store twice as much carbon as forests – here's what we can do to save them*, February 2025.
2 arXiv, *Ecological mapping with geospatial foundation models*, 2026.

Potential Applications

Utilities and Construction/Infrastructure Sectors

Utilities and infrastructure developers may need to assess biodiversity and land-use risks across large operational footprints. They could use AI-enabled land-use change models to help conduct forest condition assessments to protect electric reliability, preserve trees, and reduce risks, like wildfires, and costs. Over time, integrating multimodal data might also enhance reporting under frameworks like the UK's Biodiversity Net Gain law.

Mitigation Banking

In contexts such as mitigation banking, these same land use change signals could support site selection, and verifiable monitoring to meet permit conditions and underpin credit issuance.

Consumer and Agriculture Sectors

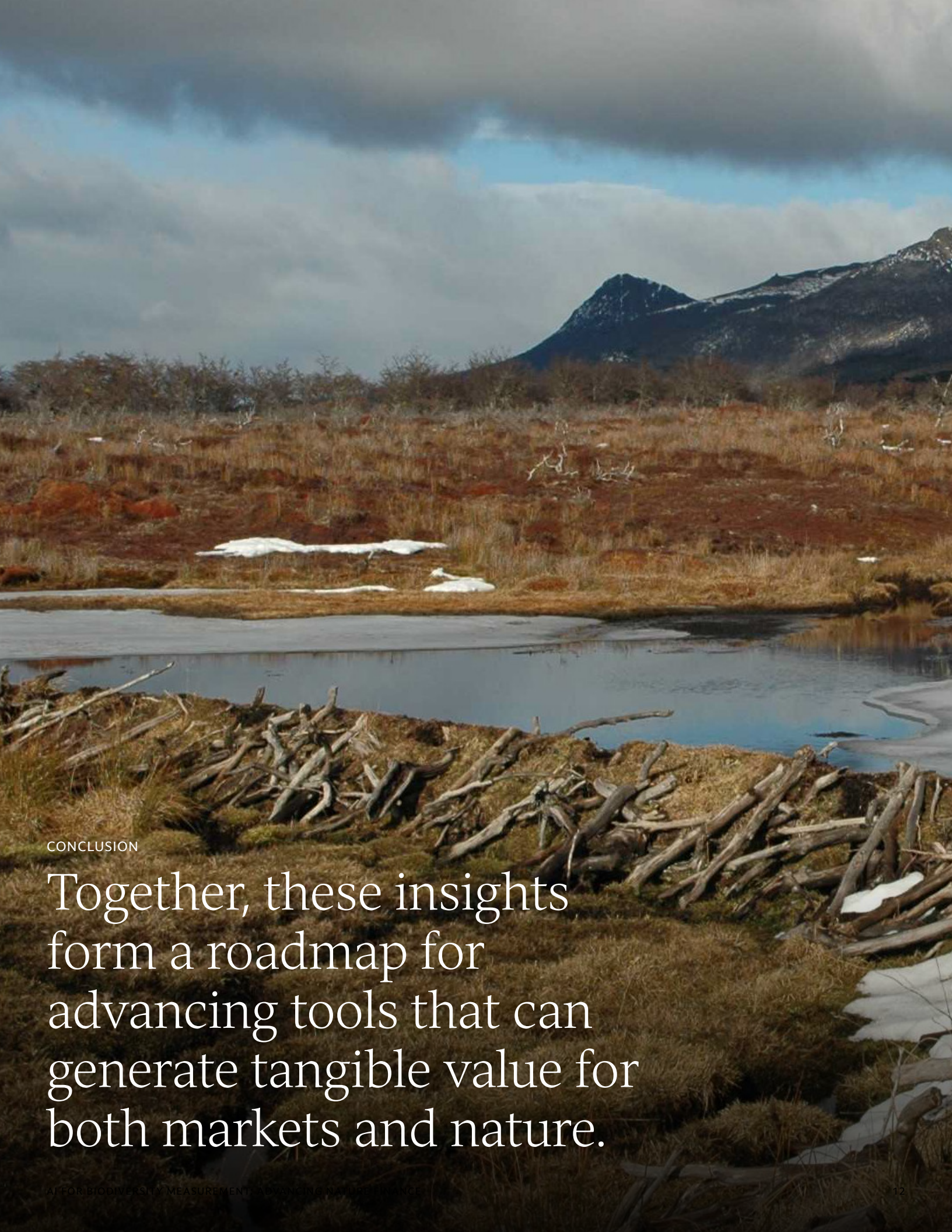
Land-intensive consumer categories—especially food and beverage—typically run asset-level assessments across farms, plantations, and processing assets to quantify land-use change and deforestation associated with commodity production. Using AI-enabled remote sensing and land use change models, companies could potentially monitor forest loss and landscape condition in near real time and link risks like drought, disease, and pest pressure to expected yield outcomes. These insights could potentially provide decision-useful inputs for risk management, sourcing strategy, and financing.

Nature-Based Solutions and Carbon Markets

In the future, investors—and especially hyperscalers—funding reforestation or conservation projects to offset emissions could use AI foundation models to support site selection and ongoing verification by providing consistent signals of land-use change. Enhanced data integrity may improve transparency and scalability across voluntary carbon and biodiversity credit markets.

Collectively, the pilots show how improved measurement—through greater reliability, broader coverage, and deeper insight—can support a range of downstream applications across finance and operations, from establishing credible baselines to enabling more transparent monitoring and verification. More broadly, the pilots reinforce enhanced measurement as a foundational unlock for scaling nature finance by improving confidence in how nature-related information can be used in decision-making.

These tools aim to lay the foundation for a more consistent, cost-effective, and decision-useful approach to biodiversity data.



CONCLUSION

Together, these insights form a roadmap for advancing tools that can generate tangible value for both markets and nature.

Conclusion

Key Takeaways

This joint report highlights how progress in biodiversity measurement depends as much on collaboration as it does on technology. Linking scientific rigor, AI innovation, and financial insight, the project highlights five key takeaways:

1. The strength of cross-sector collaboration in translating research into market-relevant solutions
2. The importance of human expertise in validating and refining AI models
3. The potential of improved measurement as a foundation for scaling credible nature-based finance
4. The possibility for better biodiversity data to drive value through cost reductions, better operational management, and the identification of productivity enhancements
5. The value of targeting underinvested market gaps to strengthen decision making and market innovation

Enabling the Next Stage of Nature Finance

The pilots show meaningful potential but also the need for continued development and market engagement. Beyond research, scaling nature finance will depend on enabling policy and capital mobilization. Blended-finance structures, regulatory clarity, standardized disclosures and metrics, and policy incentives can help derisk early investment and catalyze a more credible, liquid market for nature-positive outcomes.

Looking ahead, each organization plans to continue contributing to market scale in complementary ways.

Recognizing the critical link between impact measurement and finance for conservation, Goldman Sachs is supporting The Conservation Fund (TCF) with a grant to leverage AI technology for advanced biodiversity monitoring and assessment of TCF's nature-based projects. The aim is to explore how this technology can enhance project value and attract capital for conservation by providing more reliable and scalable insights. Goldman Sachs will continue to serve clients pursuing nature-related commercial opportunities, sharing relevant insights from this joint report across advisory, financing, and investing activities in emerging themes such as water, circularity, and carbon markets.

IBM will continue to use its technology, talent, and innovation to drive sustainability and business outcomes such as lowering energy costs, reducing waste, mitigating risks, and enabling growth and revenue, focusing on leveraging innovative approaches and technologies to deliver what is needed for clients.

MIT will advance AI models for nature and biodiversity assessment, training them to focus on fine-grained ecological data to capture enhanced details. Building on this, MIT is going to improve ecosystem tracking to reliably detect changes over time. MIT plans to scale AI approaches to incorporate additional multimodal data sources, considering surrounding habitats and human impacts alongside observed species when assessing ecosystem health.

Together, these efforts reflect a shared commitment to helping market participants access credible, decision-useful data to strengthen risk management, resilience, and long-term value creation.

The MIT-IBM and Goldman Sachs joint report demonstrates the impactful possibilities when technology, science, and finance intersect to address systemic market gaps. While these models are in research stage, their potential to transform biodiversity measurement—and by extension, sustainable finance—is promising. As open-source tools mature and integration deepens, AI-powered ecological insights can help businesses and investors make more informed, transparent, and impactful decisions. Strengthening the link between data and capital is essential to help protect nature and sustain the global economy.

About the Authors

Each organization contributed distinct and complementary expertise.

Goldman Sachs

Goldman Sachs is a leading global financial institution that delivers a broad range of financial services, including sustainable finance solutions, to a large and diversified client base that includes corporations, financial institutions, governments, and individuals. Within this collaboration, Goldman Sachs provided a financial contribution to support the pilot research and helped identify potential financial applications of the findings, leveraging its deep experience in sustainable and nature finance, industry relationships, and market-based solutions.

Examples of Expertise in Nature Finance

Structured innovative nature-linked financing: Underwrote the first US nonprofit green bond for The Conservation Fund,[1] designed to advance TCF's long term ambition to protect five million acres of at-risk working forests

Landmark public-private partnerships: Donated Karukinka Natural Park to WCS,[2] creating a nature reserve that today spans over 735,000 acres for biodiversity research and protection

Investments in nature-based solutions: Invested in reforestation projects that support carbon removal and biodiversity through the firm's External Investing Group Imprint platform

Blue bonds for water-related projects: Helped Italian multi-utility A2A raise €155 million as part of both the company's and Italy's first explicit blue bond issuance. Proceeds funded projects used for sustainable infrastructure for clean and potable water, wastewater treatment, and sustainable urban drainage systems

Biodiversity and nature investment products and analytics: Manage a biodiversity bond strategy for clients[3] and review equity and credit portfolios for potential nature risks, supporting overall investment risk management

Market insights on nature and biodiversity: Publish original insights into nature and biodiversity risks and opportunities, informing investment decision making

"The commercial use case for investing in nature is multi-faceted, spanning effective risk management to capital mobilization. Measurement is a key challenge and AI-powered tools are a critical unlock to improving the accuracy and efficiency of linking ecological impacts to business results and honing key insights for decision-making."

Kara Succoso Mangone | Head of the Sustainable Finance Group at Goldman Sachs

1 The Conservation Fund: *The Fund Closes Debut $150 Million Green Bonds*, September 2019.
2 Goldman Sachs: *Tierra del Fuego: Marking 20 Years of Wilderness Preservation*, Accessed December 2025.
3 This existing biodiversity bond strategy is distinct from the research presented in this report and does not incorporate or directly leverage the research-stage AI models from this specific collaboration.

About the Authors (continued)

The MIT-IBM Watson AI Lab

The Lab serves as the research and development engine. As a joint research collaboration between the Massachusetts Institute of Technology (MIT) and IBM Research, the Lab combines academic rigor with applied AI engineering to advance solutions at the intersection of fundamental science and technology. This collaboration, led by Dr. Campbell Watson (IBM Research) and Prof. Sara Beery (MIT), provides technical leadership in AI and geospatial modeling and contributes methodological depth, scientific rigor, and ecological expertise. The Lab conducted the pilots outlined in this joint report.

Examples of IBM Research Expertise in Earth & Space

Foundation models for science: IBM and NASA are building foundation models for science across Earth and planetary systems, including the Prithvi family of foundation models for Earth, with Prithvi-EO as the world's first global geospatial foundation model

A breakthrough with the European Space Agency on multi-modality: In collaboration with the European Space Agency, IBM introduced TerraMind, pioneering multi-sensor, multi-task, and generative foundation modeling for advanced environmental intelligence

Applying geospatial foundation models for disaster management and environmental monitoring: Governments and public-sector partners are operationalizing *Prithvi* and *TerraMind* at scale, including the United Arab Emirates for urban heat island mitigation and the Government of Kenya for deforestation monitoring, targeted reforestation, and carbon financing mechanisms

"Supporting the market needs I see around nature requires both the collection of accurate biodiversity data and tools that can analyze and interpret it. Strategically investing in AI models can deliver on both of these items, bringing better insights to businesses, stronger infrastructure to financial services, and more transparency to reporting."

Christina Shim | Chief Sustainability Officer of IBM

Examples of MIT's Expertise in Computer Vision for the Environment, Sustainability, and Conservation

Primary model for camera trap image analysis: Researchers co-developed MegaDetector, a general AI model for the detection of animals in camera trap imagery, used to help process and analyze more than 500 million images per year across more than 100 countries

Spearheading large-scale monitoring of animal populations: Researchers developed the first method to dramatically accelerate estimation of animal population density from camera trap data, enabling efficient studies at landscape-level scale for the first time

"Artificial intelligence provides huge potential for scaling up biodiversity data collection to better understand the state of nature, detect human impacts, and develop effective mitigation strategies. To fully realize this potential, we need to develop artificial intelligence approaches that go beyond a single modality and can instead leverage many complementary modalities and sources of information."

Sara Beery | Professor of AI and Decision Making at MIT

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