

Biodiversity risks in government bond portfolios

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Biodiversity is emerging as a critical dimension of credit risk. The Global Biodiversity Framework (GBF), adopted in 2022 and often called the "Paris Agreement for Nature", set a global goal for countries to halt and reverse biodiversity loss. However, implementation has been patchy, and progress must be accelerated considerably to achieve the 30x30 target, a commitment to conserve at least 30% of land, waters and seas by 2030. Compliance with the target itself, or lack thereof, is unlikely to have an immediate impact on the pricing of government bonds, but **it is still crucial for investors to assess biodiversity risks and related investment implications**.

Emerging and developing economies are particularly exposed to the risk of collapsing ecosystems which could result in significantly declining GDP and rising debt. Already, a growing number of vulnerable countries are experiencing a vicious circle of debt, climate and nature crises.[1] Accordingly, it is important to incorporate nature and biodiversity into credit analysis, including sovereign ratings and debt sustainability analyses. **It can also be incorporated in portfolio construction to mitigate nature-related risks.**

Given the high relevance of nature for emerging markets (EMs), **our analysis focuses on the J.P. Morgan GBI-EM Global Diversified** — a widely followed benchmark for EM local government debt with over USD 200bn asset under management linked to it (as of July 2024).[2] Based on an optimisation that increases exposure to protected areas, **it is possible to align such a bond portfolio to the 30x30 target through adjustment of country weights.**

The results are notable: **a rebalanced portfolio achieved an average share of currently protected areas of nearly 28%** (compared to 15% for the benchmark) and brings the 30x30 target within reach, while maintaining the same aggregate yield and duration as the benchmark. Such a portfolio also scored considerably higher on ecosystem vitality, reflecting the included countries' stronger focus on ecosystems and related services they provide.

Our analysis shows that 30x30 alignment is feasible. However, it requires **reallocation away from the largest issuers — such as China, India, Indonesia and Mexico — toward smaller markets with stronger conservation metrics**. While the 30x30 target offers a useful reference, effective portfolio alignment also requires attention to ecological quality, governance and local context.

In conclusion, biodiversity is no longer a peripheral sustainability issue, but an emerging driver of credit risk. For investors in government bonds, particularly in EMs, the **prudent course is to begin incorporating biodiversity-related indicators into credit assessments and portfolio construction** to manage forward-looking risks.

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[1] "Tackling the Vicious Circle", Interim Report of the Expert Review on Debt, Nature and Climate, Oct 2024.
[2] "J.P. Morgan GBI-EM", J.P. Morgan, 31 Jul 2024.

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A "Paris Agreement for nature"?

The Kunming-Montreal GBF was adopted in December 2022[3] at the 15th Conference of Parties (COP15) to the Convention on Biological Diversity (CBD). Sometimes referred to as the "Paris Agreement for Nature", the framework aims for a world living in harmony with nature by 2050, as outlined in four long-term goals.[4] In addition, there are 23 targets for 2030 focused on halting and reversing biodiversity loss.

In contrast to the Paris Agreement, which is an international treaty with one overarching goal,[5] the GBF is not a legally binding agreement. However, the 196 parties committed to its implementation.[6] Importantly, both agreements have a strong scientific foundation with the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), respectively.

Conceptually, climate and nature are interconnected, but also different. Biodiversity is multidimensional and more complex to assess than greenhouse gas (GHG) emissions, for instance. As such, it's also more difficult to define an overarching target to capture all relevant considerations, particularly for investors — this applies within biodiversity (e.g. indicators to consider) and to how the erosion of biodiversity cascades though human and financial systems (e.g. transmission channels on the economy).

Target 3, often referred to as 30x30, is the most prominent in the GBF. This calls on countries to conserve at least 30% of terrestrial, inland water, and coastal and marine areas by 2030. This is a global target and requires a collective effort. Importantly, it can be achieved without every country protecting 30% of areas, so long as others protect more.

Besides the call for effective conservation and management of areas, the GBF also highlights *"recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories"* as part of Target 3. Close to 4% of global protected and conserved areas are governed by Indigenous Peoples and local communities.[7] As they play a key role in nature conservation, equitable governance is critical to ensuring an equitable and inclusive implementation of the target.[8]

Other important GBF targets include finance mobilisation (Target 19) and reduction of harmful incentives, including subsidies (Target 18). To address the estimated USD 700bn annual funding gap for biodiversity, governments adopted a finance strategy as part of resumed COP16 negotiations in early 2025. It outlines commitments to mobilise at least USD 200bn annually for biodiversity, including international financial flows to developing countries, and phase out or reform at least USD 500bn of annual subsidies harmful to biodiversity.[9]

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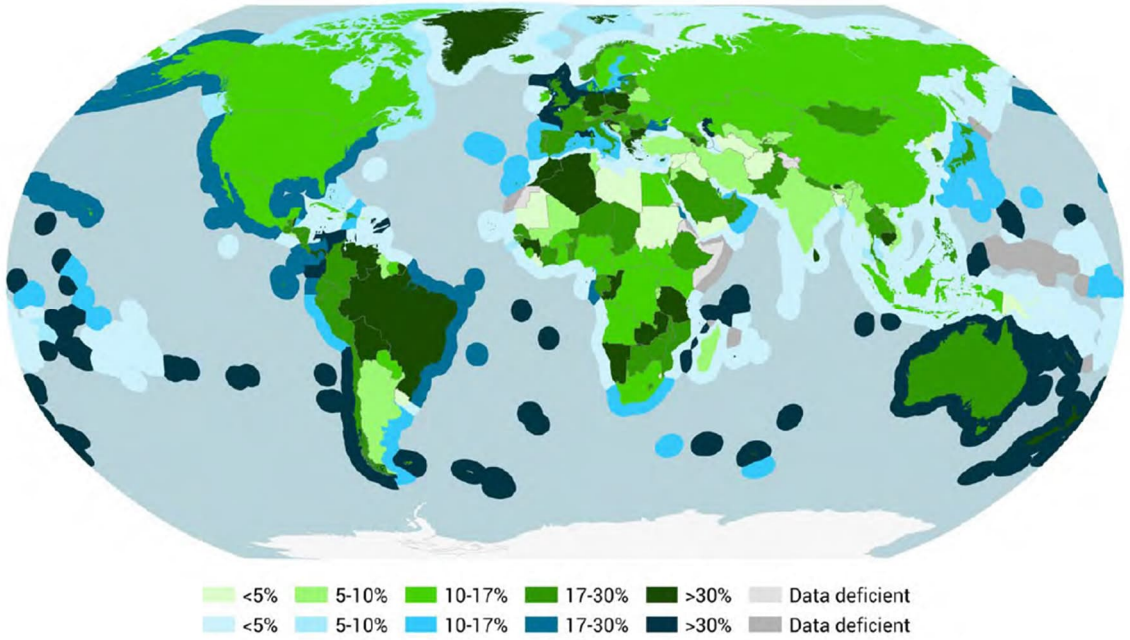
[3] "Decision adopted by the Conference of the Parties on the Convention on Biological Diversity", CBD, Dec 2022.
[4] A) Protect and Restore, B) Prosper with Nature, C) Share Benefits Fairly, D) Invest and Collaborate (see "2050 Goals" for details).
[5] "The Paris Agreement", UNFCCC, accessed Jul 2025.
[6] "Progress on implementing the Kunming-Montreal Global Biodiversity Framework", European Parliament, Dec 2023.
[7] For details, please see chapter 8 and 9 of "Protected Planet Report 2024".
[8] "A Guide to Inclusive, Equitable and Effective Implementation of Target 3 of the Kunming-Montreal Global Biodiversity Framework", WWF and IUCN WCPA, 2023.
[9] "Governments adopt first global strategy to finance biodiversity: Implications for financial institutions", UNEPFI, 3 Mar 2025.

Progress on implementing 30x30

Target 3 calls for the expansion and enhancement of protected and conserved areas *"through ecologically representative, well-connected and equitably governed systems."*[10] The first official review of progress, published in Oct 2024, provides valuable insights into the latest status of protected areas globally, as illustrated in Figure 1.

Figure 1. Percent coverage of countries and sub-regions by protected areas and other effective area-based conservation measures (OECMs), August 2024. Coverage is shown for the terrestrial and inland waters realm and for the marine realm. Source: UNEP-WCMC and IUCN.



A few key points from the report:[11]

- The global coverage of protected and conserved areas has now reached 17.6% of terrestrial and inland waters and 8.4% of marine and coastal areas.
- While progress has been made increasing the coverage of protected and conserved areas, it must be accelerated considerably if the target is to be fully met by 2030.
- There are 51 countries and territories that already have networks of protected and conserved areas that exceed 30% coverage on land and 31 that exceed 30% at sea.

In addition, an analysis by Carbon Brief and The Guardian shows that more than half of the countries that committed to 30x30 have no plans in place for achieving the target. Either they have targets lower than 30% or are not setting numerical targets at all.[12] The report states that *"Of the 137 who have submitted a plan, 70 (51%) countries do not include proposals for protecting 30% of their land and sea, and 10 do not make it clear whether they will do so. Another 61 countries are yet to*

[10] "Target 3", CBD, accessed Jul 2025.
[11] "Protected Planet Report 2024", UNEP-WCMC and IUCN, Oct 2024.
[12] "More than half of countries are ignoring biodiversity pledges – analysis", The Guardian, 24 Feb 2025.

submit any plan on meeting the targets."[13] The countries without targets account for about one-third of global land surface and include several large, nature-rich nations, including Indonesia, Mexico, Peru and South Africa.

A recent study shows that protecting targeted areas with high biodiversity could be an effective means to protect rare and threatened species.[14] However, the expansion of protected areas has often failed to account for this. Prof Neil Burgess, chief scientist at the UN Environment Programme's World Conservation Monitoring Centre, said that the paper is an important reminder *"that achieving 30% coverage by protected and conserved areas on its own is not enough, and that it is the location, quality and effectiveness of these protected and conserved areas that will determine whether they fulfil their role in contributing to halting biodiversity loss."*[15]

A separate analysis highlights that the current protected areas are not sufficiently protecting the most critical ecosystem services, reinforcing the view that more effective management of such areas is critical to halt biodiversity decline.[16]

Biodiversity in a government bond context

While 30x30 is the most prominent target, it doesn't capture the full complexity of biodiversity and how its loss could impact the planet, people and markets. While protecting and conserving land is critical for biodiversity, by itself such activity does not necessarily have an influence on government bond pricing due to the high relevance of other credit risk drivers, particularly in the short-term. However, in our view it is important for investors to consider how nature risks can travel through various transmission channels to affect these credit risk drivers.

Like climate-related risks, nature-related risks can be organised into physical and transition categories.[17] The Network for Greening the Financial System (NGFS) outlined key concepts and the complex interdependencies between these risks in a conceptual framework (see Figure 2). This is a useful resource, and it is important to remember that these risks are endogenous, meaning the impact of various actors on nature have an impact on the financial risks they need to manage.[18]

Activities that are highly dependent on ecosystem services (e.g. agriculture, fisheries, timber, water) are most at risk of being disrupted by nature degradation, with implications for assets, productivity, prices and the fiscal balances of countries (see appendix for an overview of the key economic effects).

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[13] As of 24 Feb 2025, 44 countries and the EU had submitted NBSAPs and 124 countries had submitted national targets – some have submitted both, resulting in the 137 countries that have submitted some form of plan (for details, please see "Revealed: More than half of nations fail to protect 30% of land and sea in UN nature plans", CarbonBrief, 24 Feb 2025).

[14] "Conservation Imperatives: securing the last", Frontiers in Science Lead Article, 25 Jun 2024.

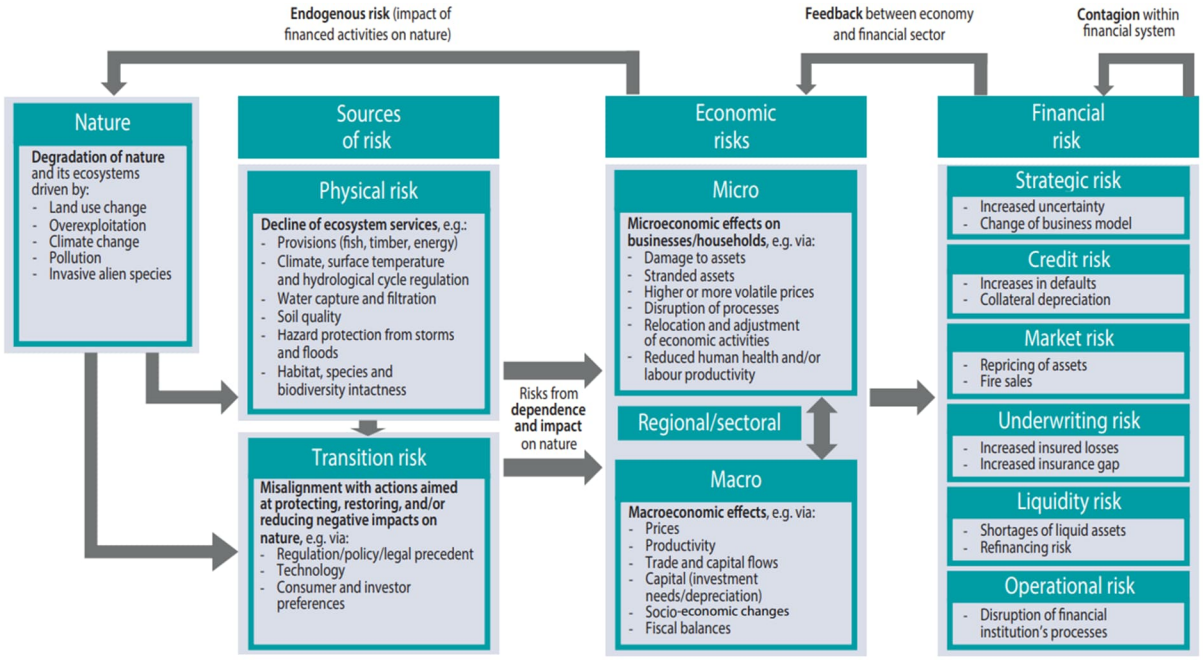
[15] "Protecting just 1.2% of Earth's land could save most-threatened species, says study", The Guardian, 25 Jun 2024.

[16] "Towards 30by30: Balancing nature and people", Natural History Museum.

[17] Following the definition outlined by NGFS: Nature-related financial risks refer to the risks of negative effects on economies, individual financial institutions and financial systems that result from: i. the degradation of nature, including its biodiversity, and the loss of ecosystem services that flow from it (i.e. physical risks); or ii. the misalignment of economic actors with actions aimed at protecting, restoring, and/or reducing negative impacts on nature (i.e. transition risks).

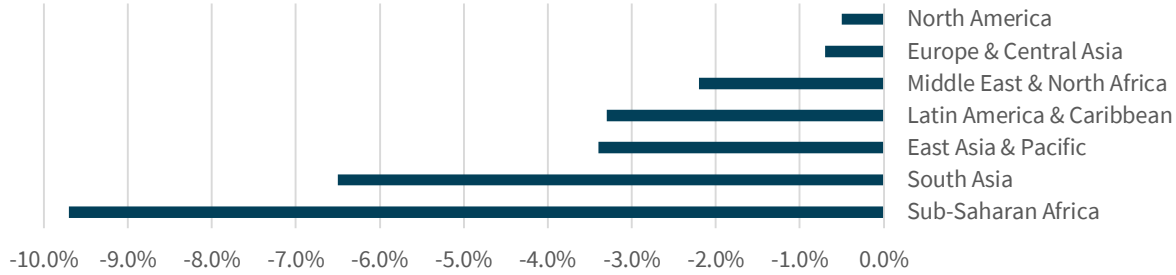
[18] "Nature-related Financial Risks: a Conceptual Framework to guide Action by Central Banks and Supervisors", NGFS, Jul 2024.

Figure 2. Transmission channels of nature-related financial risks. Source: NGFS.



As conventional economic models usually do not explicitly account for ecosystem services, they can produce overly optimistic forecasts — an issue the World Bank addressed with a first-of-its-kind study that models the interaction between nature and the global economy.[19] In a business-as-usual scenario, assuming a decline in selected ecosystems, global GDP in 2030 could see losses of USD 90 billion, and USD 225 billion if related climate change damages are also considered. On a country level, this implies an impact of -0.4% (10th percentile) to 0.2% (90th percentile), with outliers on both sides of the distribution. In a partial ecosystem collapse scenario,[20] however, the estimates show that global GDP could drop more significantly — by 2.3% annually in 2030, while the decline in low and lower-middle-income countries could reach much more severe levels of (-7.3% and -10%, respectively). In terms of regions, Sub-Saharan African (SSA) and South Asia would be particularly exposed (-9.7% and -6.5%, respectively) due to their high dependency on pollinated crops, and forestry in SSA.

Figure 3. Change in 2030 real GDP under the partial ecosystem collapse scenario compared with the no-tipping-point scenario. Source: World Bank.



[19] "The Economic Case for Nature A global Earth-economy model to assess development policy pathways", World Bank, Jun 2021.

[20] Collapse of three essential ecosystem services: wild pollination, provision of food from marine fisheries, and timber from native forests.

In the context of the 30x30 target, the study also highlights that the economic costs related to land use restrictions could be largely offset by gains from ecosystem services in the most conservation-effective scenario. However, there are important regional differences, and poorer countries would still experience net declines in GDP. This strengthens the case for global collaboration to share the burden of protection efforts.

Given the potential implications of nature degradation for economies, it would be prudent to factor this into credit risk analysis for sovereigns. Here are some examples of how this could be done:

- **Credit ratings:** Incorporating nature and biodiversity risks into sovereign credit ratings is necessary to account for the potential macroeconomic consequences of declining ecosystems. Following the aforementioned scenario of a partial ecosystem collapse, several countries could face rating downgrades of three notches or more, with China and Malaysia (> 6 notches) and India, Bangladesh and Indonesia (approximately 4 notches) likely to see the most significant shifts among the countries analysed in a recent study.[21] In a business-as-usual scenario, potential rating downgrades appear more manageable, with four countries facing a nature-driven rating downgrade (i.e. China, India, Bangladesh and Indonesia) according to the analysis. Deteriorating creditworthiness goes hand-in-hand with higher risk premiums and financing costs for governments.
- **Debt sustainability analysis (DSA):** Following the recommendations by the Expert Review on Debt, Nature and Climate, *"DSAs should start to incorporate the risks associated with nature loss in their underlying baseline macroeconomic and fiscal projections. The analysis should also account for the economic and fiscal benefits associated with nature protection and recovery. Improved data collection and modelling will be necessary to do so robustly."*[22] As concerns low-income countries, a recent report emphasises that nature-related risks are structural, and concludes that incorporating nature into the IMF-World Bank Debt Sustainability Framework is critical and technically feasible.[23]

Given the significant potential implications for countries, it is important to incorporate nature and biodiversity into sovereign credit analysis. In addition to a baseline outlook, investors need to pay attention to risk scenarios, like a partial ecosystem collapse, and the various transmission channels and feedback loops. Protecting land and marine areas, as outlined in the 30x30 target, can help reduce risks by safeguarding biodiversity and related ecosystem services.

Besides country-specific analyses and risk assessments, biodiversity can be incorporated into portfolio construction to mitigate nature-related risks. In the following section, we discuss related considerations and show how an EM government bond portfolio can be aligned to the 30x30 target.

[21] "Nature Loss and Sovereign Credit Ratings", Finance for Biodiversity Initiative, Jun 2022.
[22] "Healthy Debt on a Healthy Planet: Towards a Virtuous Circle of Sovereign Debt, Nature and Climate Resilience", Final Report of the Expert Review on Debt, Nature and Climate, Apr 2025.
[23] "Integrating Nature into the IMF-World Bank's Debt Sustainability Framework for Low Income Countries", CLimate, Environment, and Nature (CLEAN) Helpdesk, Jul 2025.

Nature and biodiversity exposure in government bond portfolios

To connect the country-level impacts of nature and biodiversity risks with investable bond portfolios, we analyse a range of benchmark indices, both for developed and emerging markets, since these often act as reference points for portfolio construction. There are a range of relevant bond indices with different characteristics and composition, of which the below is a selection:

- **FTSE World Government Bond Index (WGBI):**[24] fixed-rate, local currency, investment-grade debt, currently includes bonds from 25 countries
- **Bloomberg Global Aggregate Treasuries Index:**[25] fixed-rate, local currency, investment-grade debt, currently includes bonds from over 40 countries
- **J.P. Morgan Government Bond Index (GBI) Global:**[26] fixed-rate, local currency bonds issued by a fixed list of 13 core developed markets
- **J.P. Morgan GBI-EM Global Diversified:**[27] comprehensive index of EM local government debt, currently includes bonds from 19 countries

A few general observations: indices that include developed markets (DMs), are heavily dominated by exposure to the United States (GBI Global: ~50%, WGBI: ~41%, Global Agg. Treasuries: ~34%) and concentration in these indices is high, with a dozen or fewer countries accounting for more than 90% of their composition. This is also the case for the GBI-EM, but the popular "diversified" version of this index caps country weights at 10%. Overall, these four indices are broadly comparable in terms of instruments (i.e. government bonds issued in their respective currencies); their main differences are in index composition.

Technically, a portfolio will be aligned to the 30x30 target if all country constituents protect 30% of land and marine areas, but this is not a necessary condition due to differences in country sizes and the ways in which protected areas can be aggregated. On a portfolio level, for instance, a large country that protects more than 30% of its territory could compensate for smaller countries that protect less. Therefore, aligning a portfolio to the 30x30 target should take into account the size of countries and protected areas, not just a weighted average of the shares of protected areas, in our view. Table 1 shows this aggregated data on an index level for land and marine areas.

Table 1. Land and marine areas (protected, total, share), aggregated on index level for key benchmarks (as of 30 Jun 2025). Source: AFII, Bloomberg, FTSE, J.P. Morgan.

	Land area (km²)			Marine area (km²)		
	Protected	Total	Share	Protected	Total	Share
WGBI	740,802	5,274,965	14.0%	829,529	4,408,070	18.8%
Global Agg Treas.	653,530	4,586,101	14.3%	749,221	4,086,458	18.3%
GBI Global	707,011	5,172,481	13.7%	1,002,731	5,288,061	19.0%
GBI-EM GD	438,195	2,461,843	17.8%	219,336	1,795,807	12.2%

[24] "FTSE World Government Bond Index (WGBI)", FTSE Russell, accessed Jul 2025.
[25] "Bloomberg Global Aggregate Treasuries Index", Bloomberg, 11 Mar 2024.
[26] "J.P. Morgan Global Government Bond Index (GBI Global)", J.P. Morgan, 20 Jun 2024.
[27] "J.P. Morgan GBI-EM", J.P. Morgan, 31 Jul 2024.

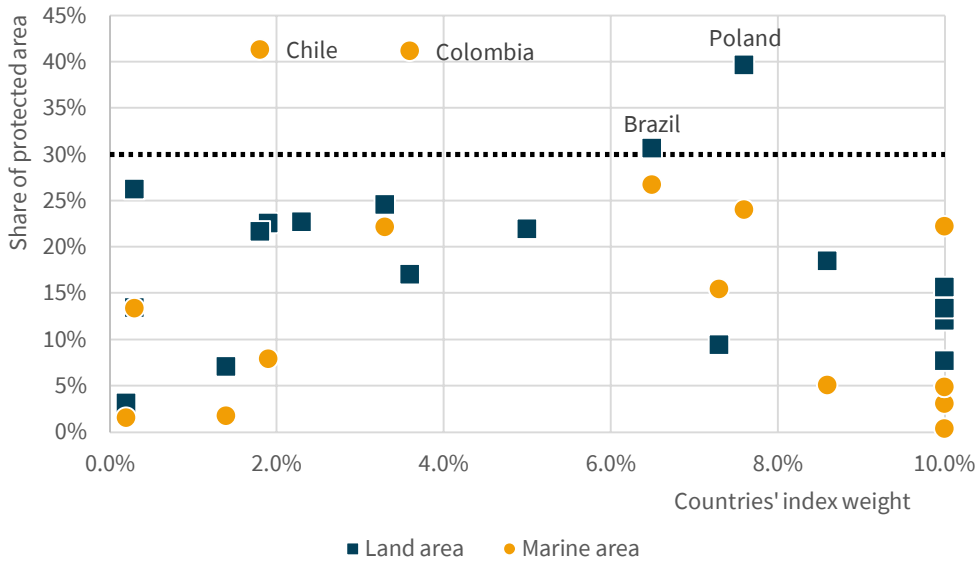
Aggregates for indices that include the US are heavily driven by its very high index weight and the country's large size. To illustrate, even if the twelve other countries in the GBI Global protected all their land, this would still not be sufficient to offset at the index level the rather low share of protected territory in the US (13%), which is at the bottom of the list together with Canada. The share of US protected marine areas is slightly higher at 19%. However, the elephant in the room is that the US is not a signatory of the GBF.

Fundamentally, the economic risks from a partial ecosystem collapse (e.g. impact on GDP and credit ratings) look relatively manageable in the US compared to most other countries, according to the abovementioned studies. This doesn't mean nature protection in the US doesn't matter. But looking at the fundamental issues around US debt more broadly (e.g. fiscal deficits, debt-to-GDP ratio, politics), nature-related risks are likely not high up most investors' list of concerns at the moment. Also, portfolio optimisation purely based on the 30x30 target would require outsized changes in country allocation (e.g. divestment from US) at the expense of other key considerations (e.g. impact on credit risk, diversification, liquidity).[28]

Nature-related risks are generally higher in emerging markets, as larger proportions of their economies directly rely on ecosystem services. While the share of protected land area for GBI-EM is somewhat higher (17.8%) compared to DM-heavy indices (13.7-14.3%), the five largest countries, each accounting for 10% of each benchmark's weight, are below the aggregate level. Meanwhile, the share of protected marine areas (12.2%) is the lowest among the indices analysed.

As illustrated in Figure 4, there are only two countries in each category that are above the 30% target, but overall the country weights and share of protected areas show fairly broad dispersion, suggesting there is room for portfolio optimisation.

Figure 4. Share of protected area (land, marine) and countries' index weights for GBI-EM GD. Source: AFII, J.P. Morgan, Protected Planet.

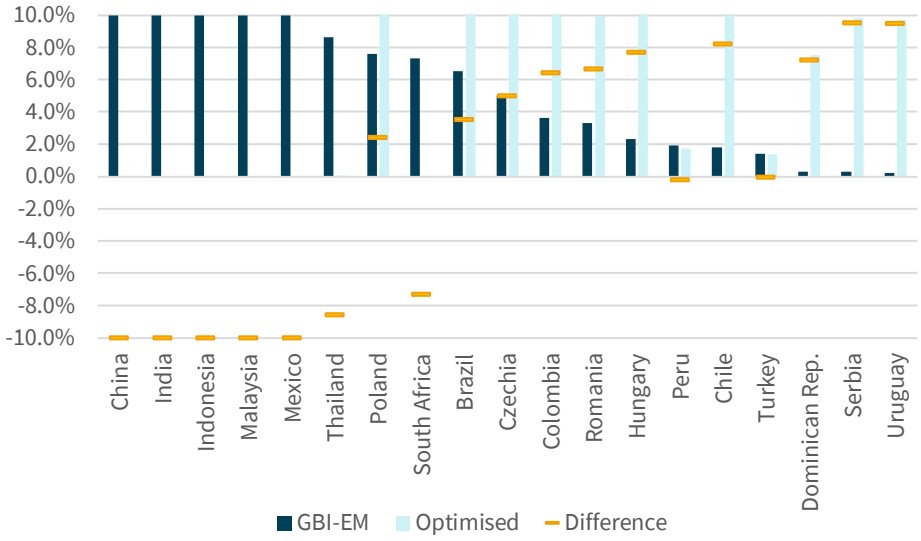


[28] This was the broad conclusion of our earlier work "Kunming-Montreal agreements: a bond perspective", AFII, 5 Apr 2023.

As a starting point, we run optimisations[29] for protected land and marine areas separately, with a few restrictions (maximum country weight 10%, no negative weights, and country weights have to sum to 100%). This simple approach with the goal to maximise the shares of protected areas gives some promising results, with 28.7% for the land optimisation and 35.3% for the marine optimisation. Investors only concerned about one of the other could implement the respective country allocation. Compared to the benchmark allocation, this is a meaningful improvement in each category (land: 28.7% vs 17.8%, marine: 35.3% vs 12.2%). Overall, these optimisations cause the portfolios to become more concentrated in fewer countries.

As a next step, we run an optimisation on the average of the share of protected land and marine areas with a single set of country weights, resulting in average of 30.3% based on 27.8% and 32.8% for land and marine areas, respectively. The changes in country weights are shown in Figure 5. Interestingly, the five largest countries in the benchmark, each accounting for 10%, are not part of this optimised portfolio. Meanwhile, several countries with small benchmark weights increased.

Figure 5. Country weights in GBI-EM GD benchmark and the optimised portfolio (maximising the combined share of protected land and marine areas), including differences. Source: AFII, iShares, J.P. Morgan, Protected Planet.



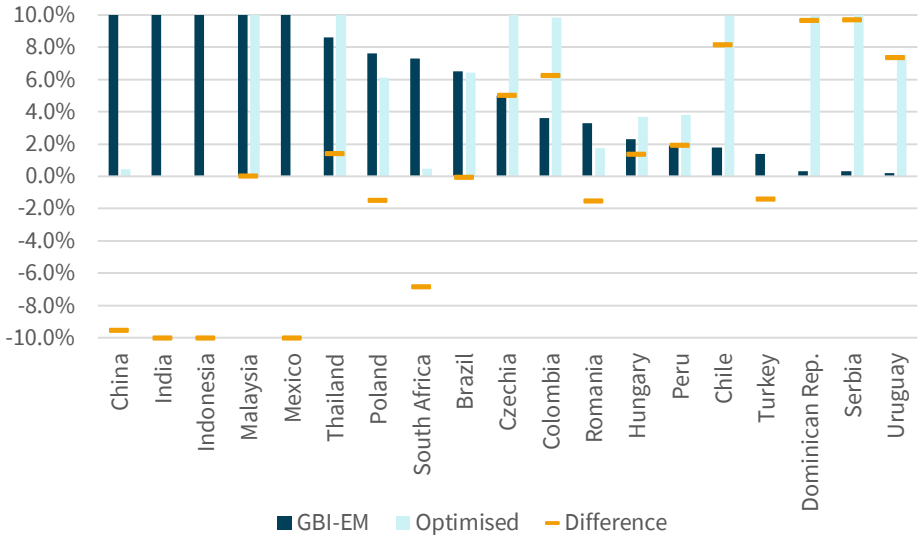
While this analysis suggests it is possible to create a portfolio aligned to the 30x30 target on an aggregate level, we have yet to consider other portfolio parameters like yield and duration. To incorporate these, we calculate country-level data using the iShares J.P. Morgan EM Local Currency Bond ETF (LEMB) and aggregate it using the latest monthly benchmark weights.[30] This approach results in a yield of 7.9% with a duration of 4.6 for the optimised portfolio (benchmark: 6.5% yield, 5.3 duration). Looking at average local-currency ratings (Moody's / S&P / Fitch), the aggregated rating is indeed half a notch lower on aggregate level than the benchmark.

To go further, we re-run this optimisation and include country-level yield and duration with the goal of keeping them at the same aggregated level as the benchmark. As shown in Figure 6, there

[29] We use the generalised reduced gradient (GRG) nonlinear method for optimisation here. As results are dependent on the initial values, we run the optimisation with 250 random starting values. While the values converge to the illustrative values outlined in the following paragraphs, they could be local optimums and there might be another solution with even slightly better results (i.e. global optimum).
[30] Index constituents based on iShares J.P. Morgan EM Local Currency Bond ETF (as of 16 Jul 2025), country weights based on J.P. Morgan GBI-EM Global Diversified (as of 30 Jun 2025).

are some notable differences compared to the previous optimisation. For example, there are higher allocations to Malaysia and Thailand, which are better rated than countries like Romania where the allocation is lower than before. Overall, the aggregated credit rating is fairly close to the benchmark. In terms of protected areas, the average is at 27.9% (land: 25.5%, marine: 30.3%). While this is lower than before, it's still well above the benchmark level of 15%. Importantly, if countries complying with the target achieve it, the portfolio could reach a share of protected areas of 30% on average.

Figure 6. Country weights in GBI-EM GD benchmark and the optimised portfolio (maximising the combined share of protected land and marine areas, while keeping aggregated yield and duration at the same level as the benchmark), including differences. Source: AFII, iShares, J.P. Morgan, Protected Planet.



However, protected land is only one way of measuring biodiversity and conservation. Other variables matter too. For instance, the Environmental Performance Index (EPI), a collaboration between Yale University and Columbia University, provides a broad coverage of indicators and countries.[31] Here, we focus on the Ecosystem Vitality sub-index which is based on 34 indicators, about a third of them related to Biodiversity & Habitat, across six categories — it measures how well countries are preserving, protecting and enhancing ecosystems and the services they provide.[32] Using benchmark country weights, the GBI-EM has an aggregated score of 50.1 and the final stage optimised portfolio reaches 57.9, based on country scores ranging from a low of 30.4 (India) to a strong 79.2 (Poland).[33] This data illustrates again the wide range of countries included in the GBI EM, offering meaningful potential for optimisation beyond market weight.

[31] Appendix B shows an overview of the index composition; for further details: EPI.
[32] Biodiversity & Habitat (12), Forests (5), Fisheries (5), Air Pollution (4), Agriculture (4), Water Resources (4); for further details: Ecosystem Vitality.
[33] For reference: globally, the scores range from 83.1 (Luxembourg, rank 1) to 22.7 (Cabo Verde, rank 180). Poland and India are on rank 3 and 171, respectively.

Table 2. Overview of key characteristics of benchmark and optimised portfolios. Source: AFII, iShares, J.P. Morgan, Protected Planet., Yale University.

	Benchmark	Optimised portfolios[34]		
	GBI-EM GD	Maximising land and marine areas with separate country weights	Maximising land and marine areas with combined country weights	Maximising land and marine areas with combined country weights, same duration and yield as benchmark
Countries:	19	12	12	15
Yield:	6.5%	6.6% (land) / 8.8% (marine)	7.9%	6.5%
Duration:	5.3	4.9 (land) / 4.7 (marine)	4.6	5.3
Protected areas (% of total):				
▪ Land	17.8%	28.7%	27.8%	25.5%
▪ Marine	12.2%	35.3%	32.8%	30.3%
▪ Average	15.0%	/	30.3%	27.9%
EPI: Ecosystem Vitality	50.1	61.6 (land) / 59.8 (marine)	62.8	57.9
Illustration:			Figure 5	Figure 6

To summarise, this analysis shows the standard approach to construct benchmark indices (i.e. market weight) leaves significant optimisation potential for portfolio managers to incorporate other considerations, such as the reduction of nature-related risks. Considering the increasing relevance of biodiversity for countries, particularly in emerging markets, it is sensible to assess related risks and opportunities. While there is no one-size-fits-all indicator, the 30x30 target can act as useful reference, ideally complemented by other indicators like the Ecosystem Vitality sub-index of the EPI. As illustrated, portfolio construction might involve trade-offs between different factors, ranging from traditional risks (e.g. duration, ratings) to biodiversity (e.g. protected areas, ecosystem vitality). Ultimately, the portfolio optimisation can be tailored to investor preferences and requirements.

Conclusions

Biodiversity matters for government bond investors. In this analysis, we show there are different ways to incorporate relevant considerations into credit analysis and portfolio construction, complementing other credit risk considerations.

As shown in our analysis for government bonds in emerging markets, it is possible to significantly increase the share of protected areas at the portfolio level, while keeping aggregated yield and duration at the same level as the benchmark. However, protecting areas in and of itself is not sufficient to address biodiversity decline. Other data (e.g. ecosystem vitality) can help to assess conditions at the country level.

There are a range of issues that nature-concerned investors could stress when engaging with policymakers:

[34] Restrictions for all optimisations: maximum country weight 10%, no negative weights and country weights adding up to 100%.

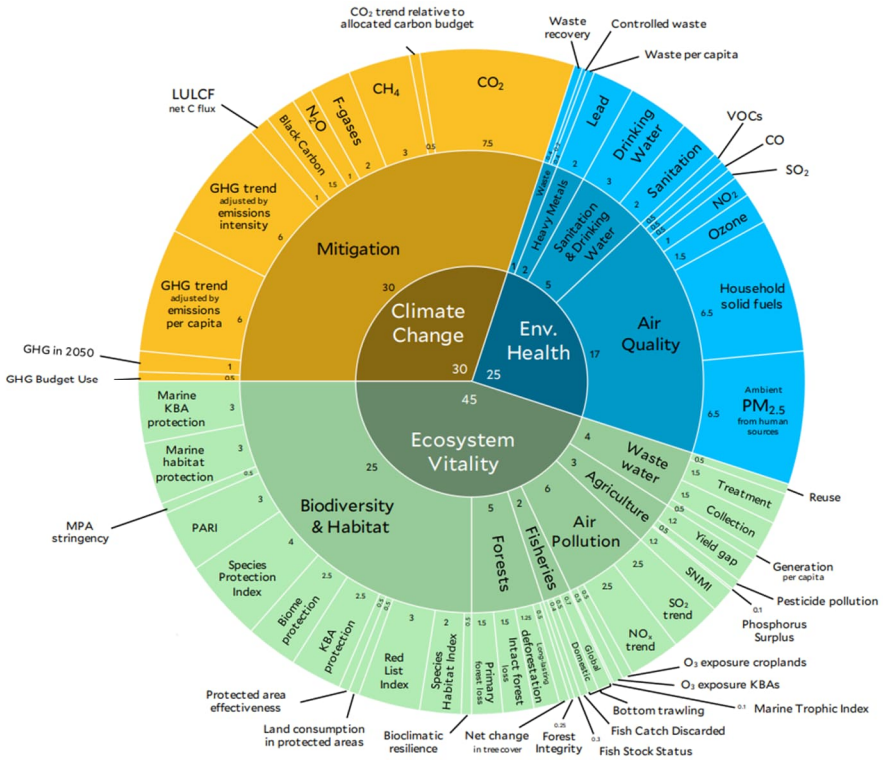
- Nature and biodiversity matter. The GBF is an important framework to halt and reverse biodiversity loss. A strong commitment to the 30x30 target is important to achieving this goal by 2030. This necessitates effective conservation and management of key areas as well as equitable governance.
- Given the potential implications of nature degradation on economies, it would be prudent to embed related considerations in credit risk analysis. Incorporating nature and biodiversity risks into sovereign credit ratings is necessary to account for the potential macroeconomic consequences from the declining ecosystems. With the growing relevance of nature-related risks, particularly in low-income and lower-middle-income countries, such risks should be included in debt sustainability frameworks and analyses.

Appendix

A) Key economic effects of nature-related financial risks. Source: NGFS.

Micro level effects	Macro level effects
Capital destruction: Damage to assets arising from physical shocks and hazards such as flooding or landslides.	*Prices:* Changes in prices of commodities, energy, or water could create inflationary pressure.
Stranded assets: New regulations or changing consumer preferences resulting in premature write-offs of assets, for instance because a factory is located in an area that becomes designated as protected.	*Productivity:* Effects on GDP from a diversion of investment or lower risk appetites for innovation, reduced labour productivity (e.g. as a result of heat or pollution), the loss of provisioning or regulating service productivity (e.g. affecting agriculture) or damage and disruptions to assets.
Price volatility of raw materials: Higher or more volatile prices of commodities due to, for instance, failed harvests of food crops.	*Capital:* Higher investment needs for mitigation or adaptation to prevent nature degradation and potentially accelerated depreciation of the current capital base.
Disruptions of production processes and value chains: Increases in costs as a result of temporary disruption to businesses or households processes, such as a suspension of services due to flooding.	*Socio-economic changes:* Effects from changing societal preferences, arising inequalities, migration or conflict.
Relocation and adjustment of economic activities: Relocation or alteration of economic activities to account for a reduction or loss of ecosystem services, or to reduce negative impacts, such as planting different crops on a farm.	*Trade and capital flows:* Changes to trade and capital flows may result from shocks in ecosystem service provision, potentially amplified via value chains, which affects exchange rates and sovereign credit ratings.
Pricing of externalities: Cost increases as a result of pricing in negative (or positive) impacts on nature, for instance a tax on certain pollutants.	*Fiscal balances:* The lack of access to ecosystem services may necessitate an increase in social protection spending on, for instance, water or food. Losses in production and employment may also reduce fiscal revenues.

B) The 2024 EPI Framework. The framework organizes 58 indicators into 11 issue categories and three policy objectives, with weights shown at each level as a percentage of the total score. Source: Yale Center for Environmental Law & Policy.



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