REPORT ON BIODIVERSITY RISK MANAGEMENT BY INSURERS

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European Insurance and
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1. EXECUTIVE SUMMARY

1. This report is the first European supervisory report mapping current practices and challenges in the identification, measurement, and management of biodiversity risks by (re)insurer as part of the existing Solvency II risk management framework.
2. The report analyses market practices based on the existing regulatory requirements for the identification and management of sustainability risks in the Solvency II Directive and Delegated Regulation.
3. Biodiversity, or more generally, nature-related loss can result in significant economic risks, potentially jeopardising financial stability. It can affect the value of investments, the frequency and intensity of insured losses, and the overall risk profile of insurers' portfolios. EIOPA identified for example a significant investment exposure in the insurance sector to assets dependent on nature and ecosystem services, which may indicate an exposure to biodiversity risks. A lack of data prevents to date a comprehensive insight into the sector's underwriting exposure to biodiversity risk.
4. Biodiversity loss represents a multifaceted risk, which is intertwined with climate change risk. The measurement of the risk is not straightforward, and while datapoints on, for example, the evolution of species or habitats are available, these are not easily translated into risk metrics for financial decision-making purposes by (re)insurers.
5. Challenges to the integration of biodiversity and nature-related risk in insurers' risk management practices range from the limited capacity to identify the risks (linked to data limitations), to the complex nature of biodiversity (due to its regional specificities and its interlinkages with other risks such as climate change).
6. Yet, the consultation on the draft report showed that biodiversity and nature-related risks are starting to be measured and integrated in insurers' risk management practices, and tools and methodologies exist to guide insurers in doing so.
7. The report shows promising market practices and, going forward, EIOPA identifies areas for further engagement to support biodiversity and nature-related risk assessment. These include seeking closer collaboration among stakeholders to enable synergies in the collection of and access to data, the development of models and scenarios, and targeted identification of specific themes of priority on biodiversity and nature-related risks. Dedicated attention to potential lines of business and areas most at risk could be considered.
8. Further action could be taken to address the climate-biodiversity *nexus*. EIOPA recognises the critical interconnection between climate change and biodiversity/nature loss, emphasising their mutual impact on natural catastrophes. Targeted initiatives that leverage this relationship could help advance climate adaptation efforts and, in turn, address natural catastrophe protection gaps.
9. Eventually, EIOPA aims to engage in structured capacity building among supervisors and with industry on the management of biodiversity risk following the publication of this report.

2. BACKGROUND

10. If unmitigated, biodiversity loss can result in significant economic risks, potentially jeopardising financial stability.
11. The NGFS notes that "biodiversity loss and nature-related risks could have significant macroeconomic and financial implications", and the failure to address these risks is "a source of risks relevant for financial stability".[1] Loss of biodiversity and collapse of ecosystems are among the top three most severe risks over the long term (10 years).[2]
12. More than half of global gross domestic product (GDP) would be dependent on nature and its services.[3] Water-related risks are dominant and could constitute 7-9% of global GDP, with significant impacts on the manufacturing sector. Risks to agriculture are also significant, estimated at around 14-18% of output at risk from water-related risks and potentially 12% of output at risk related to pollinator decline.[4]
13. According to the OECD, the world lost an estimated USD 4-20 trillion per year in ecosystem services from 1997 to 2011, owing to land-cover change and an estimated USD 6-11 trillion per year from land degradation.[5] If no mitigating measures are taken ('business as usual'), the loss of ecosystem services could lead to an annual loss of USD 479 billion. Over the period between 2011 and 2050, the total cumulative loss would be USD 9.87 trillion.[6]
14. Other estimates have been made to suggest that biodiversity loss and ecosystem degradation could lead to annual economic losses ranging from EUR 1.7 trillion to EUR 3.9 trillion.[7]
15. Studies on the exposure of the financial sector (including the insurance sector) show that 36 to 42% of their investments are in economic activities that depend on biodiversity or nature.[8]
16. EIOPA has identified that approximately 30% of insurers' direct corporate bond and equity exposures are highly and directly dependent on at least one ecosystem service (e.g. water resources. See Annex).[9]

2.1 MANDATE TO EIOPA FOR A REPORT ON BIODIVERSITY LOSS RISK IN THE ORSA

17. Considering these economic and financial impacts and dependencies on biodiversity and nature, the amended Solvency II Directive includes a mandate for EIOPA to assess (re)insurance

[1] NGFS (2022). Statement on Nature-Related Financial Risks.

[2] World Economic Forum (2024). The Global Risks Report 2024.

[3] World Economic Forum (2020). Nature Risk Rising, Why the Crisis Engulfing Nature Matters for Business and the Economy.

[4] Ranger, N., et al. (2023): The Green Scorpion: the Macro-Criticality of Nature for Finance – Foundations for scenario-based analysis of complex and cascading physical nature-related risks.

[5] OECD (2019) Biodiversity: Finance and the Economic Case for Action.

[6] WWF (2020). Global Futures, Assessing the global economic impacts of environmental change to support policy-making.

[7] DNB Biodiversity Working Group (dnb.nl)). Or also: World Economic Forum (2010). Biodiversity and business risk, A global risks network briefing. The report refers to The Economics of Ecosystems and Biodiversity (TEEB), Cost of Policy Inaction Report, 2008. $2 - $4.5 trillion is the present value of net ecosystem service losses from land-based ecosystems (e.g. forests, tundra, cultivated land) caused in 2008 and continuing for 50 years, based on discount rates ranging from 1 – 4%.

[8] DNB (2020). Indebted to nature – Exploring biodiversity risks for the Dutch financial sector. Banque de France (2021). Working Paper, A "Silent Spring" for the Financial System? Exploring Biodiversity-Related Financial Risks in France.

[9] EIOPA (2023). Financial Stability Report June.

undertakings' current own risk and solvency (ORSA) practices and identify necessary actions for undertakings to adequately consider biodiversity loss risks.

> Article 304(c)(3) of Directive EU 2025/2 [10] (amending the Solvency II Directive) mandates EIOPA to "*[…] evaluate whether and to what extent insurance and reinsurance undertakings assess their material exposure to risk related to biodiversity loss as part of the assessment referred to in Article 45(1). EIOPA shall subsequently assess which actions should be taken to ensure that insurance and reinsurance undertakings duly consider these risks. EIOPA shall submit a report with its findings to the Commission by 30 June 2025.*"

18. EIOPA's report aims at presenting a structured overview of the type of current market practices. The report contributes to sharing insights into the challenges (re)insurers face in managing biodiversity and nature-related risk. The report is a fact-finding exercise which does not set new requirements but aims to enhance the understanding of the risk or its potential relevance for action by (re)insurers. By promoting a more informed assessment of biodiversity risk, this document can contribute to more effective decision-making and supervisory convergence on the assessment of the risk in the insurance sector, and potential actions.
19. EIOPA launched a public consultation on the draft report in December 2024, which ended on 26 February 2025. EIOPA received 15 responses from the private sector, non-profit organisations, academia, as well as private individuals. In addition, EIOPA conducted a stakeholder outreach in June 2024 to gather evidence of industry experiences and practices related to integrating biodiversity loss risk assessments into their ORSA.[11]
20. The revised report was presented to EIOPA's Board of Supervisors (BoS), for adoption, who approved it on 25 June 2025. The comments received during the consultation as well as their resolution are available on the EIOPA webpage.

Feedback statement from the public consultation

21. EIOPA noted promising steps that are being taken across the industry to identify biodiversity risks and to take measures to reduce their (financial) impact on certain activities. The consultation allowed EIOPA to collect further market practices which show that the industry is aware of the potential risk to the economy as a whole or to specific investment or underwriting activities.
22. Some stakeholders noted the relevance of drawing from climate risk assessment practices where appropriate, given the relation between loss of nature and natural catastrophes. More

[10] Directive (EU) 2025/2 of the European Parliament and of the Council of 27 November 2024 amending Directive 2009/138/EC as regards proportionality, quality of supervision, reporting, long-term guarantee measures, macro-prudential tools, sustainability risks and group and cross-border supervision, and amending Directives 2002/87/EC and 2013/34/EU (amending the Solvency II Directive). Directive - EU - 2025/2 - EN - EUR-Lex

[11] EIOPA (2024). Stakeholder engagement on biodiversity loss risk for insurers - EIOPA (europa.eu).

specifically, some respondents noted difficulties to distinguish biodiversity from climate change risk and were concerned about potentially double counting the risk. Stakeholders also agreed that a single "footprint" indicator (compared to CO2e metrics for global warming) seems overly simplistic. Stakeholders also noted the current lack of developed quantitative methodologies for measuring the risk, which may lead to performing qualitative assessments only. However, these challenges do not seem to prevent actions or risk assessments in specific lines of business or for specific biodiversity-related risks.

23. As for the materiality assessment, the consultation showed insightful examples of market practices regarding biodiversity risk, while also noting a call for suitable quantitative as well as qualitative indicators.
24. As to the financial risk assessment, stakeholders expressed a preference for allowing a variety of models and approaches. Respondents highlighted scenarios ranging from broad analyses to more specific, sector-focused contexts (incl. agriculture, health, forestry, fisheries and marine ecosystems, real estate, tourism).
25. Regarding possible management actions, the report includes further examples provided by stakeholders on possible types of action: exclusions, nature-based underwriting and investment practices and engagement strategies.
26. EIOPA also received the views from its Insurance and Reinsurance Stakeholder Group (IRSG). Their main perspectives and considerations which have been reflected in this report are:
    - Simplicity and practicality: The IRSG noted the need to avoid overcomplicating the risk assessment process. The key priority should be establishing understandable and practical models rather than striving for perfect methodologies in a rapidly evolving field with limited data and experience.
    - Interdependencies vs. separate assessment: The interdependencies between climate and biodiversity risks should be recognised, but it should also be acknowledged that, due to the (current) lack of biodiversity-related data and the complexity of relevant metrics, insurers may initially need to separate the two analyses. Climate risk assessment may be more quantitative, while biodiversity risk assessment may remain qualitative in the early stages.
    - Integrated approach: At the same time, IRSG notes that the climate-biodiversity nexus exhibits self-reinforcing feedback loops, and an integrated approach would ensure consistency in firms' strategies, operating models, and capabilities. Reflecting on current difficulties in assessing biodiversity risks, IRSG believes that integrating biodiversity assessment into existing climate risk models would be more practical for undertaking.
27. IRSG recognises the importance of integrating biodiversity risks into insurers' risk frameworks and suggests an incremental approach that aligns with climate risk efforts and broader sustainability considerations.
28. Based on the market practices collected for the purpose of this report, EIOPA sets out in the conclusions of the report a potential way forward to support the (re)insurance industry in its efforts to identify, measure, manage and monitor biodiversity-related risks.

2.2 BIODIVERSITY RISK ASSESSMENT IN SOLVENCY II

29. The Solvency II Directive 2009/138, as amended by (EU) Directive 2025/2, and the Solvency II Delegated Regulation (EU) 2015/35, as amended by Delegated Regulation (EU) 2021/1256[12], require undertakings to identify, measure, manage and monitor sustainability risks.
30. Undertakings are required to integrate all sustainability risks, including environmental risks, such as biodiversity risks, into their governance and risk management system and ORSA, in accordance with Articles 44(2), 45(2) and 45a of the Solvency II Directive and Article 260(1)(a) of the Solvency II Delegated Regulation.
31. The risk management function must identify and assess sustainability risks, which should form part of the (re)insurers' own risk and solvency assessment (ORSA) (as per Article 269 Solvency II Delegated Regulation, with reference to Articles 262 Solvency II Delegated Regulation and 45 Solvency II Directive regarding ORSA). For climate-related risks, Solvency II requires scenario analysis for material risks (Solvency II Directive, Article 45a). [13] Materiality assessment is inherently embedded in the ORSA, which requires undertakings to conduct a comprehensive evaluation of all potential emerging risks.
32. The Solvency II Delegated Regulation specifies the following:
    - **Risk management function**: The risk management function is responsible for identifying and assessing emerging risks and sustainability risks (Article 269 (1) (e) Solvency II Delegated Regulation). Sustainability risks identified by the risk management function must be included in the ORSA (Article 269 (1a) Solvency II Delegated Regulation). These risks must also be integrated into the risk management areas underwriting and reserving policy, investment policy, and where applicable, other policies (e.g. policies on ALM, liquidity, concentration, operational, reinsurance and other risk mitigating techniques, deferred taxes risk management) (Article 260 Solvency II Delegated Regulation). The underwriting and reserving policy must include actions to be taken by the undertaking to assess and manage risks related to inadequate pricing and provisioning assumptions due to sustainability risks. The investment risk management policy must detail actions to ensure that sustainability risks in the investment portfolio are properly identified, assessed and managed.
    - **Prudent person investment principle**: For risk management purposes, when identifying, measuring, monitoring, managing, controlling, reporting and assessing risks arising from investments, undertakings shall take into account the potential long-term impact of their

[12] Commission Delegated Regulation (EU) 2021/1256 of 21 April 2021 amending Delegated Regulation (EU) 2015/35 as regards the integration of sustainability risks in the governance of insurance and reinsurance undertakings. Delegated regulation - 2021/1256 - EN - EUR-Lex

[13] EIOPA issued application guidance on climate related risk materiality risk analysis and is monitoring the application of the EIOPA Opinion on climate change scenarios. See: EIOPA (2022). Application guidance on climate change materiality assessments and climate change scenarios in ORSA. EIOPA also conducted the analysis of the risk profile for fossil-fuel related stocks and bonds and found evidence which could support a differentiated capital treatment (EIOPA's Report on the Prudential Treatment[13] of sustainability risks for insurers). Final Report on the Prudential Treatment of Sustainability Risks for Insurers - EIOPA. For social risks, EIOPA's Report on the Prudential Treatment[13] of sustainability risks for insurers indicates potential for development of Pillar II requirements for qualitative materiality risk assessment as part of ORSA. No advice has been provided on a dedicated Pillar I prudential treatment. Social risks and objectives can also be addressed through product oversight and governance, ensuring fair treatment.

investment strategy and decisions on sustainability factors and the sustainability preferences of its customer (Article 275a Solvency II Delegated Regulation (EU) 2015/35).

- **Actuarial function**: As part of its responsibility for the underwriting policy, the actuarial function must include conclusions regarding the effect of sustainability risks in its opinion (Article 272 (6) (b) Solvency II Delegated Regulation). Additionally, the actuarial function must take into account all relevant information, including on sustainability risks, in its other tasks, such as assessing the adequacy of technical provisions (Article 272 (2) Solvency II Delegated Regulation (EU) 2015/35).
- **Remuneration policy:** The remuneration policy must include information on how it integrates sustainability risks in the risk management system (Article 275 Solvency II Delegated Regulation (EU) 2015/35).[14]

33. In addition to the explicit references to the integration of sustainability risks in the governance and risk management of undertakings,
    - The handling of sustainability risks must be appropriately considered in the relevant written policies (Article 41 (3) of the Solvency Directive);
    - Employees must be empowered and informed so that they can properly carry out the tasks assigned to them (Article 258 (1) (e) (f) Solvency II Delegated Regulation (EU) 2015/35); and
    - The compliance function must also assess potential compliance risks related to both existing and new requirements on sustainability (Article 46 (2) Solvency II Directive 2009/138).
34. The administrative, management or supervisory body (AMSB) would set out the risk strategy and appetite, supported by the written policies that would specify how the undertaking intends to deal with biodiversity risks. In practice, the strategy would be based on potential exposures in their investment and underwriting portfolio to biodiversity-related risks. In the context of Solvency II, risks are considered material when ignoring them could influence the decision-making or judgement of the users of the information.[15]
35. A materiality risk assessment aims to qualitatively and ideally quantitatively determine which risks are material to the undertaking. For a proportionate materiality risk assessment, the undertaking would consider the nature, scale and complexity of the underlying biodiversity risks. Indicators for assessing the proportionality of biodiversity risks can be, for example, the size of relevant investment or underwriting exposure, the impact of biodiversity risks on this exposure and the probability that the impact will take place.
36. When assessing biodiversity risks and determining their materiality, both short-term and long-term effects can be considered. As these risks will most likely materialise over a longer time horizon, the medium-to-longer-term consequences of biodiversity losses can have major impacts for the undertaking itself.

[14] European Commission (2021a). Commission Delegated Regulation (EU) 2021/1256 of 21 April 2021 amending Delegated Regulation (EU) 2015/35 as regards the integration of sustainability risks in the governance of insurance and reinsurance undertakings (Solvency II Delegated Regulation).

[15] See Recital 1 and Article 291 of the Solvency II Delegated Regulation.

37. When assessing biodiversity risks and determining their materiality, insurers would also consider the impact of their investment strategy and decisions on sustainability factors.[16] This double materiality implies that financially material sustainability risks for the undertakings can arise on the one hand from the external sustainability risks themselves, but also from the effects of the undertakings' own financial decisions on sustainability factors.[17]
38. If the (investment, underwriting) exposure shows to be material, the undertaking would conduct more quantitative financial risk assessment via scenario analysis in the ORSA. The ORSA in Solvency II includes the assessment of all risks that could materially affect own funds for all risk categories included in the calculation of the solvency capital requirement (SCR) – such as underwriting, counterparty default, market, operational risks -, as well as other risks that may not be fully captured in the SCR calculation (e.g. strategy and reputational risks).
39. Based on the outcome of this financial risk assessment as part of the ORSA, the undertaking can then consider appropriate actions aligned with its risk management appetite and strategy. These actions should aim to manage both the impact of biodiversity loss on the insurer's operations and the impact of the insurer's activities on biodiversity, which can translate into financial risks.

[16] Art. 275a of the Solvency II Delegated Regulation.

[17] European Commission (2021b), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Strategy for Financing the Transition to a Sustainable Economy, COM/2021/390 final.

3. DEFINING BIODIVERSITY AND RISK DRIVERS FOR INSURERS

3.1 DEFINITION OF BIODIVERSITY RISK

Biodiversity and nature[18]

40. The mandate to EIOPA refers to biodiversity risk. Biodiversity is often referred to interchangeably with "nature", though biodiversity specifically refers to the variety of different species and ecosystems that make up the natural world.
41. Biodiversity is inextricably linked to the state of nature. Nature encompasses all biotic and abiotic elements on Earth, and provides a continuous flow of benefits to people, often referred to as ecosystem services. These ecosystem services are categorised as follows:
    - Provisioning services: provisioning of raw materials, such as food and water, shelter, energy and other resources,
    - Regulating & maintenance and supporting services: regulation of climate and natural processes, pollination, filtering of waste, purifying and maintenance of natural resources,
    - Cultural services: non-materialistic goods and services ('spiritual and recreational benefits'), such as green spaces, as well as land and seascapes that allow for leisure and tourism-related activities.
42. Biodiversity[19] ensures the ongoing provision of these ecosystem services. For this reason, the terminology of nature-related risk may be more appropriate, while recognising that the loss of biodiversity is a key risk to the provision of ecosystem services.
43. Many industries heavily rely on or directly impact nature. Consequently, biodiversity/nature loss poses a multidimensional risk for insurers, potentially affecting, among other things, the value of investments held or the intensity and frequency of insured losses.

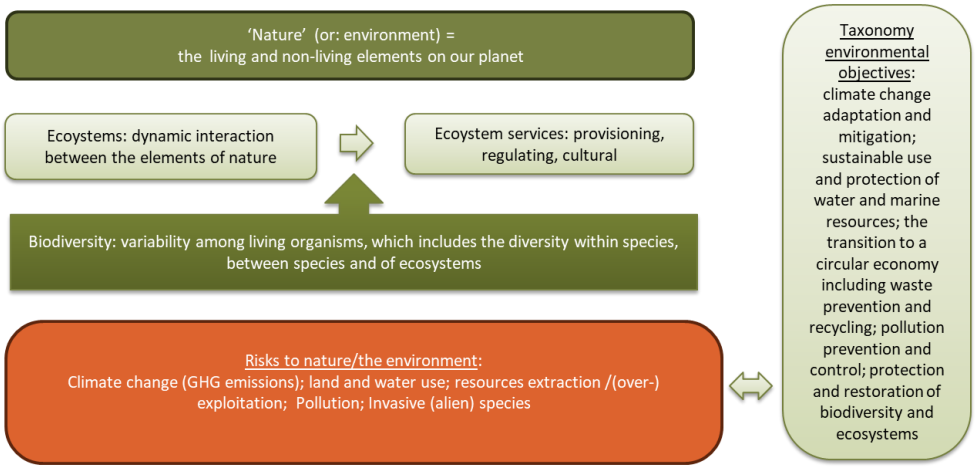


Figure 1: interrelation of nature, ecosystems, biodiversity and risks to nature. Based on IBPES key drivers of biodiversity loss.

[18] The report builds on the earlier EIOPA Staff Paper on Nature-Related Risks.

[19] Defined 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.' See Convention on Biological Diversity (1992), Article 2.

44. A number of frameworks help defining biodiversity risk as well as identifying risk drivers and transmission channels, including exposures in the real economy based on impacts and dependencies on ecosystem services (see Box 1 below).
45. These frameworks show a common understanding of the drivers of these risks:
    - Physical risks: risks to an organisation's operations or assets resulting from the degradation or loss of nature and biodiversity (e.g. loss of ecosystem services, changes in species composition, or extinction).
    - Transition risks: risks to an organisation's business model or profitability resulting from the transition to a nature-positive economy (e.g. changes in regulations, stakeholder expectations, or market preferences).
    - Legal or other operational risks: potential costs or liabilities arising from an organisation's impact on biodiversity (e.g. fines, litigation, or reputational risk).

    References to these frameworks are included shown in Box 1 below.

Box 1: Frameworks for identifying and defining biodiversity risk.

The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services** (IPBES) uses the terms "biodiversity loss" and "nature's degradation" to describe the decline in biodiversity and the degradation of ecosystem services. These risks are driven by changes in sea and land use, overexploitation of organisms, pollution, invasive alien species, and climate change[20] (further referred to as 'IBPES risk drivers').

The **EU Taxonomy Regulation 2020/852** defines environmental objectives in relation to these IBPES pressure points. The objectives include the sustainable use and protection of water and marine resources, transitioning to a circular economy (including waste prevention and recycling), pollution prevention and control, protecting and restoring biodiversity and ecosystems, and climate change adaptation and mitigation.

The **EU Delegated Regulation 2023/2486** sets out technical screening criteria and defines activities contributing to the protection and restoration of biodiversity and ecosystems as activities aimed at maintaining or improving the status and trends of terrestrial, freshwater and marine habitats, ecosystems and populations of related fauna and flora species. The activities should also not harm climate change mitigation purposes and comply with criteria set out for climate change adaptation, sustainable use and protection of water and marine resources, and pollution prevention and control.[21]

[20] IBPES (2019). Global Assessment Report on Biodiversity and Ecosystem Services.

[21] European Commission (2023a). Commission Delegated Regulation (EU) 2023/2486 of 27 June 2023 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Commission Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities.

The **NGFS "Nature-related Financial Risks: Conceptual Framework to guide Action by Centrals Banks and Supervisors"**[22] does not separately define biodiversity risk, and refers to biodiversity and nature, adopting an integrated approach which also considers climate-related financial risks within the scope of nature-related financial risks.

The **Taskforce on Nature-related Financial Disclosures** (TNFD) defines nature loss as loss and/or decline of the state of nature, including but not limited to, the reduction of any aspect of biological diversity, such as diversity at the genetic, species and ecosystem levels in a particular area through death (including extinction), destruction or manual removal. The report continues identifying nature-related (physical and transition) risks as potential threats (effects of uncertainty) posed to an organisation that arise from its and wider society's dependencies and impacts on nature.[23]

The **European Sustainability Reporting Standards** (ESRS) define biodiversity and biological diversity as the variability among living organisms from all sources including, inter alia, terrestrial, freshwater, marine and other aquatic ecosystems and the ecological complexes of which they are part. Biodiversity loss is defined as the reduction of any aspect of biological diversity (i.e. diversity at the genetic, species and ecosystem levels) in a particular area through death (including extinction), destruction or physical/manual removal; it can refer to many scales, from global extinctions to population extinctions, resulting in decreased total diversity at the same scale.[24]

Biodiversity and climate

46. 'Biodiversity risks and climate risks are interconnected but distinct', as one stakeholder noted. Climate change is a significant driver of biodiversity loss and could become the most important driver of biodiversity loss by mid-century.[25] Biodiversity loss can, in turn, exacerbate the effects of climate change.[26] This is known as the 'climate-nature nexus', which poses difficulties to the separate identification of biodiversity risk, and its risk to economic activities, in addition to or separately from climate risk.
47. As a result of this nexus, it is difficult to distinguish biodiversity loss risk from climate change-related risk, especially when accounting for the impact of natural catastrophe losses. Significant losses related to biodiversity risks stem from their amplification of damage caused by natural catastrophes, such as floods, earthquakes, and other events. For example, the loss of

[22] NGFS (2023a).

[23] TNFD (2023c).

[24] Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards, page 261.

[25] For instance, the absorption of excess carbon dioxide by oceans has increased both their temperature and acidity, making it difficult for marine species such as shellfish to form their calcium shells. As a result, many species at the base of marine food chains are disappearing, which negatively impacts the growth and distribution of fish stocks higher up the food chain. See also: Henrique M. Pereira *et al.,* Global trends and scenarios for terrestrial biodiversity and ecosystem services from 1900 to 2050.*Science***384**,458-465(2024). DOI:10.1126/science.adn3441.

[26] For example, the destruction of marine life reduces the oceans' capacity to sequester CO2 from the atmosphere (i.e. degrading carbon storage), thereby accelerating global warming.

biodiversity and depletion of ecosystems (e.g. degradation of coral reefs or wetlands) can lead to increased losses from natural catastrophes in property insurance lines of business, including increasing claims for business interruption insurance. In reverse, natural habitats such as mangrove swamps and salt marshes can offer significant protection against storms.[27] Also, forests with a rich diversity of vegetation can create natural fire breaks, slowing down the spread of wildfires and reforestation can help mitigate climate change risks. Natural catastrophes can lead to the (further) destruction or depletion of natural resources.

48. Climate mitigation and adaptation measures can support biodiversity conservation or targets but can also have undesirable effects on biodiversity. These can include:
    - Land-use change pressure from renewable energy installations such as wind farms or solar power plants, or from biofuel farming.
    - Ecosystem disruption due to mining of minerals necessary for batteries and sustainable technologies, the planting of monocultures to capture CO2, or dam infrastructure for clean energy purposes.
49. The question arises whether it is relevant to identify biodiversity risk separately, or address the risk more holistically, for examples as biodiversity loss and climate change have an impact on natural catastrophes.
50. Stakeholders' views vary on whether to support integrated or separate climate and biodiversity/nature risk assessments. Stakeholders note that undertakings should have the option to draw on climate risk assessment practices where appropriate, given potential overlaps. Some stakeholders stress that when climate and biodiversity are separated, it could be considered to include a central climate change trajectory in biodiversity scenarios and vice versa. At the same time, relevant steps are being taken to explore the feasibility of integrated climate-nature scenario assessments.[28] Climate- and biodiversity-related financial risks could also be encapsulated under a broader umbrella of "nature-related financial risks."[29]

Box 2: Elements for considering a separate or integrated risk assessment for biodiversity and climate risk

Arguments for a separate assessment of biodiversity and climate risk	**Arguments for an integrated assessment of biodiversity and climate risk**
Due to the local and regional nature of some risks, biodiversity loss may require a targeted risk assessment.	Climate change is a global phenomenon, whereas biodiversity and nature-related risks have both local and global dimensions.

[27] Natural habitats can reduce flood losses | Swiss Re

[28] See: Forecast Policy Scenario Plus Nature (FPS+N). See also, for example, Stevanović M.1 , Ceglar A.2*, von Jeetze P.1 , Costermani Visconti A.3, Krisht S.3, Johnson J.A.4, Borrelli P.5, Heemskerk I.2*, Popp A.1,6, Zadek S. Climate-nature scenario development for financial risk assessment (2024) PIK-Report2024-tweaked-FINAL2

[29] The NGFS conceptual framework goes further by adopting an integrated approach which also considers climate-related financial risks within the scope of nature-related financial risks.

	Biodiversity loss and climate change share mutually reinforcing biophysical dynamics, leading to compounding effects that cause larger-than-expected financial losses compared to separate assessments.
A dedicated risk assessment allows for focused evaluation of biodiversity-specific factors, such as ecosystem dependencies and species loss. Aggregating them could lead to an oversimplification of biodiversity risk exposure, reducing insurers' ability to manage it effectively. Viewing biodiversity risk through an ecosystem-specific lens may help, for instance by introducing specific metrics referring to forest and water risks.	Biodiversity risk as a stand-alone factor is not linear and difficult to model without highly detailed understanding of local habitats and their interdependencies.
Location-specific data is critical in biodiversity assessments, as its financial impact is often regionally concentrated.	Integrating insights from climate risk assessments can provide a holistic understanding of environmental risks. A holistic approach that integrates biodiversity and climate risk assessments can enhance systemic risk analysis.[30] An integrated approach can support nature-based solutions, which simultaneously mitigate climate impacts and protect biodiversity, to reduce financial and systemic risks.
	Undoing the inter-relation between climate and other environmental risks may lead to underestimate the risk. Requiring separate assessments may also lead to a potential overestimation of the risk. Risk of overburdening undertakings in requiring separate risk assessment of biodiversity risks that are strongly related to climate risk, and for example, natural catastrophes.

[30] Thematic Assessment Report on the Interlinkages among Biodiversity, Water, Food and Health | IPBES secretariat

	Risk of maladaptation leading to greater vulnerabilities or misaligned transition plans.

51. To address these concerns, both holistic integrated climate-nature scenario assessments and specific (regional, local), tailor-made biodiversity risk scenarios may be needed. Both approaches are compatible, and their implementation may depend on the undertakings' portfolios.
52. Attempts are being made to develop integrated scenarios for use by financial institutions.[31] Such more holistic scenarios could integrate global warming, biodiversity as well as other sustainable development goals.
53. Natural catastrophe modelling may in the future need to consider increasingly the interaction between climate change and biodiversity to assess potential losses, but also opportunities for adaptation measures. Integrating biodiversity and nature-related data into catastrophe modeling is an emerging field. While traditional catastrophe models focus on natural hazards like earthquakes and hurricanes, incorporating ecological factors can provide a more comprehensive understanding of potential risks. Targeted analyses of certain hazards and nature-related risks (e.g. drought /water scarcity) which materialise in natural catastrophes could be considered. Advanced geospatial technologies, including geographic information systems and remote sensing, can facilitate the mapping and analysis of biodiversity patterns at different spatial and temporal scales. These tools can enable the integration of ecological data with CAT models to assess how changes in land use, habitat fragmentation and ecosystem degradation may alter hazard profiles.
54. Ecological forecasting uses knowledge of ecological processes to predict how ecosystems will change in response to environmental drivers, including climate change and biodiversity loss. These predictions can be integrated into catastrophe models to anticipate how changes in biodiversity may influence the occurrence and impact of natural disasters. For example, ecological forecasting can predict changes in species distributions that may affect the likelihood of events such as forest fires or disease outbreaks.
55. Other examples exist of local or regional scenarios to assess a specific type of nature-related risks.[32] The report further analyses developments and use of scenarios for financial risk assessment of biodiversity risk in section 4.3. The report integrates both the broad approach of defining biodiversity or nature-related risk, useful for narrative purposes, and the narrower identification of the exposure of investments and liabilities to activities with high impact or dependency on specific ecosystem services, for the purpose of exposure and financial risk assessment, respectively.

[31] See for example, the report on an integrated climate-nature scenario approach for the assessment of climate and nature-related economic and financial risk: Nature Finance (2024). Climate-nature scenario development for financial risk assessment: Invitation for Feedback on Scenario Development Framework. See also, for example, an investment risk scenario integrating climate-focused land use policy, incorporating protected areas, land restoration and emerging nature markets: Inevitable Policy Response (IPR) (2023). Forecast Policy Scenario + Nature (FPS + Nature). Preparing financial markets for climate- & nature-related policy & regulatory risks.

[32] DNB (2023). The economic and financial stability repercussions of nature degradation for the Netherlands: Exploring scenarios with transition shocks. Occasional Studies Volume 21-02.

Box 3: Comparison of features of sustainability risk: climate, nature/biodiversity and social

Comparison climate-biodiversity[33]

Similar: Both are 'environmental risks', which can transmit via physical and transition risks, over a short and medium-to-long-term horizon. Requires forward-looking risk assessment and scenarios on development pathways. Non-predictability and non-linearity of risks, with possibility of 'tipping points' (irreversible and with self-reinforcing features). Potential systemic nature due to interrelation of risks. Climate-nature nexus – mutual reinforcement of risks and opportunity of compound mitigation measures.

Different: Biodiversity risk is even more multi-dimensional (related to intricate functioning of ecosystems) and cannot be reduced to a single metric (as is the case for e.g. climate - global warming metric of GHG emissions). This requires handling multiple indicators, including species richness, or indicators on the intactness of land and water resources. Biodiversity risk is of a more local/regional nature, risk data is more difficult to collect and ecological interactions are even more difficult to model than climate change. Possibly more intensified risk concentration, threatening risk pooling across a region.

Comparison social-biodiversity[34]

Similar: Both risks are subject to local and regional specificities. Similar risk typology of transition and physical risks applies (for social: social transition risk – misalignment with transition to socially beneficial developments; social physical risk – impact of social risks on physical and mental integrity of individuals or communities). Possibility of identification of high impact economic activity (exposed to transition risk) and high dependency activity (exposed to physical risk). Note: social-environmental nexus – environmental risks can exacerbate social risks; environmental objectives can support social objectives.

Different: Social risk entails less common 'science-based' risk indicators, targets and scenarios: minimum social safeguards based on international conventions, local or national targets reflecting national social and labour or communal specificities. Progress in EU regulation (e.g. SFDR[35], CSRD[36]) provides a framework of social risk indicators; currently less advanced regarding biodiversity risk.

[33] EIOPA (2023b), p. 7 ff.

[34] EIOPA (2023a). Prudential Treatment of Sustainability Risks, p.110 ff.

[35] European Commission (2022b). Commission Delegated Regulation (EU) 2022/1288 of 6 April 2022 supplementing Regulation (EU) 2019/2088 of the European Parliament and of the Council with regard to regulatory technical standards specifying the details of the content and presentation of the information in relation to the principle of 'do no significant harm', specifying the content, methodologies and presentation of information in relation to sustainability indicators and adverse sustainability impacts, and the content and presentation of the information in relation to the promotion of environmental or social characteristics and sustainable investment objectives in pre-contractual documents, on websites and in periodic reports (**SFDR**).

[36] European Commission (2022a). Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (**CSRD**). European Commission (2023b). Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards (**ESRS**).

3.2 BIODIVERSITY RISK DRIVERS FOR INSURERS

56. (Re)insurers are primarily exposed to indirect biodiversity risks through their investments and liabilities. These risks transmit to the insurers' balance sheets by investing in or providing coverage to companies that (i) have not adapted to the (technological developments or regulatory requirements for transition toward a low-impact (i.e. nature-positive or neutral) environment or (ii) face increasing risks due to declining biodiversity and ecosystem services. The sources of these risks are transition risks and physical risks, respectively. These risks can indirectly impact an undertaking's prudential risks, such as market risk, health, life or non-life underwriting risk, counterparty default risk, or operational risk.[37]
57. Significant biodiversity loss may not present a material risk to insurers in one circumstance, where in another, the loss of a single keystone species could fundamentally change the insured risk or value of an asset. Also, risk transmission to the insurers' liabilities would depend primarily on product specifics and, for transition risks, is triggered by legal or regulatory requirements, rather than by changes in biodiversity itself.
58. Financial risks can arise directly from biodiversity losses that affect the undertaking ('outside-in'), as well as from the (re)insurers' impact on biodiversity ('inside-out'). To address financial risks to assets and liabilities would therefore involve assessing the potential long-term financial impacts of insurers' investments and underwriting on biodiversity factors, while also considering risk management measures to mitigate such impact.
59. For example, for an insurer specialising in underwriting risks for a particular industry sector that negatively impacts biodiversity, its underwriting activity may indirectly contribute to biodiversity loss and ecosystem degradation. Consequently, financial risk may materialise via underwriting risk due to increased potential for liability claims against the policyholder related to biodiversity loss, or the risk that the policyholder may be unable to pay premiums if legal restrictions on their activities cause financial hardship. There is also potential reputational risk for the insurance undertaking, as its investors may choose to exclude the undertaking from their portfolio. Investors' divestment could also negatively affect the undertaking's share price.
60. It should be noted at this stage that establishing causal relationships between specific insured activities and biodiversity loss and further correlating this with claims-related financial impacts, is highly challenging given the potential need to understand the impact of each policyholder.

Indirect transition and physical risks

61. Transition risk arises when (re)insurers' asset and liabilities portfolios are misaligned with developments aimed at reducing or reversing damage to nature, such as new policies, technological advances, legal requirements, or changes in consumer preferences. For example, transition risks can emerge from the introduction of new regulations, like the EU Nature Restoration Law, or from a sudden technological breakthrough that significantly reduces the negative impact of an economic activity (e.g. in the construction or agricultural sector) on biodiversity.

[37] Biodiversity risks may also transmit from insuring citizens and households.

Box 4: Transition risk examples

Examples of transition risk affecting underwriting risk: There is a risk of mispricing and increasing claims due to tightening (or increase) of legal requirements for due diligence or mandatory liability for environmental damage. Transition risks may materialise due to higher claims in liability insurance (e.g. Environmental Liability or Directors and Officers insurance). Environmental liability insurance coverage may face increasing claims with increasing biodiversity and nature-related losses and regulatory requirements.[38]

Examples of transition risk affecting market risk: There is a risk of declining asset values from investments in companies that significantly impact biodiversity or operate in areas that become protected due to nature restoration efforts. For example, increasing or changing regulatory requirements for arable land could lead to a loss in land value. Financial markets may also reassess expectations of a future transition to a biodiversity-focused economy, such as under the EU Biodiversity Strategy, resulting in price declines of assets related to land-intensive or chemical companies.

62. Physical risk arises from the materialisation of damage to nature, changes in natural stocks and flows, or the decline of ecosystem services, which can lead to increased losses in investments or liabilities.
63. For underwriting, different lines of business are affected differently by physical biodiversity risks. For example, environmental liability risks may be particularly relevant for industrial insurers, maritime biodiversity risks for transport insurers, and biodiversity risks relating to the preservation of natural resources for agricultural insurers. Additionally, health insurers may face risks from invasive species (e.g. zoonotic diseases), while property insurers may be concerned with risks associated with water or land use.
64. The same applies to exposure analysis on the asset side: if an undertaking invests heavily in individual companies or sectors that are particularly dependent on or vulnerable to biodiversity risks, it may face increased exposure.

Box 5: Physical risk examples

Examples of physical risk affecting underwriting risk: There is a risk of increasing losses and claims related to:

- Loss of biodiversity and depletion of ecosystems (e.g. degradation of coral reefs or wetlands) leading to increased losses from natural catastrophes in property insurance lines of business or an increase in claims for business interruption insurance.

[38] AAE discussion paper. Environmental liability directive. Financial security and the polluter pays principle. 2022

- Exposure from farmers who depend on the flood retention capacity of nearby natural sites. The physical risk exposure of stables to the risk flooding transmits into the insurers' non-life underwriting risk, covering damage to buildings or income protection for agriculture.
- Reduced waterway navigability and nature-related soil erosion causing sinkholes and infrastructure damage, leading to loss of revenue in Marine, Aviation and Transport insurance.
- Loss of revenue due to reduced soil productivity from extensive land-use or the lack of pollination (in crop insurance).
- Increased morbidity and mortality caused by temperature-related deaths or a rise in zoonotic diseases and pandemics due to changes in nature (in Life and Health insurance).[39] Other potential impacts relate to the cost of health and life insurance: biodiversity plays a vital role in medicine and research and loss of biodiversity may impact health[40] and the provision of health care.[41]

Example of physical risk transmitting affecting market risk: There is a risk of decline in asset value for investments in activities that heavily depend on natural and biodiversity resources in their production process (e.g. timber, water, fish, plants) due to changes in the provision of ecosystem services.

Indirect 'systemic' risks

65. The loss of biodiversity and the degradation of ecosystems can impact economic activities more broadly, affecting insurers at a sectoral level or even the financial sector. Increased natural disasters, resource depletion, health impacts, asset value depreciation, and increased legal risks for economic activities can lead to economic shocks in key industries.[42] These shocks may trigger potential cross-sectoral feedback loops and disrupt global supply chains, which could, in turn, affect the financial sector operating within the global economy.
66. Indirect channels can cause additional, unexpected risks to individual insurers beyond their exposures to economic activities that directly depend on or impact biodiversity and ecosystem services. Systemic risks can propagate through second-order shocks to companies/regions exposed through trade and value chains and pressures transmitted directly to insurers through financial market interconnections and contagion.

[39] Schmeller, D.S., Courchamp, F. & Killeen, G. Biodiversity loss, emerging pathogens and human health risks. *Biodivers Conserv* **29**, 3095–3102 (2020). https://doi.org/10.1007/s10531-020-02021-6.

[40] Marselle, M.R., Lindley, S.J., Cook, P.A. *et al.* Biodiversity and Health in the Urban Environment. *Curr Envir Health Rpt* **8**, 146–156 (2021). https://doi.org/10.1007/s40572-021-00313-9.

[41] Biodiversity: its importance to human health. *Center for Health and the Global Environment, Harvard Medical School, Cambridge, MA*, *23*. 10693_Cover_(dcnanature.org); Alves, R.R., Rosa, I.M. Biodiversity, traditional medicine and public health: where do they meet? *J Ethnobiology Ethnomedicine* **3**, 14 (2007). https://doi.org/10.1186/1746-4269-3-14. See also for insight on health benefits of nature and the role of insurance: Schelske O.: Biodiversity and its benefits for human health. Swiss Re 2021.

[42] See, for example, If-you-destroy-nature-you-destroy-the-economy-2050NOW-La-Maison-x-SDA-Bocconi-by-Sylvie-Goulard.pdf

Direct physical and transition risks

67. Insurers can also face direct biodiversity risks, such as physical risk to property held for their own use (e.g. company offices), as well as reputational, legal or operational risks. For example, properties located in landscapes that suffer environmental damage – such as increased flood risks due to soil erosion from deforestation – may face physical risks or properties near nature-sensitive sites (e.g. Natura2000) may face transition risks. Additionally, associations with investees or policyholders who negatively impact nature can lead to direct reputational risk, resulting in loss of policyholders or divestment by stakeholders.
68. Depending on the applicable regulatory framework, insurers may also face direct legal risk from failing to disclose or report adverse environmental impacts, or for not performing due diligence under regulatory requirements for their investees or policyholders. An increase in compliance risks may ultimately harm stakeholder and shareholder value, contributing to operational risk. Furthermore, if an insurer's strategic decisions lead to an unsustainable business model or fail to meet sustainability expectations, this can cause strategic risk, reducing both the availability of insurable as well as investable assets and affecting business opportunities more broadly.
69. Beyond prudential risks, (re)insurers may also face direct conduct risks. For example, if insurance products are unclear about whether losses caused by biodiversity risks are covered, the increasing exclusions of cover may negatively impact the value of insurance products for consumers.

4. MARKET PRACTICES ON BIODIVERSITY RISK ASSESSMENT

70. This chapter presents observed (emerging) practices from insurance and reinsurance undertakings in the assessment of material biodiversity risk and financial implications in the context of their ORSA.
71. The purpose of identifying these practices is to provide a basis for the exchange with the insurance sector on the potential materiality of biodiversity risk for their activities, on the available data and methodologies, as well the challenges and possible solutions to identify and manage biodiversity risks.
72. The report collects promising market practices that reveal the industry's awareness of the potential impact of biodiversity loss on the economy more generally, as well as in certain lines of business or sectors more specifically, such as for the agriculture or forestry sector or health insurance.
73. At the same time, the market practices indicate that the identification, measurement and management of biodiversity risks by the insurance industry are still at an early stage, in particular for underwriting activities.
74. Supervisory assessment of end-year 2023 ORSAs showed that in a sample of more than 700 ORSAs surveyed, about 1 in 5 undertakings mention biodiversity. This figure doubles for large undertakings. When undertakings explicitly mention conducting biodiversity risk assessment, most of them are qualitative in nature. A smaller portion combines both qualitative and quantitative elements, while only a few are purely quantitative.
75. Most undertakings consider biodiversity to be an important but emerging risk - a 'megatrend' that is difficult to translate into concrete financial impacts on insurance activities. The most assumed risk is a potential negative impact on investments, such as a decrease in asset values. As a result, biodiversity risk is primarily viewed through the lens of reputational risk. To date, limited material biodiversity risk analysis has been found in undertakings' ORSAs (FYE 2023).
76. Main initiatives observed in the market aim at creating awareness for biodiversity risks at board level, expressing the need for strategic attention on what undertakings identify as an emerging risk, or a mega trend. Several large undertakings mention in their annual reports that they plan to further refine their strategies, policies, and targets in the coming years to address other environmental topics, including pollution, biodiversity and ecosystems, resource use, and the circular economy.
77. The results presented below are based on further desk-top analysis of publicly available reports, complemented with findings from the consultation and stakeholder engagement. In the following chapters, practices have been collected on materiality assessment, financial risk assessment and management actions to address risks.

4.1 MATERIALITY ASSESSMENT

4.1.1 Narrative

78. The narrative involves identifying the main direct and indirect drivers of biodiversity risk that could impact the undertaking's investment or underwriting activities.

79. The narrative can distinguish between nature-related risks that are transmitted into society either directly ("first-order"), indirectly (i.e. "second order", for example through value chains) or via spill-over effects (contagion), which affect citizens, businesses and the economy. An accumulation of economic impacts at the micro-level (e.g. business level) can lead to consequences at the meso-level (e.g. at local government level). When these effects occur on a larger scale (national, regional or global), they can lead to macroeconomic impacts, such as the disruption of value chains, volatility in raw material prices, business relocations or adjustments, or an increased rate of capital depreciation.
80. The NGFS identifies narratives as the essential first step in conducting any scenario-based risk assessment: "Narratives are storylines that describe how the world could evolve in the future, considering likely socio-political, macro-financial and environmental trends. In essence, narratives can help to characterise the transformations of the direct and indirect drivers of nature loss or the economy that could take place".[43]
81. Market participants emphasized the importance of narratives in underpinning scenarios that capture the complexity of biodiversity risks, including interlinkages between climate and biodiversity, as well as spillover and compounding effects.
82. Undertakings pointed out that the scope of the narrative is potentially broad due to numerous interdependencies with other risks. These include not only other environmental risk drivers such as climate, pollution, water, and natural catastrophes, but also the role of biodiversity risk as a risk driver of social and economic risks such as poverty, hunger, health, and economic conditions.
83. The interconnectedness with other environmental risks, along with the difficulty of quantifying biodiversity or nature risk using a single metric (as is done for GHG emissions), makes it difficult to address biodiversity risks in isolation. This complexity can make identifying biodiversity risks a cumbersome task for undertakings. Additionally, undertakings must navigate both global macro-level developments and local micro-level dynamics, complicating the creation of decision-useful narratives.
84. The challenge in building these narratives lies in ensuring their relevance to the specific areas and economic activities in which an insurer is investing, or to underwriting risks. Where available, national risk registers can already prove useful in creating more targeted narratives.[44]
85. In its work on developing physical and transition scenario narratives to assess nature-related financial risks, the NGFS identified several avenues that can support sector and country analyses, as well as comprehensive nature-related risk analyses. These narratives would serve as an initial step in developing relevant nature-related scenarios for the purpose of financial risk assessment. The SwissRe Foundation's[45] work in progress seeks to produce policy-relevant narratives, which can eventually support the development of scenarios for assessing biodiversity and ecosystem services losses.
86. Three key challenges in developing such scenario narratives are (i) the local specificities, complexities and the non-linear nature of natural systems which make it difficult to create global

[43] NGFS (2023b). Recommendations toward the development of scenarios for assessing nature-related economic and financial risks, p. 20.

[44] HM Government (2023). National Risk Register.

[45] Biodiversity and Ecosystem Services Scenarios Modelling Initiative, see 2023-01-sri-bes-call-for-submissions.pdf

measures for biodiversity risk (i.e. equivalent to the CO2 measures for climate); (ii) the interdependency of the environmental risks, including both positive and negative synergies and (iii) the fact that the substitutability of nature is generally overestimated in the short and medium term.[46]

87. Valuable attempts by undertakings at building a narrative consist in a first instance in assessing their business context. This involves, for example, considering the nature and size of the portfolio (assets and liabilities), its duration, concentration and diversification options. National biodiversity action plans can provide useful narratives to assess biodiversity risks and developments in a given country.
88. Investment and underwriting are the two main activities for which insurers tend to identify their main exposures and impacts on biodiversity. However, undertakings can also consider other areas, such as (outsourced) operations and corporate social responsibility activities.
89. Identifying specific physical and/or transition risks drivers is an essential second step in developing the narrative. The relevant risk factors when assessing biodiversity risks would include direct biodiversity risks (for example, mapped to the IBPES risk drivers as referred to previously), and could also involve indirect drivers of biodiversity or nature degradation, as well as micro- and macro-economic factors that contribute to or are impacted in turn by biodiversity risks.
90. Micro-economic factors can include capital destruction and stranded assets, the price volatility of raw materials, disruptions of production processes and value chains, the relocation and adjustment of economic activities or other externalities (e.g. taxation). Macro-economic factors can include inflation, productivity effects on GDP, capital needs for mitigation and adaptation and their impacts on government budgets. Other factors can include demographic and socio-cultural drivers which refer to societal values and behaviour, including production and consumption patterns, trade, and human population dynamics, as noted in the Figure 2 below.

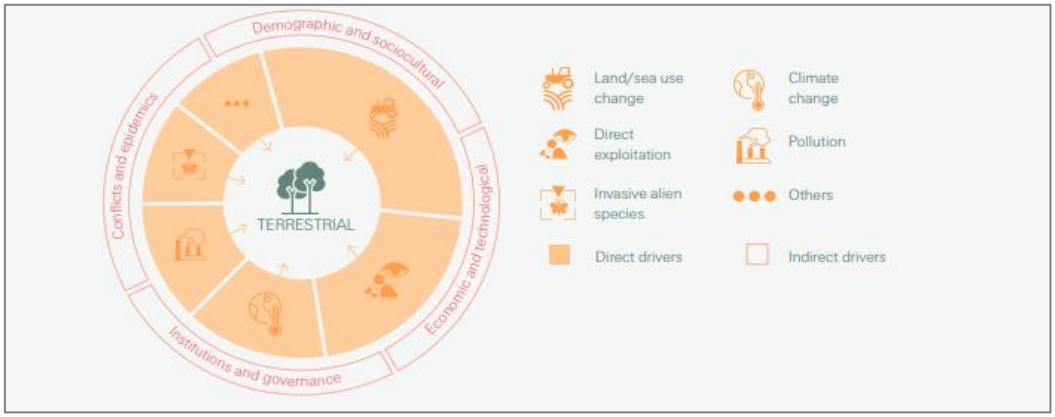


Figure 2: Indirect and direct drivers and examples of biodiversity and ecosystem degradation. Source: Swiss Re Institute, based on IBPES 2019.[47]

[46] NGFS (2023b), p. 46.

[47] Swiss Re Institute (2020). Biodiversity and Ecosystem Services A business case for re/insurance.

91. As part of the narrative, undertakings can also refer to global pathways that outline the potential evolution of medium-to-long term biodiversity risk, as shown in Figure 3 below. Global and EU targets for biodiversity preservation and restoration (see section 4.4 of the report) also help framing the narrative by providing expected transition scenarios. Stakeholders also refer to reproducing climate pathways and integrating assumptions on specific biodiversity risks.

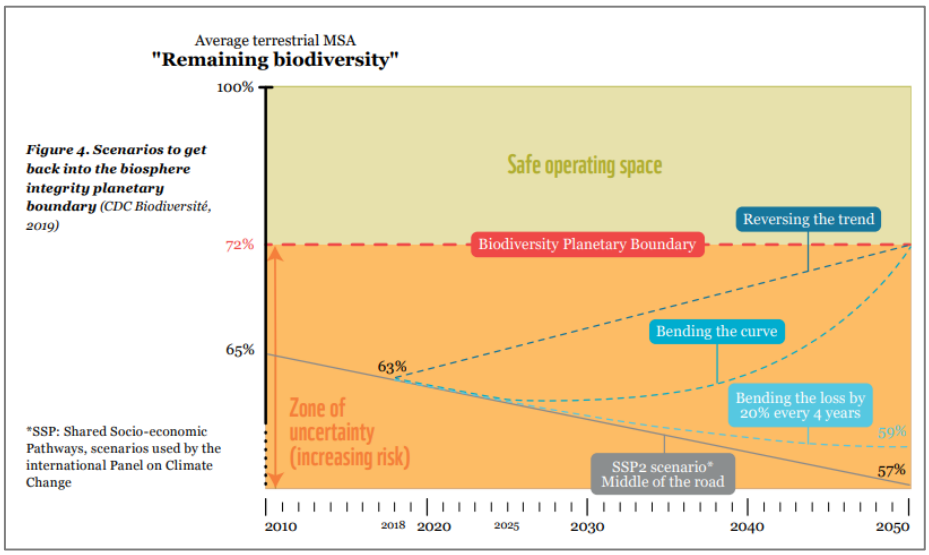


Figure 4. Scenarios to get back into the biosphere integrity planetary boundary (CDC Biodiversité, 2019)

Figure 3: Pathway to get back into the biosphere integrity planetary boundary. Referred to in WWF Report FR 2019 „Into the wild. Integrating nature into investment strategies ", p. 59, sourced from CDC Biodiversité 2019.

4.1.2 Exposure assessment

92. Part of a materiality assessment often involves analysing dependencies and/or impacts of the related economic activity on biodiversity to identify material sources of exposure to physical and transition risks. In turn, this assessment aids in evaluating insurers' potential exposure to these risks through their investment and/or underwriting portfolios.
93. The exposure analysis can indicate whether the exposure is material and help identify clusters, sectors, or ecosystems.
94. Exposure assessment can be conducted by identifying the exposure of assets or liabilities to:

(i) Economic activities that are dependent on biodiversity and ecosystem services. In this approach, production processes are mapped to biodiversity and ecosystem services, and their degree of dependency is assessed. This makes it possible to assess the exposure of an activity to nature-related physical risks, as a high dependency implies a high exposure to the physical risk of damage to nature.

(ii) Economic activities that have an impact on biodiversity and ecosystems ('biodiversity footprint'). This approach builds on the assessment of the contribution of an economic activity to changes to biodiversity and ecosystems, either from its own operations or from the operations it enables (e.g. through investments or insurance). This allows an assessment of an activity's exposure to nature-related transition risks, as a high footprint

indicates that the activity may face increased conservation and restoration measures through regulation or reduced consumer preferences in the future.

95. The exposure assessment can provide both high-level quantitative and qualitative insights into the potential materiality of the risk the insurer may face. For assessing its exposure an undertaking can, for example, identify the amount of premiums written in economic sectors with a high dependency on biodiversity and ecosystem services and/or high biodiversity footprint (economic exposure). It can also assess the potential exposure to biodiversity risk in a particular region or geography (geographical exposure).
96. This type of exposure assessment aligns with what the NGFS refers to as a short-term option for static analysis on the path toward more dynamic scenario analysis for quantifying nature-related risks over the long term. The NGFS suggests the use of input-output models to assess sectoral exposure, and to use bio-physical models for static maps of physical hazards (geographical exposure).[48] The next, more critical step would be translating such "ecological patterns" into financial risks for the insurer, by generating financial risk indices.
97. Possible data sources for assessing investment and underwriting risk exposures based on Solvency II are set out below in Box 6. Data to assess underwriting risk exposures is more limited compared to data for investment activities, and the limitations of the data sources, especially for underwriting risk, are set out in Annex I.

Box 6: Overview of available Solvency II QRT data for investment and underwriting exposure to biodiversity risk

Investments:

- S.06.02: Financial assets at country level (with sectoral breakdown in NACE sectors) and location of property investments.

Liabilities:

- S.04.05 and S.17.03: LoB at country level
- S.21.02: If biodiversity/nature-related risk is identified as one of the top twenty non-life underwriting risks.

98. A more detailed asset analysis can be conducted for individual holdings within specific sections of the undertaking's portfolio, such as significant investments in forests or agricultural land. If the undertaking operates heavily in certain regions (either as an insurer or investor), the exposure analysis can also consider the risk specific to these regions. For example, if the undertakings' business is particularly concentrated in coastal areas, the risk profile will differ compared to operations inland. Additionally, internationally active undertakings are also subject to national variations in laws and objectives.

[48] NGFS (2023b).

99. When assessing the materiality of exposures, insurers can consider both the direct impacts and dependencies on biodiversity, as well as the risks that can arise through value chains and indirect transmission channels. For example, natural disasters can negatively impact a region's biodiversity, such as when habitats for local species are destroyed. In turn, a decline in biodiversity (e.g. flora in vulnerable areas such as steep slopes or coasts) can increase the potential damage and/or likelihood of natural disasters occurring. Similar interactions are conceivable for pandemic risks. Loss of biodiversity can promote the emergence of new pandemics in regions where they previously did not occur, while new pandemics can stress endemic biodiversity. Biodiversity is also interconnected with climate change, as described in section 3.1 of the report.
100. At the same time, it is challenging to perform a biodiversity materiality assessment including all potential impacts and dependencies, without relying on scenario analysis, which would be appropriate for material risks.
101. The following boxes below provide a number of existing frameworks and tools that can support the high-level identification of biodiversity risk exposure at sectoral and geographical level. The tools or data sets are illustrative and not comprehensive.

Box 7: Frameworks for biodiversity risk assessment in a financial sector context

The following frameworks provide guidance for conducting high-level exposure and materiality assessments, offer potential narratives for scenario analysis, and present several metrics for financial risk assessment.[49]

- NGFS: Nature-related Financial Risks – a Conceptual Framework to guide Action by Central Banks and Supervisors[50]
- OECD: A supervisory framework for assessing nature-related financial risks[51]
- TNFD: Recommendations of the Taskforce on Nature-related Financial Disclosures[52] which sets out the LEAP approach to locate, evaluate, assess and prepare (to respond and report) on nature-related risks and opportunities.
- European Commission (COM): Study for a methodological framework and assessment of potential financial risks associated with biodiversity loss and ecosystem degradation[53]

Box 8: Examples of tools and methods for biodiversity exposure risk assessment

[49] TNFD (2024). Additional guidance for financial institutions version 2.0.

[50] NGFS (2023a). Nature-related Financial Risks: a Conceptual Framework to guide Action by Central Banks and Supervisors.

[51] OECD (2023). A supervisory framework for assessing nature-related financial risks: Identifying and navigating biodiversity risks.

[52] TNFD (2023c). Recommendations of the Taskforce on Nature-related Financial Disclosures.

[53] European Commission (2024). Directorate-General for Financial Stability, Financial Services and Capital Markets Union, Cziesielski, M., Dekker-Hufler, C., Pal, T., Nicholls, G. et al., Study for a methodological framework and assessment of potential financial risks associated with biodiversity loss and ecosystem degradation – Final report.

The following tools and methods are provided for illustrative purposes to show a range available on the market and to identify types of tools. They have not been verified by EIOPA as to their functionality and capabilities, and their inclusion does not amount to endorsement for risk management purposes.

Stakeholders noted that there is no single scenario, model, or tool that can provide a comprehensive assessment of nature-related risks. Multiple types of models to assess biodiversity/nature-related risks would be needed to assess biodiversity/nature-related risks. Tools differ as to their purpose and range: many tools provide a view on risk exposure of ecosystem services across the globe **(Ecosystem services exposure)**, often via spatial maps. A number also combine ecosystem risk exposure with relevant economic sectors, scoring the sectors on impact and dependency (**Economic exposure)**. Combining these elements, the next step is to assess how these exposures can transmit into a financial effect on the insurer's balance sheet (**Financial exposure**).

The comprehensive and relevant listing of tools and methods is a difficult task. The TNFD's Tools Catalogue aims to provide a list of nature-related data tools.[54] The challenge for (re)insurers is to identify the relevant tool, and to translate the exposures into potential investment or underwriting risk. Also, the Finance for Biodiversity Foundation regularly issues a practitioner guide for financial institutions to engage on biodiversity risk assessment, which includes measurement tools and case studies.[55]

Ecosystem services exposure

Risk exposure views for specific geographies and ecosystem services can be sourced from a variety of risk maps, open source of licensed tools:

Sub-area	Tool
Biodiversity	Biodiversity risk filter[56] (WWF) S&P Global's Nature & Biodiversity Risk Methodology ISS ESG Biodiversity Impact Assessment Tool (BIAT) IUCN Red List of Ecosystems[57]
Biodiversity, climate change and sustainable development	UN Biodiversity Lab [58]

[54] Tools Catalogue – TNFD

[55] Biodiversity Measurement Approaches Guide (4th edition) - Finance for Biodiversity Foundation

[56] See https://riskfilter.org/biodiversity/home.

[57] https://iucnrle.org/

[58] UN Biodiversity Lab – Providing decision makers with the best available spatial data to put nature at the center of sustainable development.

Protected Areas, Key Biodiversity Areas and Endangered species	Integrated Biodiversity Assessment Tool (IBAT)[59]
Environmental sustainability	Strong Environmental Sustainability Index (SESI)[60]
Deforestation	Global Forest Watch[61] (WRI)
Multiple	ENCORE[62] (NCFA, Global Canopy, UN)
Protected Areas	SIGHT[63] (WWF)
Land use, road disturbance, land fragmentation, nitrogen deposition, and climate change.	Globio[64] (PBL Netherlands Environmental Assessment Agency)
Water	Aqueduct[65] (WRI)
	Water risk filter[66] (WWF)
	Corporate bonds water credit risk[67] (NCFA, Global Canopy, UN)
	Drought stress testing tool[68] (NCFA, Global Canopy, UN)

[59] Combines global diversity datasets on threatened species and protected or 'key biodiversity' areas to identify critical biodiversity regions. Offering geographic information on the presence of Protected Areas, Key Biodiversity Areas and Endangered species. Integrated Biodiversity Assessment Tool (IBAT) (ibat-alliance.org).

[60] Based on the Environmental Sustainability Gap (ESGAP) framework, the index measures environmental sustainability across countries on a range of environmental and resource issues. Arkaitz Usubiaga-Liaño, Paul Ekins, Monitoring the environmental sustainability of countries through the strong environmental sustainability index, Ecological Indicators, Volume 132, 2021, 108281, ISSN 1470-160X, https://doi.org/10.1016/j.ecolind.2021.108281 .

[61] See https://www.globalforestwatch.org/.

[62] See https://encorenature.org/en.

[63] See https://wwf-sight.org/.

[64] A model based on terrestrial biodiversity databases that expresses biodiversity intactness using the mean species abundance indicators. GLOBIO - Global biodiversity model for policy support - homepage | Global biodiversity model for policy support.

[65] See https://www.wri.org/aqueduct.

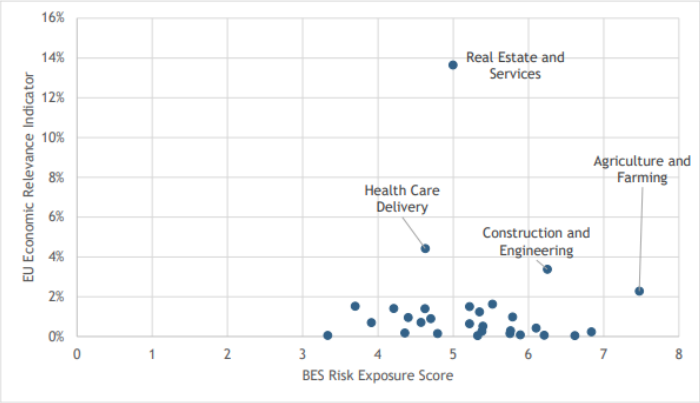
[66] See https://riskfilter.org/water/home.

[67] See http://www.naturalcapitaldeclaration.org/bonds-water-scarcity/.

[68] See https://www.unepfi.org/drought-stress-testing-tool/.

Economic exposure

Biodiversity and ecosystem services risk exposure can be mapped with relevant economic sectors, scoring the sectors on impact and dependency. An example for the EU economy below shows that the economic sectors of real estate and construction, agriculture and farming, and health care delivery are the most critical areas from the EU perspective when assessing biodiversity risks. [69]



Heatmaps can assist in illustrating the sectors exposed to nature-related risks. An example of such heatmap is provided in the TNFD Guidance on the identification and assessment of nature-related issues (the TNFD LEAP approach). [70] A 'footprinting approach' can help an undertaking to conduct a materiality assessment for aggregated impacts at portfolio level, recognising the limitations for risk management decisions.[71] Other datasets on impact and footprints include the Global Biodiversity Score and the Corporate Biodiversity Footprint (CBF, Iceberg Data Lab).[72]

Open source tools provide biodiversity risk maps, such as, for example, the WWF Risk Filters.[73] The Swiss Re Institute Biodiversity and Ecosystem Services (BES) Index assesses which economic sectors are most reliant on nature and evaluates the exposure each country has to BES decline. It enables locating at a 1km^2 resolution, which ecosystem services are existent in each location and assess their capacity status (with red areas indicating low-capacity areas).[74]

In conjunction with, for example, the ENCORE database, the insights may inform companies to compare locations to assess their risk exposure.

[69] European Commission (2024).

[70] TNFD (2023a). Guidance on the identification and assessment of nature-related issues. The TNFD LEAP approach.

[71] See for further insight: TNFD (2024a). Discussion paper on biodiversity footprinting approaches for financial institutions.

[72] Global Biodiversity Score (CDC Biodiversité which assesses impact and dependency of companies and investments on biodiversity) Global Biodiversity Score: 2023 update | CDC Biodiversité (cdc-biodiversite.fr); Corporate Biodiversity Footprint (CBF, Iceberg Data Lab)which, based on the concept of Mean Species Abundance (MSA) assesses the degradation of ecosystems caused by business activities , Iceberg Datalab.

[73] WWF Risk Filter Suite - Home

[74] Retsa A., Schelske O., Rutherford G., Wilke B., de Jong R.: Biodiversity and ecosystem services: A business case for re/insurance. Swiss Re 2020. Page 7

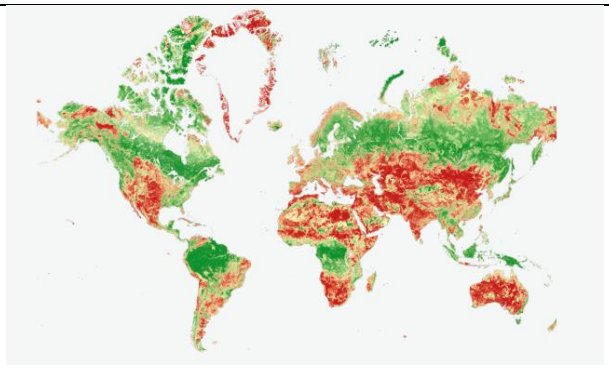


Figure 4: Global SRI BES Index map at 1 km^2 resolution

Financial exposure

To identify the relevance of these exposures for the insurance sector, at a global level, the Sustainable Insurance Forum (SIF) provided a mapping which suggests that subject to firm- and geography-specific characteristics, seven economic sectors, contributing to about 10 percent of the global P&C insurance premium, could be exposed to significant disruption as nature-related risks become more severe. The business sector contributing the most to global insurance premiums is pharmaceutical, healthcare, life sciences and biotechnology, followed by the automotive or motor sector.[75]

102. Many undertakings are currently screening their potential asset exposures to sectors or companies that exert significant pressure on nature. This aligns with a management approach that considers biodiversity risks primarily from a reputational perspective, with a focus on stewardship and engagement strategies. It also reflects the fact that investment exposures may be more easily identified through market risk transmission channels.
103. The assessment of underwriting risk exposure requires a combination of a multitude of data and tools, covering in a first instance geospatial risk mapping (to identify exposure to biodiversity-sensitive areas), sectoral and company-specific risk analysis (to identify industries and companies with high biodiversity dependencies (e.g. agriculture, fisheries, forestry) and assess their exposure to nature-related transition and physical risks). Additional insight on potential losses from biodiversity-related events, related to the value of the ecosystem affected will need to inform the exposure - before any analysis on the impact on insured losses can be made. To date, limited information is available to assess potential risks for SMEs and other unlisted companies which are an important part of insurers' underwriting portfolio; there is also limited information on project-specific insured assets.
104. A few undertakings have begun identifying biodiversity risks in specific assets or lines of business. These include exposures in sectors such as agriculture, forestry (with land use change, including deforestation, as the primary pressure point), health (through emerging diseases or the degradation of life supporting services such as water filtration and soil regeneration),

[75] UNDP Sustainable Insurance Forum [SIF] (2021). SIF scoping study: Nature-related risks in the global insurance sector.

chemicals (e.g. the physical risk of water pollution transmitting into liability risk), and real estate (where construction activities may be impact on nature).

105. However, stakeholders noted that economic activity exposure is not a direct proxy for financial risk. A high dependence on an ecosystem service does not equate to high risk from a Solvency II (capital) perspective. As such, dependence alone is directional but not indicative of financial risk for insurers' investment portfolios. This is due to the management actions that the undertaking may take to manage the risks associated with the economic exposure (e.g. certain lines of business may explicitly exclude biodiversity-related risks, such as pollution exclusions in liability policies; others may actively assume and price for biodiversity-related risks, such as environmental impairment liability insurance, reflecting their risk appetite and underwriting strategies). Reinsurers, who may receive information at a more aggregated, less detailed, portfolio level or may be covering legacy risk may face additional challenges in identifying exposure to such activities.
106. On that basis, it would be premature for insurers to rely on exposure-based assessments as the primary basis for financial risk assessment. In other words, exposure assessment serves as a preliminary assessment of potential vulnerabilities to changes in the provision of ecosystem services which may or may not translated into financial risks.

Box 9: Example of nature-related physical and transition risks in agriculture or forestry insurance

- In its 2023 annual report, Achmea highlighted the importance of its agriculture insurance portfolio, covering activities such as greenhouse cultivation, arable farming, arboriculture and livestock sectors. The undertaking notes that agriculture insurance is linked to several environmental issues, including nitrogen pollution but also loss of habitat, monoculture and soil degradation.[76]
- In its 2022 Biodiversity Report[77] Aviva referred to its underwriting in the forest sector, providing insurance to property and business interruption in lumber manufacturing processes. The primary drivers of tree cover loss are forestry and wildfires.

Box 10: Example on nature-related risks to real estate assets and property insurance[78]

In its Climate and Biodiversity report 2023, a.s.r. notes that its rural properties rely on ecosystem services, such as groundwater and surface water, soil quality, crop pollination and natural disease control. Urban real estate also depends on ecosystem services, such as rainwater runoff and vegetation-based heat regulation. Disruption of these services can lead to lower crop yields, higher costs for maintenance and insurance costs, investments to cover risks and a decline in property values. For transition risks, the undertaking highlighted the risk of legislation and regulations including the expansion of Natura 2000 sites with associated restrictions, nitrogen policy and

[76] Achmea (2023). Annual Report 2023.

[77] Aviva (2022). Biodiversity Report.

[78] a.s.r. (2023). Climate and biodiversity report 2023.

stricter sustainability requirements for buildings. These could result in higher investment and financing costs, and reduced tenant demand for less-sustainable properties.

For its underwriting portfolio, a.s.r found approximately 16.5% of business insured under its P&C policies are located within one kilometre of a Natura 2000 site. To assess the impact, a.s.r. prioritised companies with a high (potential) impact or dependency on nature loss in nearby Natura 2000 sites. The undertaking estimates that approximately 3% of the insured companies met the criteria for having a potential high impact on biodiversity, and physical and transition risks for the P&C activity could arise from nature loss, such as an arable farm relying on dry land, which may face flooding if a nearby site's water retention capacity declines. This could cause water damage to farm buildings or result in reduced production, leading to a potential increase in claims costs and/or loss of premium income. Transition risk could result in measures to better protect Natura 2000 sites which could cause increasing groundwater costs near natural areas or temporarily banning its use during droughts. The example was made of claims under liability or income protection from building companies who operate near a freshwater because of regulatory requirements on use of freshwater or the prevention of pollution.

4.2 FINANCIAL RISK ASSESSMENT

107. Once the undertaking has identified the biodiversity risks to which it is materially exposed, the next step consists in determining the potential financial impact of those risks on its balance sheet. Given its nature, biodiversity risk might better be captured following a forward-looking dynamic assessment of material exposures, by using a combination of model and approaches. Where appropriate, the assessment would imply to subject those identified material risks to a sufficiently wide range of stress tests or scenario analyses.
108. Financial risk assessment involves identifying relevant quantitative risk scenarios to assess the financial risk and the metrics to monitor the financial risk.
109. Some market participants have highlighted key challenges to carry out consistent scenario analysis for determining the financial impact of these risks. One challenge is the significant variation in this risk, which varies locally, regionally and in nature. While climate change risks can often be assessed using global scenarios, biodiversity risks today lack universally applicable global scenarios.
110. Given these challenges to perform a full financial impacts analysis, some undertakings focus on specific exercises and use tailored models or tools that could better capture the biodiversity risks to which the undertaking is materially exposed. There are certain sectors and lines of business where there are more developed models and tools to perform a financial risk assessment (e.g. forestry, health, agriculture).
111. Accordingly, given the current data and methodological limitations, qualitative risk analysis can be a valid first step in assessing financial risks related to biodiversity.[79] In a next step, biodiversity risk can be added as an additional risk driver in existing scenarios, particularly in business areas

[79] See EIOPA (2023b).

highly affected by biodiversity loss, such as health or agriculture insurance or market risk for corporate and real estate bonds.

4.2.1 Scenarios

112. The Network for Greening the Financial System (NGFS) is conducting important work in developing scenarios to assess nature-related financial risks. The NGFS' analysis includes assessing existing approaches for modelling nature's impacts on the economy (nature-economy models), biophysical models and models that identify the transmission of nature related hazards throughout value chains (using input-output tables and models). The key take-aways from the NGFS' Recommendations towards the development of scenarios to assess nature-related economic and financial risks are summarised below.[80] These provide a summary of different types of models which can form the basis for constructing scenarios.

Box 11: Key takeaways from NGFS' review of models for assessing nature-related risks

Nature-economy models. These models combine nature and macroeconomic aspects, economic and bio-physical modelling. They aim to estimate sectoral and macro-economic consequences resulting from physical or transition scenarios. The NGFS reviewed six modelling frameworks as to their scope, structure and objectives. The results show that nature-economy modelling is less mature than climate-economy modelling and currently focuses on the effects of the economy on nature, rather than the reverse. For models assessing physical impacts, the dependency of the economy on nature is crucial. These physical or transition risks affect the economy through transmission channels, leading to changes in sector productivity and output, particularly in agriculture, forestry, and energy. Assumptions about sector adaptability (often high in reviewed models) and the relative importance of sectors in the economy significantly influence the results. The NGFS concludes that these models likely underestimate the economic consequences of nature-related hazards. Systematic sensitivity analysis and using a variety of models are recommended to address this issue.

Biophysical models. These models simulate one or more interconnected biological systems, predicting the influence of biological and physical factors on complex ecosystems.[81] Various models exist for different biomes, such as agriculture, water, fisheries, fire, and health (related to climate change). While these models represent relationships between ecosystems and emphasise the flow of materials, energy, and species, they do not incorporate economic dimensions, making it difficult to assess economic implications.

Input-output tables and models. To better capture nature-to-economy impacts, complementary modelling approaches, such as multi-regional input-output modelling, are necessary. These models trace the value chains within the economy by showing the origin of inputs to produce goods and services and how these products generate profits, income, and taxes. This static snapshot of the

[80] NGFS (2023b).

[81] Definition used by the NGFS, referring to Biophysical models - Latest research and news | Nature.

global economy can complement macroeconomic models by refining assumptions about the substitution or replacement of production factors.

113. When assessing the financial risks of biodiversity loss for specific lines of business or exposures, tailored scenarios help capture sector-specific impacts and guide effective decision-making. As noted by stakeholders, the challenge with available scenarios is to translate them into meaningful analysis at individual insurer level. In addition, an initial prioritisation of ecosystems and biodiversity-related risks would be necessary to identify, analyse and understand the specific risks in first assessments.
114. Below are examples of initiatives for the development of scenarios for assessing nature-related risks, including for specific sectors which may be affected by loss of biodiversity and ecosystem services. Most are not quantitative models, but narratives to explore how biodiversity risks might develop. Often the scenarios involve (setting targets for) national strategies for addressing nature-related risks. Hence, many of these scenarios are more useful for the purpose of materiality assessment, and not directly for financial risk assessment.

Nature	• TNFD guidance on scenarios[82] • ESGAP-SESi methodology[83] • Oxford Integrating Nature-Climate Scenarios & Analytics for Financial Decision-Making (INCAF) project[84]
Agriculture	• Land degradation neutrality (LDN) initiative: Provides guidance on target setting for governments related to risks of land degradation and biodiversity loss in agricultural landscapes. • Allianz Research. Concepts, challenges and a first quantitative case study on pollination85
Health	• One Health approach: examines the links between biodiversity loss, zoonotic diseases, and human health risks.[86]
Forestry	• REDD+ Program: on national strategies for reducing emissions from deforestation and forest degradation in developing countries[87]
Fisheries and marine ecosystems	• Maritime spatial planning scenarios: to assess risks related to overfishing, habitat loss, and biodiversity degradation in fisheries under different regulatory and conservation policies[88];

[82] Guidance on scenario analysis – TNFD.

[83] Measuring the environmental sustainability of countries: the ESGAP story | Bartlett Faculty of the Built Environment Based on 21 sub-indicators of environmental sustainability, the method can be used to identify the ecosystems and their functions that are most degraded compared with an intact state, and therefore most likely to be affected. Coupled with the ENCORE database, which assesses the interdependence of 86 types of production processes with 21 ecosystem services, these two approaches can provide a representation of the degradation of nature and the dependence of economic activities on these ecosystems.

[84] See UK Research and Innovation, Integrating NatureClimate Scenarios & Analytics for Financial Decision-Making (INCAF).

[85] 2023-02-28-Biodiversity.pdf

[86] See for example, World Health Organisation or the European Centre for Disease Prevention and Control.

[87] See REDD+ UNFCCC

[88] See for example, Best practice and scientific publications | The European Maritime Spatial Planning Platform

	• Blue Economy Scenarios[89]: scenarios on risks to marine ecosystems and industries reliant on healthy oceans.
Real estate	• Nature-inclusive urban development scenarios: to examine financial risks from biodiversity loss in urban areas, such as reduced flood protection and ecosystem services. • Land use change and ecosystem services loss scenarios: to assess the effect of the destruction of wetlands, forests, and other natural habitats increases exposure to flooding, soil erosion, and extreme weather events, impacting property values and insurability.

115. Further development is needed to enable the translation of these scenarios into financial risk assessments for insurers, with the aim to identify how capital requirements may be sensitive to material biodiversity risks.
116. The Dutch National Bank (DNB) conducted an analysis moving from a nature-related shock to economic impact and then to the impact on financial institutions using a series of transition (and one physical) risk scenarios.[90] While some narratives are inspired by global frameworks, the identification of specific transition and physical risk scenarios by the regulator helps undertakings potentially exposed to these risks at a local or regional level, enabling them to capture the specificity of biodiversity risks in a decision-relevant manner.
117. The Authorité de Controle des Assurances (ACPR) in its 2023 insurance climate exercise provided two long-term scenarios for analysing the impact of an increase in vector-borne diseases and increasing pollution in urban areas on life and health insurance.[91]

4.2.2 Metrics

118. The use of metrics to monitor biodiversity-related financial risks is complex. Challenges include the interconnectedness of biodiversity with other environmental risks, such as climate change, and the need to account for ecosystem degradation using multiple metrics and indicators.[92] Global metrics are limited in their ability to capture local or regional biodiversity risks. Impact metrics, such as "mean species abundance per square kilometre", can help evaluate the biodiversity impact of a portfolio and provide insights into potential transition risks that could affect insurers' portfolio but are less suitable for directly assessing the financial risk to an insurer. For undertakings with specific geographical or sectoral exposure (e.g. agriculture or forestry), other metrics may be more relevant. Some indication on the type of biodiversity and nature-related metrics is provided in the following paragraphs.

Box 12: Biodiversity and nature-related metrics

[89] See for example the Sustainable Ocean Initiative. Or: Scenarios for Scotland's Blue Economy

[90] DNB (2023).

[91] https://acpr.banque-france.fr/system/files/import/acpr/medias/documents/2023_main_assumptions_and_scenarios_of_the_acpr_climate_exercise.pdf

[92] NGFS (2023b), p. 23 ff

In its efforts to promote the disclosure of nature-related risks and opportunities, the **Task Force on Nature-related Financial Disclosures (TNFD)** has established principles for such metrics:[93]

- Science-based: Provide insights into the consequences of business and finance activities.
- Sensitive: Able to reflect change on an annual basis.
- Relevant: Tailored to the business model and value chain of report preparers, recognising that issues can vary significantly within sectors, business models and value chains.
- Proportionate: Reflect the practical capacity and cost constraints of report preparers to assemble, assess and report information on an annual basis.
- Decision-useful: Provide current insights and comparability within and across sectors.
- Subject to assurance: Capable of independent limited assurance in the medium term.
- Aligned to policy goals: Aligned with global and national policy goals and targets, such as the indicators and metrics in the Global Biodiversity Framework (GBF) measurement framework and other international treaties. This is similar to how organisations align their reporting with the Paris Agreement and net zero targets, as well as other standards and target setting frameworks.

The TNFD framework distinguishes between metrics that aim to locate ('location prioritisation metrics'), evaluate ('dependency and impact metrics'), assess ('risk and opportunity metrics') and prepare to respond ('response metrics', including policies and targets, engagement or capital allocation). The TNFD also distinguishes between core global (applicable to most economic sectors) and core sector metrics, as well as additional metrics. Example of core (and additional) global disclosure metrics for financial institutions[94] include, for example:

- Dependencies and impacts on nature: Exposure in millions to sectors or companies with high dependency or medium dependency on nature (or high/medium impact on nature); exposure as percentage of total portfolio amount/value.
- Nature-related risks and opportunities: Value of assets, liabilities, revenue and expenses that are assessed as vulnerable to nature-related transition or physical risks (total and proportion of total).
- Responses to nature-related issues: Value of investment in projects that avoid or reduce negative nature impacts or conserve or restore ecosystems or species where impacts cannot be avoided; proportion of sites that have active engagement with local stakeholders on nature-related issues.

For financial institutions, TNFD disclosures also map references to principal adverse impacts (PAIs) of investment decisions on sustainability under the Sustainable Finance Disclosure Regulation (SFDR). The ESAs issued their advice to the European Commission on the SFDR at the end of 2023, including the following binding indicator (metric) on biodiversity: share of investments in investee companies with sites/operations located in or near to biodiversity-sensitive areas where activities

[93] TNFD (2023c).

[94] See TNFD (2023b). Guidance for Financial Institutions version 1.0 and TNFD (2024b). Additional guidance for financial institutions version 2.0.

of those investee companies negatively affect those areas (Core PAI 7). Additional (non-binding) impact indicators include:

- Share of investments in investee companies whose operations affect threatened species (additional PAI 15.1)
- Share of investments in investee companies without a biodiversity protection policy covering operational sites owned, leased, managed in, or adjacent to a protected area or an area of high biodiversity value outside protected areas (additional PAI 15.2)
- Share of investments in companies without a policy to address deforestation (additional PAI 16)

In addition, the European Sustainability Reporting Standards (ESRS)[95] require reporting on direct impact drivers of biodiversity loss, impacts on the state of species, the extent and condition of ecosystems, as well as impacts and dependencies on ecosystem services.

Other developments:

- MSCI's "Underwriting the Biodiversity Crisis" report explores the link between biodiversity loss and increased underwriting risks. The report provides insights into how insurers can incorporate emerging biodiversity risks into their underwriting processes, helping to mitigate long-term financial and environmental risks through an overlay of data on asset geographical location and ownership with appropriate biodiversity metrics.

- An emerging metric is Biodiversity Value at Risk (Biodiversity VaR), which quantifies the potential financial loss from biodiversity-related risks. This metric provides a forward-looking assessment that enables organisations to assess biodiversity risks and opportunities within their investment portfolios.[96]

4.3 MANAGEMENT ACTIONS

4.3.1 Strategy

119. As noted earlier, the complexity of environmental interactions makes it nearly impossible to establish a single target for nature-related conservation and restoration, unlike the clear global warming targets set by the Paris Agreement (e.g. limiting global warming to well below 2°C, with efforts to limit it to 1.5°C, supported by necessary GHG emissions reductions).
120. When addressing biodiversity risks, the objectives and targets set by global and EU strategies can serve as a basis for an undertaking's strategy for addressing transition risks and can help guiding efforts at minimising negative biodiversity impacts financed by the insurer.

Box 13: Global and EU targets on biodiversity

[95] European Commission (2023b). ESRS E4.

[96] (PDF) Bio-Value-at-Risk: A Concept to Assessing the Implications of Biodiversity Risks on Portfolio Management using Geospatial Analysis.

The **Kunming-Montreal Global Biodiversity Framework** agreed in December 2022 sets targets for a transition pathway to protect and restore biodiversity. Governments are responsible for implementing these targets, while economic and financial market participants are expected to align their activities accordingly. Before COP2024, countries must prepare updated National Biodiversity Strategies and Action Plans as well as National Biodiversity Finance Strategies. The upcoming COPs will consider whether the cumulative impact of the national actions is sufficient to reach the global goals and targets for 2030 and 2050.[97]

At the EU level, the **EU Biodiversity Strategy** aims to put Europe's biodiversity on the path to recovery by 2030. This includes achieving legal protection for at least 30% of the EU's land area and sea areas and restoring significant areas of degraded and carbon-rich ecosystems by 2030. The strategy also seeks to ensure that habitats and species do not experience further deterioration in conservation trends or status, with at least 30% to reach a favourable conservation status or showing a positive trend.[98] The **Nature Restoration Law**[99] implements binding targets to restore degraded ecosystems, particularly those with the most potential to capture and store carbon, and to prevent and reduce the impact of natural disasters. As an overall target, Member States are required to implement restoration measures in at least 20% of the EU's land and sea areas by 2030. By 2050 such measures should be in place for all ecosystems that need restoration.

Other policy frameworks such as, for example, Europe's Farm to Fork strategy[100], which aims to implement a sustainable food system, can inform target setting for certain sectoral exposures.

121. Consistent with the observation that biodiversity risks are primarily considered as emerging and reputational risks, a number of insurers publicly commit to industry-wide pledges, such as the Finance for Biodiversity Pledge, where financial institutions pledge to protect and restore biodiversity through their financial activities and investments by collaborating and sharing knowledge, engaging with companies, assessing impacts, setting targets, and publicly reporting on these actions.
122. Currently, most investment or underwriting decisions to mitigate risks are based on the potential impact of the investee or policyholder on nature and biodiversity.
123. Theoretically, one can distinguish between de-risking measures aimed at reducing explicit financial risks (e.g. increased claims or asset depreciation) and impact measures focused on limiting reputational risks or achieving positive environmental outcomes. In practice, these measures are often linked to another. Risk management actions by undertakings are primarily

[97] Secretariat of the UN Convention on Biological Diversity [CBD] (2022): Kunming-Montreal Global Biodiversity Framework.

[98] See European Commission (2020b). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, EU Biodiversity Strategy for 2030. Bringing nature back into our lives.

[99] See European Commission (2024). Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 [99] (**Nature Restoration Law**).

[100] See European Commission (2020a). Farm to fork strategy.

focused on engagement and stewardship strategies to better understand and manage potential risks, including support for nature-positive initiatives. This can involve integrating biodiversity targets in investment strategies.

124. Following recurring targets have been identified:
    - Reducing potential biodiversity-related impacts of an organisation's own operations (e.g. through issuing activities or vehicle fleet management).
    - Exclusion of insurance/investment in/of sites within (vicinity of) sensitive areas listed in UNESCO list of world heritage sites, or NATURA2000 sites if the investment/activity has a specific detrimental effect on biodiversity.
    - Screening based on geolocation in initial project acquisition.
    - Establishing a target percentage of customers in the commercial portfolio for whom an engagement strategy has been developed or setting a target number of dialogues and engagements related to investments.

4.3.2 Actions

125. Risk management actions addressing biodiversity risks can range from identifying risks and setting the risk appetite to adapting the portfolio. Materiality and financial risk assessments contribute to identifying dependencies and impacts on nature and biodiversity. Thus, it enables the integration of a biodiversity risk assessment into the underwriting or investment process, by evaluating and anticipating the potential impact of biodiversity loss across sectors and regions. The use of modelling tools to better understand and predict nature-related risk claims or asset valuation can contribute to setting the undertakings' risk appetite.
126. Actions to manage material biodiversity risks can include de-risking and mitigation measures in investment and underwriting, that aim to reduce prudential risks or to reduce impacts. Assessing the actual financial risk reduction remains challenging in both cases. When applying exclusions to limit the negative impacts of investments or underwriting it is relevant to specify how the exclusion contributes to limiting biodiversity loss, and potential also financial risk for the undertaking. It may be also relevant for undertakings to differentiate between biodiversity-specific exclusions and those related to other environmental issues.
127. Targeted investments or underwriting in order to contribute to biodiversity restoration or conservation, known as 'nature-based solutions' can help reducing transition and physical risks on the (re)insurers' balance sheets. Also here, the challenge lies in the assessment of how much risks are mitigated.[101]

De-risking measures to reduce prudential risks or address negative biodiversity impacts

128. De-risking measures can include:

[101]See for example, United Nations Environment Programme 2024. Insuring a Resilient Nature-Positive Future. Geneva. Also for example: WWF/Deloitte Switzerland (2023) report, "Underwriting Our Planet https://wwfint.awsassets.panda.org/downloads/wwf-deloitte-insurance-biodiversity-climate-2023-full--report.pdf.

- Developing an investment policy with sector-based exclusions for industries deemed harmful to nature and climate (due to the interconnection between biodiversity and climate).
- Creating an investment policy with geographical exclusions that, although more difficult to implement, may be better suited to address biodiversity-related risks.
- Diversifying investments across different geographical areas and asset classes to mitigate concentrated risks.
- Define insurance exclusions in the underwriting policy for specific sectors or geographical areas that could be heavily impacted by biodiversity loss.
- Define a methodical and consistent exclusion process that aligns with an overall biodiversity strategy, targeting at reducing impacts of the investment or underwriting activity on biodiversity.

129. Exclusion approaches require detailed information on the economic activities being financed or risk underwritten and their locations. These approaches become more complicated when investments are made through funds, as this requires engagement with all financial partners and relevant stakeholders.
130. It was noted by stakeholders that for both underwriting and investment policies, area-based or activity-based exclusions (e.g. protected areas; ecosystems with tipping points) should be applied at the level of the corporate group, not only at project level. This can capture potential liability or reputational risks that tend to emerge at group-level, which undertakings can become exposed to even if they do not insure or invest directly in the harmful project in question. It could also capture contributions to physical risk that are relevant from a macroprudential perspective.
131. Exclusions (and impact strategies) do not only serve a short-term and micro-prudential de-risking purpose for a single company but also can have a macroprudential de-risking purpose and contribute to long-term financial stability. Additionally, exclusion approaches carry the risk of divesting or withdrawing insurance cover from economic sectors, which may have broader economic consequences (incl. protection gaps).

Box 14: Examples of exclusion strategies

- Exclusion criteria that, for example target deforestation risk in underwriting as well as investment strategies. For example, according to the IFD report "Fighting deforestation: overview of the strategies of the Paris financial market", the participating insurance companies and banks in the study have integrated the measures regarding deforestation into their policies.[102]
- Several institutional investors, including insurers, have signed a Financial Sector Commitment Letter on eliminating commodity-driven deforestation. By 2025, signatories will publicly report on their progress in eliminating forest-risk, agricultural commodity-driven deforestation in

[102] IFD_Report_Fighting-deforrestation-overview-of-the-strategies-of-the-paris-financial-market.pdf

their investment portfolios. They will only invest in entities that meet risk-reduction criteria and will increase investments in nature-based solutions.[103]

Targeted investments or underwriting to contribute to positive biodiversity and nature impacts ('nature-based') and engagement strategies

132. The European Commission defines nature-based solutions as "solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions." Nature-based solutions support key EU policy priorities, particularly the European Green Deal, the EU Biodiversity Strategy and Climate Adaptation strategy, to foster biodiversity and make Europe more climate-resilient.[104] In the recent joint communication on the European Preparedness Union strategy[105], the European Commission and High Representative presented the promotion of nature-based solutions as part of the future European Water Resilience Strategy, to enhance preparedness and resilience including against natural disasters.
133. (Re)insurers' investment or underwriting strategies can contribute to funding or covering risks for nature-based solutions, aimed at protecting and restoring biodiversity and ecosystem services and incentivise adaptation ('impact underwriting').
134. Such decisions can help reduce transition and physical risks on the (re)insurers' balance sheets. The nature-related externalities generated by the insurance industry through its investment or underwriting activities provide a basis for identifying how (re)insurers can target nature-based solutions. Insurers can assess their investees' and/or policyholders' nature-related footprint or dependency, serving as input for science-based due diligence requirements to identify, monitor, and mitigate the most significant impacts.
135. These approaches complement investment and underwriting policies by adopting a contributory approach to biodiversity. This approach involves identifying economic players or sectors whose financing will positively impact the preservation and restoration of biodiversity. Such investments or underwriting can include companies focused on conserving animal species or cleaning up pollution, as well as investments in asset classes that align with multiple ESG objectives, including biodiversity (e.g. green bonds focused on biodiversity). The challenge remains in ensuring the effective reduction of the impact and assessing potential reductions in financial risk for the undertakings' portfolio.

[103] nature-and-tackling-deforestation - Climate Champions (unfccc.int).

[104] See European Commission, Nature-based solutions research policy (europa.eu).

[105] See Joint Communication of the EU Commission on the European Preparedness Union strategy. According to the European Central Bank, almost 75% of bank loans to companies in the euro area are granted to companies that are highly dependent on at least one ecosystem services, notably on water.

136. Based on the activities that can have a 'substantial contribution to the protection and restoration of biodiversity', according to the Taxonomy Regulation, nature-based investment or underwriting activities can aim at supporting the financing or the coverage of risks for activities related to[106]:

- nature and biodiversity conservation including achieving favourable conservation status of natural and semi-natural habitats and species or preventing their deterioration where they already have favourable conservation status, and protecting and restoring terrestrial, marine and other aquatic ecosystems in order to improve their condition and enhance their capacity to provide ecosystem services.
- sustainable land use and management, including adequate protection of soil biodiversity, land degradation neutrality and the remediation of contaminated sites.
- sustainable agricultural practices, including those that contribute to enhancing biodiversity or to halting or preventing the degradation of soils and other ecosystems, deforestation and habitat loss.
- sustainable forest management, including practices and uses of forests and forest land that contribute to enhancing biodiversity or to halting or preventing degradation of ecosystems, deforestation and habitat loss.

Box 15: Examples of nature-based investment or underwriting activities

Nature-based underwriting policies

- AXA signed in 2017 "The Oceana and UN Environment Program Finance Initiative (UNEP FI) Insurance Industry Statement Against Illegal, Unreported, and Unregulated (IUU) Fishing". This implies, for example, that AXA's Marine underwriting rules and guidelines require vessels to be checked against IUU fishing blacklists, which allow to assess whether fishing vessels have the proper licenses and to check that they do not have periods when their tracking systems are inactive.
- Tokio Marine, through its customer-participating "Green Gift project", aims to gather funds by incentivising policyholders to choose web-based rather than paper-based contracts. A portion of the expense saved due to a reduction in paper usage is then used to support mangrove-planting activities overseas and environmental protection activities in Japan.[107]
- The AXA XL Coastal Risk Index integrates protective benefits of coastal ecosystems into insurance risk models. It supports the case for investing in nature-based solutions by estimating the potential benefits of the coastal ecosystem (coral reefs, mangroves) to assets and populations in different flooding scenarios.[108]

[106] Based on Article 17 Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (**Taxonomy Regulation**).

[107] See https://www.tokiomarinehd.com/en/sustainability/pdf/sustainability_tnfdreport_202403.pdf

[108] AXA XL Ocean Risk Initiative (2021). Coastal Risk Index.

- Marine Protected Area (MPA) Insurance Coverage: In collaboration with governmental and non-governmental organisations, insurance products have been designed to cover MPAs, limiting the impact of natural catastrophe losses. For instance, in Belize, insurance covers the Marine Reserve of the Turneffe Atoll, which includes 132,000 hectares of coral reefs. In the Philippines, a network of reserves in northern Oriental Mindoro covering 5,200 hectares of coral reef, on which 12,000 fishers depend, is insured. A payout is triggered within days if a cyclone comes within a 50km radius of the MPAs. Once compensation is activated, the social enterprise Blue Finance engages in activities to restore weakened marine ecosystems, such as cleaning up debris and repairing damaged corals. Blue Finance also allocates funding for repairing MPA equipment, such as guard posts, and covers operating losses related to ecotourism and artisanal aquaculture.[109]

Nature-based investment policies:

- The "Fonds Objectif Biodiversity" (Fund for Biodiversity) launched in March 2024 by 11 French investors[110] has the objective to invest in listed companies (small and medium-sized) which are either in transition towards a sustainable business model from a biodiversity perspective or developing innovative solutions to preserve biodiversity.[111]
- Promotion of biodiversity within rural properties: Farmers who lease agricultural land from a.s.r. are actively encouraged to manage the land sustainably, which positively impacts biodiversity. To support sustainability efforts, a.s.r. reduces the rents for farmers with whom additional agreements have been made. In the first three years, farmers receive a 10% discount, followed by a 5% discount in subsequent years. This scheme provides farmers with financial security and the flexibility to invest in sustainability.[112]

137. Broader engagement strategies allow insurers to leverage their influence to advance practices in the insurance market, creating positive momentum toward policies that preserve biodiversity. Stakeholders note that engagement should not only be with investees and policyholders, but also with scientists, local community and indigenous people.

Box 16: Examples of engagement strategies / other

- Achmea highlighted its engagement strategy within its agriculture insurance portfolio, focusing on several environmental themes. Through discussions with agricultural businesses, including

[109] University of Cambridge Institute for Sustainability Leadership and Howden (CISL and Howden), 2024. Nature-related financial opportunity use case: The role of mangroves, coral reefs and seagrasses in supporting and protecting near-shore fisheries in Bolinao, the Philippines. Cambridge, UK: University of Cambridge Institute for Sustainability Leadership. opportunity-use-case-howden.pdf (cam.ac.uk).

[110] Launched by Abeille Assurances (Aéma Groupe), BNP Paribas Cardif, BPCE Assurances, la Caisse des Dépôts, CNP Assurances, EDF Gestion, MAIF, MACIF (Aéma Groupe), Malakoff Humanis, Société Générale Assurances, Crédit Agricole Assurances, with Af2i.

[111] See Fonds-Objectif-Biodiversite-les-11-investisseurs-institutionnels-slectionnent-Mirova-pour-gerer-le-fonds-cote.pdf

[112] a.s.r. (2023).

via permanent consultation structures like sector councils, the company gains insight into sustainability issues and explores potential solutions.[113]

- A collaborative investor initiative called "Investors Policy Dialogue on Deforestation (IPDD)" has been implemented to engage with policymakers in selected countries to halt deforestation. It is an initiative promoted by the "Storebrand Asset Management" whose goal is to collaborate and share knowledge, engage with companies, assess impacts, and set appropriate targets.[114]
- CNP Assurances notes that it conducts its shareholder dialogue, with regard to biodiversity aspects, based on the following principles: Implement a robust governance framework that clearly sets out the Board of Directors' responsibility for biodiversity-related risks and opportunities; set quantitative targets on the protection and restoration of biodiversity in line with the Kunming-Montreal Agreement; measure the company's biodiversity footprint and dependence on ecosystem services; establish an action plan to combat deforestation, pesticide use and plastic pollution, with quantitative indicators; publish information in accordance with TNFD recommendations enabling investors to assess the soundness of the company's business plan against different biodiversity scenarios.[115] It also expresses commitment to 'engage in annual dialogue with five companies to encourage them to adopt a strategy aligned with international biodiversity agreements by the end of 2024'.[116]

[113] Achmea (2023). Annual Report 2023, p. 61.

[114] Storebrand's policy on nature - www.storebrand.com

[115] CNP-Assurances--Politique-engagement-actionnarial-2024_EN.pdf

[116] CNP-Assurances-Bilan-RSE-2023-VA.pdf

5. CONCLUSIONS

138. The present report is the first European supervisory report on current practices and challenges in the identification, measurement, and management of biodiversity risks by (re)insurers as part of the existing Solvency II risk management framework.
139. The report analyses market practices, building on existing regulatory requirements. The main findings are set out below.
140. In accordance with these findings, EIOPA concludes with potential actions to build on these market practices.

5.1 MAIN FINDINGS

Promising market practices

141. Promising market practices reveal the industry's awareness of the potential impact of biodiversity loss on the economy more generally, as well as in certain lines of business more specifically, such as for the agriculture or forestry sector.
142. Main initiatives observed in the market aim at creating risk awareness for biodiversity risks at board level, expressing the need for strategic attention on what undertakings identify as an emerging risk, or a mega trend.
143. Market participants emphasised the importance of narratives in underpinning scenarios that capture the complexity of biodiversity risks, including interlinkages between climate and biodiversity, as well as spillover and compounding effects.
144. Furthermore, industry and stakeholders are undertaking an important number of initiatives to support the identification and management of biodiversity and nature-related risks. These initiatives help identifying risk drivers and transmission channels, including exposures in the real economy based on impacts and dependencies on ecosystem services. They also provide guidance on conducting high-level exposure and materiality assessments, offer potential narratives for scenario analysis and present several metrics for financial risk assessment. Different tools and methods for biodiversity exposure risk assessment are under development.
145. At the same time, the observed market practices indicate that the identification, measurement and management of biodiversity risks by the insurance industry are still at an early stage, in particular for underwriting activities. Some undertakings, however, show a greater level of maturity.
146. Biodiversity risk is often viewed through the lens of reputational risk. Conducting biodiversity risk assessment under Solvency II requires moving beyond treating the risk as a mere potential reputational risk. This requires materiality assessments to be performed with adequate resources.
147. Most undertakings consider biodiversity to be an important but emerging risk - a 'megatrend' that is difficult to translate into concrete financial impacts on insurance activities. The most assumed risk is a potential negative impact on investments, such as a decrease in asset values.
148. Some undertakings refer to potential biodiversity risks in their sustainability risk plans, but there is limited evidence of the assessment of materiality of biodiversity risk in ORSAs. References to

biodiversity in existing public sustainability plans primarily focus on governance arrangements and stewardship, with an emphasis on investment strategies.

149. A number of undertakings have analysed certain investments or underwriting activities, such as in the agriculture or forestry sector, which may be highly impacted by biodiversity risk. Some health-related exposures have also been identified, but they have not yet been further analysed in the ORSA.
150. The following challenges can be noted in the identification of the potential materiality of biodiversity risk.

Challenges to identify the potential materiality of biodiversity risk

151. The measurement of the risk is not straightforward, and while datapoints on, for example, the evolution of species or habitats are available, these are not easily implemented for financial decision-making purposes by insurers.
152. Challenges to the integration of biodiversity risk assessment in insurers' risk management practices make actionable risk assessments difficult today. These challenges range from the limited capacity to identify the risks (linked to data limitation), to the complex nature of biodiversity (due to its regional specificities and its interlinkages with other environmental risks, including climate change).
153. The difficulty of assessing the materiality of biodiversity loss is also due to its multifaceted nature, which is intertwined with climate change risk.

Lack of boundary with climate change risk (the 'climate-biodiversity nexus')

154. The nexus between climate change and biodiversity or nature-related loss potentially limits the risk assessment of specific biodiversity risks on asset classes or lines of business and introduces the risk of double counting.
155. While noting the limitations in setting clear boundaries, biodiversity risk should not be assessed solely through the lens of climate change, and insurers should consider the potential existence of biodiversity-specific and often localised risks, regional data and scenarios in parts of their portfolios. This may include lines of business and investments which may be heavily exposed to biodiversity risk: forestry, agriculture and health-related activities.
156. At the same time, it is necessary to ensure that the biodiversity risk assessment is consistent with climate risk assessment, to prevent double counting risks. For natural catastrophe risk assessment, the mutually reinforcing effects of the risks and respective adaptation measures need to be considered.
157. The use of integrated scenarios, or the integration of biodiversity risk indicators in natural catastrophe modelling may need to be considered going forward. This requires further efforts in identifying relevant data, tools and scenarios. Some stakeholders support an integrated 'nature-related risks' approach, allowing the distinct dimensions to be addressed separately and in conjunction.

Challenges in identification and access to relevant data, tools and scenarios

158. To date, the lack of access to public and corporate data on local biodiversity risks hinders effective risk assessment. Global models and metrics struggle to capture local biodiversity risks, whereas specific regional scenarios may be needed for certain portfolios and regions. Limited access to geo-spatial data may also limit the potential for accounting for local and regional biodiversity risk complexities. Responses to the consultation, however, also show that some specific tools, methodologies and scenario analyses exist and can serve as a first basis to identify biodiversity risks.
159. While financial risk scenarios are not easily available or applicable, insurers should be able to base financial risk assessments for potential material risks on plausible but extreme scenarios relevant to their risk profiles. Multiple biodiversity risk scenarios may be necessary, depending on regions and business areas.
160. Undertakings with potential limited risk exposures, as well as small and non-complex undertakings and (re)insurance captives should therefore benefit from the use of qualitative approaches to assess their financial risk, while quantitative approaches should be endeavoured with available data.

5.2 AREAS FOR ACTION

161. Quantitative methodologies for assessing biodiversity or nature-related risks are to date still less developed than those for climate risks. However, this does not prevent action. As the report shows, initiatives are being taken and various data sources and tools exist for undertakings to begin, at a minimum, qualitative biodiversity and nature-related risk assessments.
162. On the basis of these findings, EIOPA identifies at this stage the following areas for further engagement to ensure insurers can further improve on biodiversity-related risk assessment:

A. <u>Strengthened coordination in the EU among supervisors and policymakers with a view to identify targeted action</u>

163. EIOPA sees merit in closer collaboration among stakeholders to enable synergies in the identification of priority areas of action, improve collection of data, the development of models and scenarios for the identification of risk-based measures to manage biodiversity risk. On this basis, targeted areas of action could include:

- Identifying potential lines of business or investments most at risk of loss of specific ecosystem services. Targeted action may be considered regarding specific risks to nature, including the IBPES pressure points of land and water use, resource extraction/(over)-exploitation, pollution, invasive (alien) species. Special focus on high-impact sectors such as food & agriculture, mining or chemicals may be relevant going forward.
- Analysis on investments or underwriting that contribute to biodiversity restoration or conservation, known as ‘nature-based solutions’, which can help reduce transition and

physical risks on the (re)insurers' balance sheets, as well as address unintended protection gaps.

- Efforts to improve data collection and the use of common metrics to monitor biodiversity loss in insurance activities, identifying the most relevant common practices and repositories of tools. Stakeholder input showed a multitude of approaches which renders a systematic and useful identification of data, relevant tools, or scenarios to support the sector elaborate. Concerted efforts can improve systematic identification and (open source) availability of relevant data and methods.

B. Initiatives for addressing the climate-biodiversity nexus

164. EIOPA recognises the critical interconnection between climate change and biodiversity loss. There could be benefit in pursuing targeted initiatives to further address this nexus, especially considering their potential mutually reinforcing effects on climate adaptation which can contribute to reducing losses from natural catastrophes. Further potential areas for targeted input can include:

- Analysing the capacity/availability of natural catastrophe models in integrating climate hazard and biodiversity-related inputs. Integrating biodiversity and nature-related data into catastrophe modelling is an emerging field. While traditional CAT models focus on natural hazards like earthquakes and hurricanes, incorporating ecological factors can provide a more comprehensive understanding of potential risks. Targeted analysis on certain hazards and nature-related risks (e.g. drought /water scarcity) which materialise in natural catastrophes could be considered.
- Analysis on how the investment in or underwriting of nature-based solutions can contribute to narrowing the natural catastrophe insurance protection gap.

C. Capacity building

165. EIOPA aims to engage further in a structured dialogue among supervisors[117] and with industry to promote a more comprehensive understanding of biodiversity risks and their potential impacts for the insurance industry. This could take the form of dedicated workshops to share insights and practices among supervisors, the industry, and academia following the publication of the report.

[117] The results of the SIF survey on regulators and supervisors' involvement in nature-related risk assessment shows a number of initiatives as well as the need for increasing understanding of nature-related risks, tools and methods. Sustainable Insurance Forum (SIF) - Nature-Insurance Nexus.

ANNEX I THE INSURANCE SECTOR'S EXPOSURE TO BIODIVERSITY RISK

INVESTMENT EXPOSURE ASSESSMENT

Data sources: Solvency II QRT sources for the assessment of investment exposure to biodiversity risk

Reported data on investments allows to perform exposure analysis to physical and transition risks. Notably, analyses on direct equity (CIC3) and corporate bond (CIC2) holdings, as well as direct investments in real estate (CIC9). Equity and corporate bond holdings are reported on security-level, with corresponding issuer identifier (e.g. LEI), issuer country and NACE sector of economic activity. Real estate investments are reported by country and as of 2023-Q4, also with an address.

S.06.02 — List of assets: this template contains an item–by–item list of assets held directly by the undertaking (i.e. not on a look–through basis), classifiable as asset categories 0 to 9 [CIC categories].

Exposure assessment

EIOPA assessed the dependency on ecosystem services of insurers' corporate bond and equity investments following Ceglar et al. (2023).[118] The methodology relies on the ENCORE tool,[119] which provides a set of materiality scores for dependencies on ecosystem services for economic activities. The higher the materiality score, the higher the dependency on a given ecosystem service and the larger the effect of a change in provision of the ecosystem service on the production process and ultimately the financial performance of that economic activity. The ENCORE data is enhanced by the input-output table EXIOBASE, thus also capturing upstream dependencies along the supply chain for an economic activity. While EXIOBASE is country-specific, the original ENCORE materiality scores do not differ across geographies.

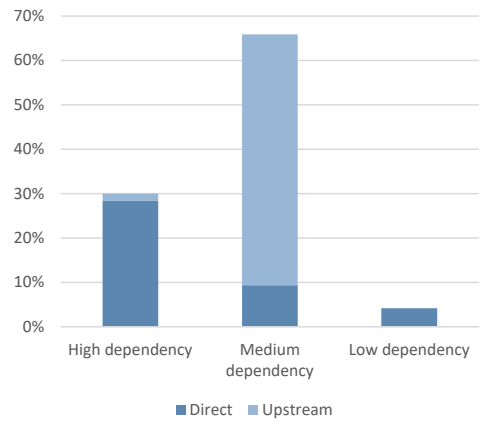
Applied to EEA insurers' direct investments in corporate bonds and equity, amounting to approximately EUR 2.3 trillion, 30% of these investments are towards economic activities that highly depend on at least one ecosystem service. Compared to direct dependencies only, accounting also for upstream dependencies along the supply chain increases the materiality to a medium dependency on at least one ecosystem service for most of the portfolio, while the highly dependent share increases only slightly.

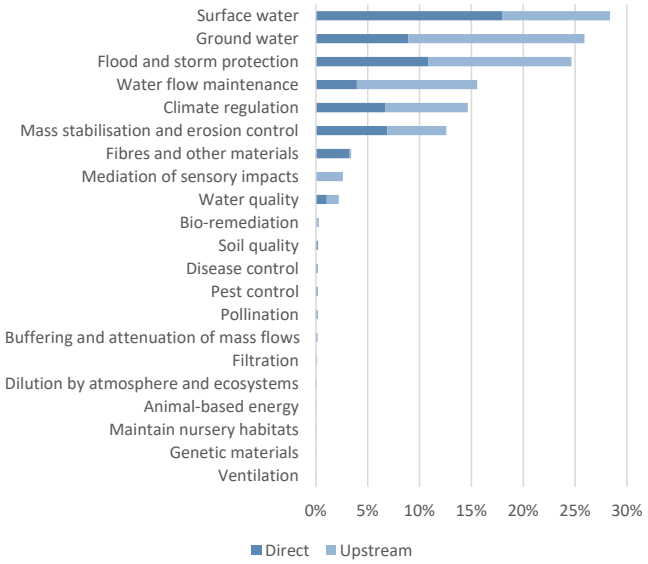
The main exposures within portfolios of corporate securities are towards surface and ground water, as well as flood and storm protection. Insurers invest a large part of their portfolio (approximately 48%) in securities issued by financial firms, which also make up the largest part of the exposures with a medium dependency on at least one ecosystem service. As the methodology relies on a mapping to the sector of economic activity and its value chain via input-output tables, the indirect dependency on ecosystem services through an investee banks' loan book might not fully be captured.

[118] ECB (2023). Occasional Paper Series No 333. Living in a world of disappearing nature: physical risk and the implications for financial stability.

[119] ENCORE (encorenature.org).

Figure 5: Maximum direct and upstream dependency on ecosystem services of insurers' corporate bond and equity portfolio





Source: ECB and own calculations based on Group SII QRT S.06.02 and ENCORE database.

Notes: Data as of 2023-Q4. High dependency when materiality score >=0.8; medium when <0.8 and >=0.6; and low when <0.6. An investment is labelled as highly dependent when the issuing firm has a sufficiently high direct dependency score (blue bar) or sufficiently high dependency when also taking into account possible supply chain linkages (light blue bar).

UNDERWRITING EXPOSURE ASSESSMENT

Data sources: Solvency II QRT sources for the assessment of underwriting exposure to biodiversity risk

Reported data on underwriting activity only allows for a broad categorisation per (Solvency II) line of business and the country of risk/underwriting. This data can be combined, for example, with country-average indicators on biodiversity (e.g. Biodiversity Intactness Index). The underwriting portfolio cannot be assessed according to the sector of economic activity, which is, for example, relevant for the assessment of potential exposure to business interruption claims. Another difficulty is the classification by line-of-business (LoB), for example not allowing to identify crop insurance or the specific risks insured.

For example,

- S.04.05 — Activity by country – location of risk: Undertakings shall report on a country-by-country basis for at least 95% of gross written premium. All business shall be reported, however, any residual business over the 95% threshold may be grouped as "other countries".
- S.17.03 — Non-Life Technical Provisions — by country: Information reported by country shall at least represent 90 % of the total Technical Provisions as a whole and Gross Best Estimate (referred

to direct business) of any line of business. For the direct insurance business for the lines of business 'Medical expense', 'Income protection', 'Workers' compensation', 'Fire and other damage to property' and 'Credit and suretyship' information shall be reported by country where the risk is situated, for all other lines of business it shall be reported by country where the contract was entered into.

- S.21.02 — Underwriting risks non–life: In this template the 20 biggest single underwriting risks, based on net retention, across all lines of business, as defined in Annex I to Delegated Regulation (EU) 2015/35, shall be reported. If the 2 biggest single underwriting risks for any of the lines of business, as defined in Annex I to Delegated Regulation (EU) 2015/35 are not covered through the above methodology, then they shall be reported in addition. In case a single underwriting risk of a specific line of business forms part of the top 20, the same risk of the affected line of business must only be filled in once.

Exposure assessment

An attempt was made to assess underwriting exposures based on reported data (SII QRT S.17.03). This underwriting data is only available at aggregated level, which merely allows for a broad categorisation per line of business (LoB) and the country of risk/underwriting based. For the analysis, the data was combined with the Biodiversity Intactness Index (BII) from the Natural History Museum, which is an estimated percentage of the original number of species that remain and their abundance in any given area, despite human impacts.[120]

Combined with the reported data on technical provisions, the expected change in biodiversity intactness from 2015-2050 per LoB and country of risk/underwriting can be mapped. However, translating this into implications for insurers or even a risk analysis for underwriting is not possible, for three main reasons. First, the underwriting portfolio cannot be assessed according to the sector of economic activity, which is, for example, relevant for the assessment of potential exposure to business interruption claims. Information on the sector of economic activity would further allow to map the data on underwriting to other data sources, such as ENCORE. Second, the classification by LoB does not allow to identify specific risks insured that might depend on biodiversity intactness, such as crop insurance. Lastly, exacerbating the previous two shortcomings, as the technical provisions are only reported at country-level, the BII can only be assessed at the country-level aggregation, thus eliminating a lot of the regional/local variance. For assessing implications or quantifying risks for insurers, more granularity in the data would thus be required.

Therefore, more granular data and further research is needed to perform undertakings' underwriting exposure to biodiversity risk.

[120] This data includes more than 54,000 species, encompassing not only birds and mammals, the groups most often used in biodiversity indicators, but also plants, fungi and insects. It thus captures the share of 'pristine' nature preserved, similar to biodiversity footprinting tools. Furthermore, it also provides estimates of future developments of the BII under different scenarios based on Shared Socioeconomic Pathways (SSPs).

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marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Commission Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities.

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