Part 2 of the PSI Nature Uncovered Series
Making Nature Visible and Actionable for Insurers

UN environment programme | finance initiative

Principles for Sustainable Insurance

Breaking Ground

Getting practical with nature-related assessments for insurers

October 2025

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About the UN Environment Programme's Principles for Sustainable Insurance Initiative

Endorsed by the UN Secretary-General and insurance industry CEOs, the Principles for Sustainable Insurance (PSI) serve as a global framework for the insurance industry to address environmental, social and governance risks and opportunities—and a global initiative to strengthen the insurance industry's contribution as risk managers, (re)insurers and investors to building resilient, inclusive and sustainable communities and economies on a healthy planet.

Developed by the UN Environment Programme's Finance Initiative, the PSI was launched at the 2012 UN Conference on Sustainable Development (Rio+20) and has led to the largest collaborative initiative between the UN and the insurance industry. The PSI represents the most extensive global network of insurance and stakeholder organizations committed to addressing sustainability challenges and opportunities.

Learn more at: unepfi.org/psi

> "The Principles for Sustainable Insurance provide a global roadmap to develop and expand the innovative risk management and insurance solutions that we need to promote renewable energy, clean water, food security, sustainable cities and disaster-resilient communities."
>
> **UN Secretary-General**
> **(PSI launch, 2012 UN Conference on Sustainable Development)**

About the PSI Working Group for Nature

Building on the PSI's long-standing work in addressing nature-related issues over the years, the PSI Working Group for Nature (WGN) was established in May 2024. The working group is a multistakeholder platform involving insurers, reinsurers, brokers, nature finance initiatives, environmental organizations, academic institutions, insurance regulators and supervisors, and insurance associations, among others.

The working group aims to support the industry and key stakeholders in advancing risk management, underwriting and insurance strategies, approaches, practices, products, services and solutions that address nature-related dependencies, impacts, risks and opportunities (DIROs) in order to contribute to achieving the mission of the Kunming-Montreal Global Biodiversity Framework (GBF) to halt and reverse nature loss by 2030, and its vision of a world living in harmony with nature by 2050. It gathers emerging practices and guides on methods available to support individual organizations in their own sustainable strategic design and development.

Learn more at: unepfi.org/psi-nature

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Abbreviations and acronyms

CBD	Convention on Biological Diversity
CISL	Cambridge Institute for Sustainability Leadership
CSRD	Corporate Sustainability Reporting Directive
DIROs	Dependencies, impacts, risks and opportunities
EC	European Commission
EFRAG	Formerly the European Financial Reporting Advisory Group
EIOPA	European Insurance and Occupational Pensions Authority
ENCORE	Exploring Natural Capital Opportunities, Risks and Exposure
ESG	Environmental, social, and governance
ESRS	European Sustainability Reporting Standards
EU	The European Union
FIT	Forum for Insurance Transition to Net Zero
FPIC	Free, prior and informed consent
GBF	Kunming-Montreal Global Biodiversity Framework
GRI	Global Reporting Initiative
GWP	Gross Written Premium
IBAT	Integrated Biodiversity Assessment Tool
IFRS	International Financial Reporting Standards
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
ISSB	International Sustainability Standards Board
IUCN	International Union for Conservation of Nature and Natural Resources
KBA	Key Biodiversity Area
LEAP	Locate, Evaluate, Assess and Prepare
LoB	Line of Business
NGO	Non-Governmental Organizations
NbS	Nature-based solutions
NBSAP	National Biodiversity Strategies and Action Plan
NGFS	Network for Greening the Financial System
NWP	Net Written Premium
ORSA	Own risk and solvency assessment
P&C	Property and Casualty
PBAF	Partnership for Biodiversity Accounting Financials

PSI	Principles for Sustainable Insurance
SBTN	Science Based Targets Network
SME	Small and Medium-sized Enterprise
TCFD	Taskforce on Climate-related Financial Disclosures
TNFD	Taskforce on Nature-related Financial Disclosures
GFI	Green Finance Institute
UN	United Nations
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNEP	United Nations Environment Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNPFII	United Nations Permanent Forum on Indigenous Issues
WBCSD	World Business Council for Sustainable Development
WEF	World Economic Forum
WGN	PSI Working Group for Nature

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Executive summary

The *Nature Uncovered for Insurers* Series

This report, *Breaking Ground: Getting practical with nature-related assessments for insurers*, is the second part of the *Nature Uncovered for Insurers Series* of the PSI Working Group for Nature (WGN).[1]

The series aims to address a critical gap in guidance and practical insights on nature-related dependency, impact, risk, and opportunity assessments ("nature-related assessments") that are tailored for insurance underwriting portfolios. It seeks to contribute to building knowledge and facilitating the use of such nature-related assessments within the global insurance industry, equipping insurers to derive strategic responses aligned with a nature-positive and resilient future, to integrate nature considerations into business processes and decision-making, to enhance risk management capabilities, and to inform nature-related disclosures (as outlined in the *PSI Nature Action Guide*).[2]

While the first part of the series (*Rooted in Risk*)[3] sets out a conceptual framework for understanding nature-related dependencies, impacts, risks and opportunities (DIROs) in insurance underwriting portfolios, this second part (*Breaking Ground*) turns to the practical application of nature-related assessments.

Aims and scope of the report

Building on the first report, this publication aims to give insurers a starting point for translating conceptual frameworks into actionable steps for undertaking nature-related assessments. It sets out early practical considerations, supported by emerging examples, for conducting such assessments in insurance underwriting portfolios. Grounded in practices observed across insurers, this report reflects current approaches, recognizing that methodologies will continue to evolve.

The PSI Working Group for Nature considers guidance, recommendations, and requirements from nature-related approaches emerging across the financial sector. Financial institutions have primarily drawn on the Taskforce for Nature-related Financial Disclosures (TNFD),[4] International Sustainability Standards Board (ISSB),[5] Global Reporting Initiative (GRI),[6] and European Sustainability Reporting Standards (ESRS) in the context of the European Union.[7] This is due to their increasing focus on interoperability, their relevance for nature-related disclosures and their applicability to the financial sector.[8]

As the focus of the report series is on nature-related assessments to support objectives beyond input for corporate disclosures (as outlined above), the TNFD LEAP (Locate, Evaluate, Assess, Prepare) approach currently offers the most specific guidance available.[9] It provides dedicated steps for identifying risk management measures and informing strategic responses, ultimately supporting corporate disclosures. Its degree of interoperability and granularity also means that applying the TNFD LEAP approach can help future-proof assessment processes against evolving disclosure expectations.

While the TNFD LEAP approach is considered advanced, this report seeks to illustrate an evolving maturity for its application in insurance underwriting portfolios. This begins with qualitative assessments that can already inform meaningful action and progressing towards more quantitative approaches to support ongoing monitoring and management of nature-related issues, in line with an individual insurer's nature journey. Through practical examples, the report illustrates how early assessments can be undertaken while data and methodologies for insurance underwriting portfolios continue to develop.

This report applies the definitions and scope set out in the first part of the series, *Rooted in Risk*.[10] However, this report focuses specifically on non-life insurance underwriting lines of business, given the current limitations on available case studies and practical examples for applying the TNFD LEAP approach to life & health insurance underwriting lines of business.

Evolving approaches and emerging practice among insurers

To date, insurers are primarily applying nature-related assessments (e.g., through the TNFD LEAP approach) in response to evolving disclosure expectations, including both voluntary frameworks (e.g., TNFD) and mandatory disclosure requirements (e.g., ESRS). These approaches are being used primarily to support materiality assessments and inform corporate disclosures.

However, most insurers have not yet fully leveraged the potential of nature-related approaches to inform strategic actions or embed nature into business processes and decision making. Some early examples exist—including the use of the TNFD LEAP approach to identify nature-related opportunities, such as for the identification and development of new products[11] and the identification and quantification of the risk reduction value of nature-based solutions.[12]

Insurers recognize the need for underwriting-specific guidance and approaches for nature-related assessments. Especially reflecting the distinct features of the insurance underwriting value chain—from enabling various insured activities and assets, to considering the dimensions of insured risks and loss events and the claims process—and the involvement of multiple actors across their value chain including upstream claims service providers, and downstream customers.[13]

Moreover, for insurers, emerging nature-related risks may not only directly or indirectly translate into financial risks but may also present opportunities for new products and services responding to nature-related risks and building resilience for businesses and communities. The line of business or type of product—whether it's covering risks to property, business operations or environmental impacts—also introduces further nuances into nature-related assessments. In addition, insurers may exercise varying degrees of control and influence over activities across their value chain and be exposed to nature-related issues across landscapes and seascapes. These considerations influence how scoping, prioritization, and materiality are approached.

Current applications of nature-related assessments are at an early—often qualitative and insurance-agnostic—stage, with initial underwriting contextualization and, to date, limited use of geospatial data and scenario-based analysis. As insurers—like other financial institutions—cover large numbers of activities and assets across many locations, data challenges have been noted, particularly around asset location data, company- and asset-specific information, and (changes to) state of nature data. These challenges concern both usability (decision-useful, manageable formats) and the required granularity and consistency, particularly when considering the full insurance value chain and the many actors involved. As a result, insurers are taking an iterative approach to applying nature-related assessments. While pragmatic, such iterative approaches should be balanced with the urgency of the targets of the Kunming-Montreal Global Biodiversity Framework (GBF) only being five years away.

Observed approaches to nature-related assessments vary among organizations, with no standardized methodologies for how to begin or implement them yet emerging. This report consolidates observed insurer practice, identifies points of convergence and overlaps, and contributes to the development of best practice.

How to navigate the report

Chapter 1 provides an overview of a) how nature-related assessments can be used, b) how insurers can get started, and c) practical considerations of applying nature-related assessments.

The report then delves deeper into these components through:

- Details on relevant use cases and the corresponding levels of applying a nature-related assessment (Chapter 2),
- Key steps and further insights on how insurers can initiate a nature-related assessment (Chapter 3), and
- Detailed practical considerations in applying the TNFD LEAP framework to underwriting portfolios, including observed practices, examples and applied tools (Chapter 4).

The report is primarily intended for insurance companies, particularly teams (see below) directly or indirectly involved in conducting nature-related assessments for underwriting portfolios. It is also intended for organizations supporting insurers in this process.

Depending on the reader's level of understanding and intended application, different sections of the report may be particularly relevant.

1. From framework to practice: At a glance—for beginners

For readers new to nature-related assessments or teams seeking a comprehensive orientation before preparing for a first nature-related assessment, it is recommended to read Chapter 1 alongside Part 1, *Rooted in Risk*, of the *Nature Uncovered for Insurers Series*.[14]

Readers already familiar with nature-related dependencies, impacts, risks and opportunities (DIROs) and the TNFD LEAP approach,[15] and looking for more in-depth considerations for implementation, can use the Chapter 2 to Chapter 4.

2. Use cases for conducting nature-related assessments—for intermediate users

Chapter 2 is mostly relevant for sustainability, risk management, actuarial, product, underwriting, claims management and risk consulting teams. It outlines the use cases for performing a LEAP assessment in relation to their respective roles and responsibilities and helps teams understand how the assessment can be applied at different levels and integrated into their business processes and decision-making.

3. Insights from insurers on getting started with nature-related assessments—for intermediate users

Chapter 3 is relevant for teams planning to perform their first nature-related assessment of an insurance underwriting portfolio. It offers practical steps and insights to initiate an assessment, identify key teams to involve, and prepare the organization for its nature journey. This section is particularly useful for teams responsible for strategy development and corporate disclosures.

4. Practical considerations and observations applying the TNFD LEAP framework—for advanced users

Chapter 4 provides detailed practical considerations for teams actively performing nature-related assessments and who already have a solid understanding of nature-related DIROs in insurance underwriting portfolios. It is relevant for teams seeking practical suggestions, methods, tools and data sources for each component of the LEAP assessment. It also provides input for sustainability teams to support the upskilling of other teams (e.g., risk management, underwriting, product, claims management, data and technology teams). To apply this section effectively, it is recommended to review the report *Rooted in Risk*[16] and the TNFD *Guidance on the LEAP Approach*.[17]

1. From framework to practice—at a glance

Overview of use cases for nature-related assessments in insurance underwriting portfolios

Nature-related assessments can serve multiple use cases and support a range of objectives, depending on how and where they are applied within the insurance underwriting business.

Nature-related assessments can be applied at different levels: at the portfolio level to inform strategic responses, portfolio risk management, and corporate disclosures; and at the product or customer level to support the implementation of dependency, impact, risk, and opportunity management objectives (see Chapter 2 for further details).

Benefits	**Portfolio level**			
	Portfolio screening & prioritization	Strategy & transition planning	Portfolio risk management	Corporate disclosures
	Product/customer level			
	Opportunities to reduce risk and engage with stakeholders	Product development and review	Underwriting process and client engagement	Risk advisory and management

Figure 1: Use cases of nature-related assessments for insurers

Nature-related assessments are essential for insurers to prioritize and define their strategic ambition and actions in response to nature-related DIROs, as outlined in the *PSI Nature Action Guide*.[18] A nature-related assessment provides the necessary baseline and input to develop transition plans that would enable insurers to contribute to a resilient nature-positive future.[19]

The outcomes of the nature-related assessment would help insurers identify and prioritize areas for action—such as specific lines of business, geographies, value chain actors, or customer segments—where it is most important to avoid and reduce nature-related impacts and risks, or where opportunities may exist to scale new business models, support transitions or build resilience through insurance solutions.[20]

Further examples include using assessment results to inform underwriting policies—such as identifying high-impact or high-risk sectors and activities that should be reflected in underwriting policies, guidelines, or criteria, as well as providing insight into relevant impact and risk indicators to be considered in underwriting processes. Assessments can also help identify high-impact or high-risk customers or suppliers for engagement, including the purpose (e.g., risk reduction/loss prevention, transition opportunities) and area of focus of such engagement. In addition, the assessment can highlight areas where the insurer can actively contribute to positive outcomes for nature—such as through new insurable assets and activities with a positive impact on nature.

To support the implementation of strategic actions and risk reduction measures, nature-related considerations and assessments should be applied across different levels of the insurance business and its processes, including integration into underwriting processes and client engagement, as well as product development and review. More detailed analyses can also help identify risk reduction opportunities and inform targeted stakeholder engagement.

Another key purpose of nature-related assessments is to support portfolio-level risk management including the management of financial risks to the business. Applying a nature-related assessment, such as the TNFD LEAP approach, provides a basis for identifying sources of nature-related risks that may also lead to financial risks to the insurer (refer to *Rooted in Risk* for more details). This, in turn, enables insurers to integrate nature-related risks into their risk management frameworks, including their risk appetite, risk taxonomy, governance, and reporting processes. The assessment can also inform risk reduction measures, such as adjustments to underwriting and reserving policies, portfolio diversification, and reinsurance strategies.[21]

See Chapter 2 for details on relevant use cases and corresponding assessment levels

Key steps for insurers to get started with nature-related assessments

Members of the PSI Working Group for Nature shared key steps and insights for initiating nature-related assessments (see Chapter 3 for further details). While nature-related assessments remain a relatively new area for many insurers, early experiences shared offer useful insights on how to get started.

Insurers will need to tailor the early assessment to their own organizational context, capabilities, and priorities. A gradual, iterative approach—beginning with a manageable scope and underpinned by strong internal coordination—can help build maturity over time and progressively advance the integration of nature into business processes and decision-making.

In terms of governance and resourcing, some insurers began by forming dedicated project teams, typically anchored in the sustainability function. While much of the work remains internally focused at early stages, senior management support and the involvement

of a range of internal teams are critical. Members have shared that it is important for the assessment to be accompanied by a capacity-building programme, so outputs are understood, and actions can effectively be embedded across the organization. Some organizations have also engaged external experts to support early capacity-building.

Key steps identified by insurers include:

Figure 2: Key steps for insurers to get started with nature-related assessments

Stakeholder engagement has been consistently highlighted as essential. The report includes a mapping of both internal and external stakeholder groups, outlining how they can contribute to different stages of the nature-related assessment (see section 3.2). For the initial phases, the working group identified the sustainability team, data and technology teams, risk management team, and the Board and executive management as critical to the success of the nature-related assessment.

See Chapter 3 for more insights from insurers and the stakeholders to involve in the assessment

Applying the TNFD LEAP approach to insurance underwriting portfolios

While not specifically developed for insurance underwriting business, insurers can apply the TNFD LEAP approach to assess nature-related issues across their portfolios. Using this approach also supports greater alignment and consistency across the wider financial sector.

This report centres on the components of the TNFD LEAP approach—specifically the Scoping, Locate, Evaluate, and Assess phases—and does not explore the Prepare phase in detail. The Prepare phase is important, as it highlights how outputs from the assessment phases can inform relevant strategic responses and corporate disclosure. In this regard, the *PSI Nature Action Guide* provides further information on relevant responses in line with an insurer's objectives.[22]

This report outlines for each phase (Scoping, Locate, Evaluate and Assess) practical considerations, observed approaches, and illustrative outputs, along with relevant supporting resources for the nature-related assessment.

How the TNFD LEAP approach is applied within insurance underwriting business depends on the intended use and level of assessment (as defined in Chapter 2):

- General considerations are provided across all application levels of nature-related assessments, with insights predominantly available for portfolio-level analysis.
- The observed approaches presented in this report primarily reflect three purposes shared through the working group: (1) initial portfolio-level screening and prioritization; (2) input to corporate disclosures; and (3) identification of opportunities for risk reduction.

The following section provides an overview of practical considerations and observed practices, with a focus on portfolio-level analysis, as this is currently the most common application and starting point for insurers.

See Chapter 4 for more in-depth considerations and details on observed approaches

Scoping

See section 4.2 for in-depth considerations for Scoping.

Overview of practical considerations and observed approaches

A. Generate a working hypothesis

Understanding the business model typically begins with a high-level map of the underwriting value chain and stakeholders—covering upstream and downstream relationships, distinguished by tiers—before greater detail is introduced in the Locate phase.

An initial view is formed of where nature-related issues are most likely to arise across operations and business relationships, with the expectation that these will principally emerge through upstream and/or downstream activities.

The scope can be defined using existing portfolio classifications—e.g., business segment, line of business (LoB), customer type, sector/sub-sector, value-chain component (upstream/downstream), and geography (or a combination of any of these classifications). In practice, initial scoping usually covers value-chain components, LoBs, customer types, and geographies.

Determinants of the scope can include: (i) where potential issues may arise (e.g., degree of interface with nature; sectors with potentially moderate and high dependencies and/or impacts; exposure to nature-related risks), (ii) data availability, (iii) influence over the value chain, and (iv) portfolio size. Early applications have tended to focus on commercial portfolios, domestic markets, P&C lines, and selected upstream actors. Insurers so far have limited the scope to tiers 1—2, explicitly excluding tier 3 (clients' value chains). Inclusion should be guided by screening where moderate or high-impact and/or high-risk issues are likely, including indirect pathways through the value chain.

B. Align on goals and resourcing

Potential exposure is identified through internal workshops and external screening tools (e.g., ENCORE), with sector-based screening commonly used to flag moderate or high dependency and/or impact sectors for further analysis.

Scoping is treated as an iterative process, with a focused entry point initially, and expanding progressively as data availability and capabilities develop.

Feasible levels of analysis and spatial scale should be defined early. In practice, approaches range from applying qualitative sector proxies to LoB and product-specific contextualization in the underwriting process (insured activities and risks), deep dives into selected value chain components, and analysis of insured assets by location (although location details are not yet always carried through into the Evaluate and Assess phases).

An understanding of existing capabilities across teams, available data and potential data sources, and relevant limitations and constraints is often established.

See Chapter 2 for relevant goals and appropriate levels of analysis, and Chapter 3 for guidance on getting started (skills, resources and potential limitations).

Locate

See section 4.3 for in-depth consideration for Locate.

Overview of practical considerations and observed approaches

L1. Span of the business model and value chain

Building on Scoping, L1 sets out a more granular map of the underwriting value chain across upstream and downstream tiers. Reflecting differences in business models, main lines of business, sector coverage and geographic footprint, additional mapping is done by stakeholder group rather than by sector or customer. In practice, L1 adds modest detail beyond scoping—clarifying main lines, sector focus and key geographies—with deeper granularity developed in subsequent Locate steps.

L2. Dependency and impact screening

In L2, insurers apply a more granular analysis by screening upstream and downstream actors in scope to determine whether dependencies and impacts are potentially moderate or high. Screening is typically sector-based and supported by tools such as ENCORE. As a practical consideration, insurers may add an overlay reflecting the degree of interface with nature by line of business or product to aid prioritization. In practice, this step narrows the subsequent location analysis (L3), as only customers and claims service providers in the sectors identified proceed to L3.

L3. Interface with nature

Determining location. As with other financial institutions, insurers face numerous asset locations across upstream and downstream actors and their value chains. Asset location can be determined at different scales—from countries/regions, administrative units like postcodes, GPS coordinates (e.g., for commercial/private property, engineering); to site/parcel reference (e.g., for agriculture) or linear features such as railways/roads (e.g., for infrastructure)—across different realms and biomes. Insurers also underwrite moving assets (personal and commercial motor, aviation, maritime transport), which requires a tailored approach.

Line of business specifics. A distinction is needed between the location of the insured asset/activity and where the loss event and claims handling occurs. In some cases, the analysis may extend beyond the immediate site boundary to a broader area of influence; or may apply landscape approaches—especially where upstream dependencies and risks or potential impacts on surrounding environments and third parties may arise. This is potentially relevant for third-party liability, environmental pollution liability, and engineering lines.

Information available. Insurers have noted differences in asset-location data by counterparty. Large customers may only provide addresses of headquarters, or may have insured sites across multiple geographies, with GPS coordinates not consistently available. Smaller businesses may provide postcode/address-level information, with limited company-specific detail. Supplier and claims service provider data vary by region, with some geographies benefiting from structured reporting frameworks and third-party data providers.

Hybrid & iterative approach. A phased approach is common, with an initial focus on own operations, followed by a planned extension to claims service providers and customers. Work usually starts with postcodes/addresses, with early translation to GPS coordinates where feasible. Where precise data are unavailable, exposures may be temporarily excluded or assessed using spatial proxies, with iteration as data improves.

L4. Interface with sensitive locations

At this stage, intersections between L3-identified locations and ecologically-sensitive areas are assessed.[23] To support this, some use national ecosystem-condition datasets or collaborate with national institutions for more granular insights into ecosystem condition and services relevant to insured activities. A few have disclosed upstream and downstream exposures in such areas, although disclosures still focus mainly on own sites. There is also initial collection of ecosystem-condition information—beyond area designations—linked to insured assets and activities to inform the Evaluate and Assess phases.

Evaluate

See section 4.4 for in-depth considerations for Evaluate.

Overview of practical considerations and observed approaches

E1. Identification of environmental assets, ecosystem services and impact drivers
E2. Identification of dependencies and impacts

Underwriting context & inputs. The focus here is on indirect dependencies and impacts across upstream and downstream activities in the underwriting value chain. Environmental assets, ecosystem services, dependencies, impact drivers and impacts are contextualized for underwriting, drawing on Locate outputs (priority sectors, actors within priority sectors, key geographies and ecologically-sensitive locations).

Levels of analysis—from proxy-level to granular. Insurers may apply different levels of analysis based on the purpose of the assessment, customer type, and data availability. Approaches can be applied by: (i) (sub-) sector; (ii) environmental asset/geography; (iii) line of business/product (distinguishing normal operations, loss event and claims process); and (iv) value-chain component—claims service providers and the associated process may be prioritized (e.g., for third-party or environmental pollution liability insurance). Where possible, the analysis can extend to the customer level and specific insured assets and locations.

Iterative approach & limitations. Many insurers apply levels (i)—(iv); the process is iterative, returning to L3/L4 for added location detail. In current practice, L2 and E2 largely converge due to limited customer and asset-specific impact and ecosystem data, except where due diligence and environmental impact assessments provide more granular asset-level information (e.g., infrastructure insurance).

Data, tools & cross-functional engagement. Sectoral and environmental-asset datasets are combined with internal workshops to build long lists of dependencies and impacts (by impact drivers and ecosystem services). Assessments are conducted in an integrated, cross-functional manner, rather than in silos.

E3. Measurement of dependencies and impacts

Assessment framing. Dependency and impact pathways provide the conceptual framing for the measurement. A comprehensive measurement following these pathways is currently constrained by data availability, especially customer and asset-specific information, and state-of-nature and ecosystem-service data across locations in scope.

Dependency measurement. In insurance, distinctions are made between ecosystem services linked to insured perils/risks, customers' activities, and claims services. Guidance for measurement exists but application across the financial sector remains limited. Depending on the objective and data availability, the following levels of analysis may be applied: (i) qualitative reliance by sector; (ii) qualitative reliance with high-level geography for ecosystem service availability/quality (indicating dependency-related risk); (iii) quantitative measures of reliance and service provision at the asset/location level (e.g., homes protected per year; water flow regulated); and (iv) monetary measures of services at the asset/location level (e.g., avoided insured losses). This approach can be particularly relevant to assess the risk-reduction value of nature-based solutions (NbS), although it is not yet widely feasible to date.

Impact measurement. Given current limitations, progressive approaches for financial institutions, which are also relevant to insurers, are available and vary by assessment objective and line of business/product: measuring (i) potential impact drivers (qualitative) via sector proxies; (ii) potential impact (qualitative) via overlays of asset locations with geospatial state-of-nature data; (iii) modelled biodiversity footprints at portfolio, company or project level (with limited underwriting applicability); and (iv) actual impact through on-site monitoring of changes in the state of nature. These considerations extend across insured assets and activities, loss events, and the claims process.

Qualitative approaches. Portfolio-level measurement of dependencies and impacts is currently largely qualitative, relying on sector-level proxies and ratings for impact drivers and ecosystem services. More granular approaches could be applied bottom up for identified priority locations. Some pilots assess the importance and value of specific ecosystem services of environmental assets for risk reduction in priority geographies.

E4. Determination of impact materiality

For impact materiality, GRI and ESRS definitions can be applied to identify and determine the materiality of actual and potential impacts (in line with TNFD). The assessment scope would cover the full insurance value chain (i.e., insured assets and activities, loss events, and the claims process). To date, materiality has been derived from the E2/E3 long list of dependencies and impacts, then evaluated and scored in organization-wide workshops against GRI/ESRS criteria.

Assess

See section 4.5 for in-depth considerations for Assess.

Overview of practical considerations and observed approaches

A1. Risk and opportunity identification

Framing & two-step approach. The focus here is on nature-related risks and opportunities arising upstream and downstream of the underwriting value chain. A two-step approach for identification may be used: (i) identifying sources of physical and transition risk for customers in relation to insured activities/assets and claims-service providers; (ii) translating risks into potential effects (e.g., physical damage; yield/revenue loss and business interruption/loss of use; financial claims/expenses; bodily injury or third-party property damage) interpreted within the business model and translated into potential financial risks and opportunities for the insurer.

Identification of sources of risks. Inputs may include: (i) ecologically-sensitive locations and priority geographies (Locate); (ii) indirect dependencies and impacts on nature (Evaluate), typically identified through "what-if" scenarios; (iii) broader contextual developments (policy/regulation, technology, market dynamics, consumer demand, planetary tipping points); and (iv) forward-looking scenarios. In current practice, sector-based approaches are most common, with some focusing particularly on claims. National risk registers may be considered, where available. Inputs are mapped to potential financial effects on the business, with some insurers indicating short-, medium- and long-term horizons.

Identification of opportunities. Opportunities include new or adapted risk-transfer solutions, hazard prevention or reduction (including NbS), and opportunities arising from broader developments (e.g., NBSAPs, regulatory change, sectoral pathways, innovations). To date, identification has largely been by sector or specifically within the claims process. Early pilots identify opportunities for nature-based risk reduction in areas with rising climate-related losses. Portfolio-level opportunity assessment remains underdeveloped.

Methods & tools. Assessments have been mostly workshop-based. The use of risk registers and other tools for risk identification has been limited.

A2. Adjustment of existing risk reduction and risk and opportunity management

Risk reduction for insured vs. insurer. A distinction is made between measures for (potential) insureds/customers and measures for insurers; loss prevention and risk reduction at the insured level is increasingly in focus to reduce potential insured losses and volatility for insurers.

Risk management approaches. Management of nature-related risks can be supported through alignment of risk taxonomies/registers; risk appetite, strategies and policies; inclusion of decision-useful nature-related metrics in reporting; integration into underwriting, due diligence, product development/review and procurement; and clear roles across the three lines of defence. Supervisory guidance on governance and risk management of sustainability risks can be helpful.

Risk reduction measures. At the insured level, measures can include risk analysis, enhanced due diligence, environmental standards, and nature-based risk reduction. For financial risks, measures can include adjustments to risk appetite/underwriting, diversification, reinsurance, concentration/accumulation limits, product oversight and model governance. Current practice includes, for example, annual contracts with adaptable terms, diversification strategies, reinsurance, and provision of risk inventories to customers.

A3. Risk and opportunity measurement and prioritization

Measuring underlying risks and financial risks. Nature-related and associated financial risks identified in A1 are supposed to be measured and prioritized for disclosure or further action. Measurement is framed in two contexts: (i) nature-related risk as an insured (insurable) risk/peril—expressed as a function of hazard, exposure and vulnerability; and (ii) financial risk as implications for the insurer's financial position (e.g., loss of premiums or impacts on liabilities). The focus here is on portfolio-level and financial risks.

Methods. A variety of methods are suggested for risk measurement: within TNFD (heatmaps, asset tagging/exposure analysis, scenario analysis) and within supervisory approaches (narrative and exposure assessment followed by scenario-based financial risk assessment) to indicate potential financial impacts. Approaches in the wider financial sector are emerging and have not yet been widely tested in underwriting portfolios.

Exposure analysis. For insurers, exposure may be assessed by sector (e.g., GWP/sum insured in high-dependency or high-impact sectors), by geography (e.g., GWP/sum insured in high water-risk locations, protected areas or key biodiversity areas), or by dependency/impact-based risk exposure (e.g., where ecosystem services are deteriorating). Exposure analysis beyond sector-based approaches remains limited (see Evaluate phase).

Financial risk assessment. For insurers, the NGFS approach may be followed: scenario narrative, economic risk assessment, and identification of financial risk (see *Rooted in Risk* report for transmission pathways). Portfolio-level, scenario-based financial risk assessment has not been applied owing to limitations in scenarios, data and modelling capability. By contrast, quantification has progressed further for specific applications, such as when developing new insurance products.

A4. Risk and opportunity materiality assessment

Financial materiality for disclosure vs. prudential risk management. For disclosures, identified and quantified risks and opportunities are assessed against ISSB IFRS S1 (or regional/national equivalents such as ESRS) to determine disclosures, with initial evaluation of financial impacts encouraged (e.g., TNFD). In the prudential context (e.g., Solvency II in the European Union), materiality is first assessed through narrative and exposure analysis. Where issues are deemed material, a financial risk assessment should be undertaken.

Expert & qualitative scoring. To date, approaches have largely been workshop-based with cross-functional groups (e.g., finance, legal, underwriting, claims) and mostly based on qualitative outputs. Existing internal risk assessment frameworks (e.g., Operational Risk Assessment Framework) are used to apply structured scoring, determining probability with expected financial impact.

Enabling application and technical progress

The working group's aim is to build knowledge, advance technical work and approaches, and facilitate the use of nature-related assessments. The considerations in this report are voluntary resources. Insurers may choose to test selected approaches and, where feasible, share observations with the working group and key stakeholders, including through disclosures. Greater understanding and technical sophistication is expected to emerge from practical application, including identifying areas where further development is needed.

At this stage, available materials and assessment approaches are primarily intended to support initial implementation. They are often qualitative and make use of sector-based proxies, and they may not yet fully:

a. Identify and assess company- or asset-specific dependencies, impacts, risks and opportunities (DIROs);
b. Reflect nature-related considerations in risk models (e.g., incorporating ecosystem condition as a driver of physical hazards and the risk reduction potential of nature-based solutions);
c. Derive and apply decision-useful indicators for monitoring and management of nature-related issues across portfolios;
d. Apply forward-looking analysis to inform strategic decision-making or assess implications on financial positions; or
e. Be systematically embedded within underwriting processes, risk management frameworks, and broader business decision-making.

These observations point to the value of continued methodological development and, where appropriate, deeper integration over time.

The PSI Working Group for Nature intends to continue contributing to the technical foundations of nature-related assessments for insurance underwriting portfolios. Possible areas could include:

a. Capacity building to equip insurers with the skills and confidence to apply nature-related assessments and translate results into benefits for the business and for nature;
b. Expanding practical considerations and case studies as new insights, approaches and experiences emerge;
c. Advancement of technical methodologies, including nature-related scenario analysis and quantitative approaches to assess and measure nature-related issues.

How to get involved

Please see a survey link below, which provides you an opportunity to share your case studies or examples on nature-related assessments with the PSI Working Group for Nature.

Link to survey

2. Use cases for nature-related assessments in insurance underwriting portfolios

Historically, nature-related risks—such as those related to accidental damages to environmental resources and natural assets—have been specifically addressed within certain lines of business, such as Construction All Risk (CAR) insurance or environmental pollution liability insurance. However, there has been limited systematic integration of nature-related impacts and risks, including damages or loss of assets and activities due to compromised natural systems, across entire insurance underwriting portfolios and within insurers' risk management frameworks.

Nature-related risks can lead to financial risks for insurers—with some of these risks already materializing (see examples shared in *PSI Nature Action Guide*[24] and *Rooted in Risk*[25]). Insurers that are able to understand and assess the implications of nature-related issues for their business models, operations, and financial position; and embed these considerations into their risk management frameworks will be better positioned to navigate a rapidly evolving and increasingly volatile operating environment.

Understanding and assessing nature-related DIROs is critical across multiple organizational levels for insurers. The TNFD's LEAP approach provides a structured process to support this. Although primarily used for portfolio risk management and disclosure, the LEAP approach—or its constituent elements—can also be applied at product, customer, and policy levels, enabling insurers to integrate nature considerations into business processes and decision-making.

This report identifies benefits of applying the TNFD LEAP approach for insurers at different levels:

- Initial assessments and prioritization to derive strategic actions, support portfolio risk management and inform disclosures.
- Implementation of dependency, impact, risk, and opportunity management objectives—through integration of nature into product- and customer-/policy-level processes.

The level of detail in each assessment will vary by intended purpose, but the LEAP guidance remains broadly applicable and helpful. Factors influencing granularity include the availability of spatial data, use of qualitative versus quantitative approaches, reliance on primary or secondary data, and assessment timeframes including forward-looking scenarios.

Table 1: Use cases for nature-related assessments for insurance underwriting portfolios—Portfolio-level

Portfolio-level			
	Purpose of the assessment	**Considerations for the level of assessment**	**References**
Portfolio screening & prioritization	Derive priorities for a) a further deep-dive and/or b) identifying nature-related issues requiring response (e.g., actions to avoid nature-related impacts in ecologically-sensitive areas or material locations, opportunities to reduce risks to customers or provide new insurance solutions). This can include identification of high-impact/-risk business segments, locations, customers, or stakeholders in the insurance value chain.	Initial assessments are mostly qualitative and apply sector and country or regional proxies. Outcomes might include heatmaps with high-impact/-risk areas across lines of business, risk registers or exposure metrics.	Refer to *PSI Nature Action Guide*—Priority action "Analyze nature-related DIROs in the underwriting portfolio"[26]
Strategy & transition planning	Integrate nature-related DIROs in strategic decision-making and the business planning process. Establish the baseline for deriving and embedding nature-related actions that contribute to a nature-positive and resilient future into insurers' transition plans.[27]	Initial stages to consider a more qualitative approach assessing nature-related DIROs to business model, strategy and financial planning. Over time, progress could focus on developing quantitative metrics to support measurable outcomes and credible nature transition plans.	Refer to *PSI Nature Action Guide*—Priority action "Analyze nature-related DIROs in the underwriting portfolio"[28]

Portfolio-level			
	Purpose of the assessment	**Considerations for the level of assessment**	**References**
Portfolio risk management	Identify, assess, and manage risks for portfolio-wide risk management. For example, to uncover risks that are not yet fully recognized or to identify concentrations, enabling insurers to implement measures to manage and mitigate financial risks, including underwriting strategy and portfolio diversification, underwriting and reserving policies, concentration/accumulation policy, and reinsurance policy. Emerging supervisory guidance indicates that nature-related risks should be embedded within insurers' governance and risk management systems and the Own Risk and Solvency Assessment (ORSA) (e.g., under Solvency II in the European Union).[29]	Current approaches start with an initial materiality assessment consisting of risk identification (including a narrative on the drivers and potential effects of nature-related risks) and exposure assessment. This will develop over time to assess financial risks, moving from qualitative to quantitative approaches for portfolio-level financial risk assessment.[30] Assessment approaches will evolve with greater sophistication of nature-related scenarios, risk models, and data granularity.	Refer to additional emerging guidance from prudential regulators and supervisory authorities.[31]
Corporate disclosures	Identify and assess nature-related DIROs and their effects on business model, strategy, financial planning, and resilience (across different scenarios and locations of assets and activities) for corporate disclosure. The TNFD LEAP provides a framework to derive material nature-related topics and metrics for disclosure.[32]	The level of assessment should align with the disclosure metrics and recommendations, which include both qualitative and quantitative information. An evolution of the level of sophistication and granularity of disclosures and relevant metrics can be anticipated.	Refer to *PSI Nature Action Guide*—Priority action "Progressively disclose nature-related DIRO's of the underwriting portfolio"[33]

Table 2: Use cases for nature-related assessments for insurance underwriting portfolios—Product/-customer-level

Product-/customer-level			
	Purpose of the assessment	**Considerations for the level of assessment**	**References**
Opportunities to reduce risks and engage with stakeholders	Identify and assess specific opportunities to reduce risks to customers, assets, and supply chains, particularly through nature-based solutions. Identify areas for engagement with policymakers, governments, and local authorities and provide insights for land-use planning and zoning that take nature-related impacts and risks into account.	Different levels for this analysis can be relevant from initial exposure assessment i.e., identification of locations, products, customers for risk reduction opportunity, to applying scenarios and risk modelling capabilities to determine risk reduction value of nature-based interventions.	Refer to *PSI Nature Action Guide*—Priority action *Engagement with stakeholders*[34] Refer to case study provided in this report *MS&AD—assessment of rain gardens for flood risk reduction* in Chapter 4.
Product development and review	Review new and existing products in terms of their location (e.g., in relation to ecologically sensitive locations), potential negative and positive impacts on nature, nature-related risks as a new insurable peril or driver of physical hazard of insured perils, availability of nature-based risk reduction measures and consideration of affected stakeholders.	Integration of impact and risk assessment in review of existing products and services relevant on a qualitative level—i.e., considering impact drivers, potential nature-related risks. Applying a more quantitative approach in the case of developing new products for nature-related risks or insuring natural assets—such as loss/risk models, and nature-related scenarios.	Refer to *PSI Nature Action Guide*—Priority action *Risk transfer solutions for nature*[35] Also refer to existing case studies applying the TNFD LEAP approach for identification of opportunities and product development.[36]
Underwriting process and client engagement	Identify and assess nature-related impacts and risks of assets and activities, (especially within high-impact/-risk areas such as ecologically-sensitive locations) within the underwriting process; and ability to derive appropriate impact and risk reduction measures. Identify and assess opportunities through client engagement to support a transition to nature-positive and build resilience (e.g., opportunities to reduce risk and address emerging nature-related risks).	Assessment to consider location-specific information, and the level of analysis of impacts and risks will depend on the type of risk, asset, or activity to be insured. Approaches can evolve from considering risk indicators (e.g., water scarcity) in risk profiles and exposure analysis to leveraging scenarios and integration of nature-related risks in risk/premium models.	Refer to *PSI Nature Action Guide*—Priority action *ESG risk management and underwriting* and *Engagement with clients and intermediaries*.[37]

Product-/customer-level			
	Purpose of the assessment	**Considerations for the level of assessment**	**References**
Risk advisory and management	Integrate assessment of nature-related risks into risk advisory services for corporate clients, as well as to provide governments and local authorities, communities and vulnerable people with relevant information on nature-related risks.	Depends on customer and stakeholder needs and the services provided.	Refer to *PSI Nature Action Guide*—Priority action *Risk analysis and management services* and *Engagement with clients and intermediaries*.[38]

Chapter 4, which draws from contributions from WGN members, examines different assessment approaches (reflecting the uses cases outlined above) with a primary focus on initial portfolio screening, qualitative portfolio risk management and inputs for disclosures. It also includes a case illustrating opportunities to reduce nature-related risks.

3. Insights from insurers on getting started with nature-related assessments in insurance underwriting portfolios

3.1 Key steps and early experiences

An important objective of the PSI Working Group for Nature was to capture lessons learned and initial insights on how insurers can approach nature-related dependency, impact, risk, and opportunity assessments.

Nature-related approaches, such as the TNFD[39] and the Natural Capital Protocol[40], provide initial recommendations and practical guidance to help organizations get started and navigate early challenges. Building on these foundations, this chapter integrates shared learnings and industry-specific insights from the working group, offering tailored considerations for insurers. The aim is to facilitate more accessible uptake of nature-related assessments by insurers and support the development of insurance underwriting-specific guidance.

The working group has highlighted that there is currently no standardized approach for insurers to get started. While many insurers have built expertise in climate-related risk assessments, nature-related risks remain a relatively new concept. Insights from adopters of nature-related disclosures within the insurance industry can offer valuable guidance to others beginning their own nature-related assessments. The steps and suggestions below are indicative rather than sequential; in practice, many are undertaken in tandem.

1. Building internal awareness	▪ Begin by reviewing the insurance company's existing understanding of nature-related risks across different teams, including Board and executive management, and extending throughout the organization. ▪ The sustainability team, especially when responsible for nature-related strategies and disclosures, will need in-depth upskilling on nature-related concepts and their relevance to insurers. ▪ At the outset, it is useful to identify key individuals across teams who already engage with nature-related issues (e.g., underwriting, risk, product development, investment or dedicated climate teams). Raise general awareness and involve these internal stakeholders early to champion nature-related efforts. ▪ Assign a dedicated team to lead nature-related assessments and disclosures, potentially establishing a cross-functional task force or project team. Involve external experts, academic researchers, or the asset management team to enrich discussions and deepen insights.
2. Clarifying business relevance	▪ Building the business case starts with understanding, in general, how an insurance company impacts and depends on nature. It requires examining how the specific insurer's business model interacts with nature, emerging regulations and frameworks, and related risks and opportunities. ▪ This involves developing an understanding of the activities of the most relevant lines of business and their potential interface with nature, even before conducting a detailed nature-related assessment. ▪ As a first step, this includes initial engagement with key lines of business to raise awareness and develop the "business case for nature". This will also help secure buy-in and support from business lines when scoping and mobilizing for the assessment.
3. Leveraging climate-related foundations	▪ To date, many insurance companies have focused primarily on climate, and stakeholders—especially the Board, executive teams, and other senior leaders—continue to prioritize climate-related activities. Introducing nature-related risks can be positioned as a natural extension of this existing focus, rather than as a separate or entirely new concept. The aim is to demonstrate how nature builds on the climate journey and leverages existing work on climate-related risk assessments. ▪ To make this practical, highlight how climate-related risk assessments are already indirectly identifying nature-related risks—for example, where physical climate risk assessments consider the impact of climate change on natural resources, such as the ability of commodities to grow under different climate scenarios or where the state of nature is already considered in hazard models for climate-related perils. ▪ Conduct an initial review of existing TCFD reports and climate-related risk assessments to identify overlaps and synergies with nature-related risk assessments and disclosures, helping to integrate nature systematically into existing frameworks.

4. Using existing data	▪ Begin by identifying environmental aspects already integrated into the insurance company's due diligence processes, policies, or products; such as deforestation, pollution, or circular economy initiatives. These existing efforts can serve as a foundation for expanding into broader nature-related considerations. ▪ Insurers may already hold relevant data for nature-related assessments. This can include not only data on the location of insured assets, but also more granular data collected through specific insurance covers, such as environmental pollution liability insurance or engineering lines or through climate-related risk assessments. Additionally, risk advisory services often have advanced analytical tools for environmental risk assessments, which could be leveraged for nature-related assessments. ▪ Existing risk models—particularly natural catastrophe models—might already capture aspects of physical risks that may be relevant to nature-related risk assessments. ▪ Insurance companies are also investors. On balance, many insurers are more advanced on their nature journey in their investment portfolios compared to their underwriting portfolios. Learnings and outcomes can be leveraged for the engagement with the Board and executive teams, analytics tools and data sources can already be available for the underwriting business.
5. Securing leadership support	▪ Raise awareness among the Board and executive management of nature-related issues, including the economic and financial value at risk from nature loss, insurance exposure to nature-related risks, implications for the long-term viability of the business (e.g., insurability of assets), risk management needs, the role of insurers in contributing to nature-positive outcomes, commercial opportunities arising from the transition, and the benefits of increased resilience.[41] Respective management committees should also be equipped with relevant questions to integrate nature into their governance processes. ▪ Demonstrate how addressing nature loss can also support the company's climate ambitions and strengthen climate adaptation and resilience strategies, especially through nature-based solutions. ▪ Secure Board and executive management buy-in and support to initiate a nature-related assessment (e.g., in line with the TNFD LEAP approach), including a commitment to allocate resources, budget, and a path towards nature-related disclosure. ▪ Ultimately, use the results of the nature-related assessment to further strengthen the business case for nature and to communicate findings and next steps to the Board, executive management, and other relevant stakeholders across the organization. ▪ Refer to UNEP FI's *Nature in the Boardroom* publication for additional practical guidance.[42]
6. Mapping a maturity pathway	▪ Start the assessment with a manageable scope. Progressively expand and deepen it to cover more business lines and apply more granular analysis and data over time. For example, begin with a specific part of the insurance company's value chain or business (e.g., non-life or commercial lines) or focus on a particular nature-related issue, and gradually broaden the scope as capabilities develop. ▪ Acknowledge initial data gaps and consider starting the assessment using qualitative data or secondary sources, such as proxy data (refer to Chapter 4 for examples of insurers using qualitative data to provide early insights). ▪ Regularly revisit and adapt the assessment based on findings, objectives, and the need for decision-useful information.

7. Tracking progress	▪ Develop a plan to regularly assess progress and support the gradual maturity of nature-related assessments. Set clear milestones to track progress and ensure continuous alignment with the insurance company's objectives regarding the integration of nature into business processes and nature-related disclosures. ▪ For insurers, it is essential to continuously improve methodologies for assessing nature-related issues. Involvement in organizations and initiatives such as the PSI Working Group for Nature and other relevant stakeholders to develop methodologies and tools can be helpful. Engage with external bodies, making use of industry-specific priority actions and recommendations (see also the *PSI Nature Action Guide*).[43]
8. Engaging stakeholders	▪ Collaborate with the investment teams to leverage existing data sources and their assessment results, and to ensure consistency between underwriting and investment teams and their approaches. ▪ Use the stakeholder list below to identify and engage internal and external key stakeholders when initiating the nature-related assessment (see Tables 3 and 4 below).

3.2 Potential stakeholder groups to engage

The following tables outline key internal and external stakeholders for engagement in the nature-related assessment based on input and insights gathered through the working group. While the list is extensive, the working group identified the sustainability, data and technology and risk management teams, as well as the Board and executive management as critical to the success of the assessment, with other stakeholders playing important supporting roles.

Working group members have shared that they have started to leverage existing materiality assessments and stakeholder dialogues to help inform nature-related dependency, impact, risk and opportunity assessments.

Potential internal stakeholder groups to engage

Table 3: List of potential internal stakeholder groups to engage in nature-related assessments

Internal stakeholder	Purpose of the engagement as part of the assessment
Sustainability	The sustainability team would coordinate efforts to conduct nature-related assessments. They would also ensure that results are incorporated into the insurance company's overall sustainability strategy and long-term planning.
Underwriting	The underwriting team would provide relevant information and data on policyholders. They are well placed to contribute to the nature-related assessment in the context of how nature-related risks could impact risk profiles.
Actuarial	Actuaries would support the development and implementation of nature-related risk analysis and assess their implications for the company's financial stability. They would also contribute to integrating nature-related risks, where relevant, into risk models.

Internal stakeholder	Purpose of the engagement as part of the assessment
Claims management	The claims management and claims supply chain teams would help identify historical claim patterns related to nature-related issues and contribute insights on impacts and risks within the insurance value chain.
Risk management	The risk management team would support nature-related risk assessments by analyzing how these risks could affect the company's financial position (e.g., physical risks to infrastructure or transition risks arising from a shift towards a nature-positive economy) and how nature-related risks can be integrated into the organization's risk management framework.
Risk consulting	The risk consulting team could provide data, risk modelling capabilities, and relevant industry insights to support nature-related risk assessments.
Product & innovation	The product team would support the identification of nature-related opportunities for new risk transfer solutions, services, and product designs, and would contribute to identifying nature-related impacts and risks associated with existing products.
Customer relationships	The customer services team would contribute to customer engagement, including sourcing information, identifying and implementing impact and risk reduction measures, and identifying opportunities to support the transition and build resilience.
Sales & marketing	The sales & marketing team would be involved in setting risk reduction measures, as well as strategic responses and nature-related actions.
Agency and broker services	The team can engage agents and brokers to create awareness of nature-related issues in the insurance industry and in sourcing additional information on customers where required.
Procurement	The procurement team would provide input on suppliers and contractors, including their environmental profiles and processes.
Finance & accounting	The finance & accounting team would assess how nature-related risks affect the company's balance sheet and would be involved in developing strategic responses.
Data & technology	The data & technology team would support the collection, management and analysis of nature-relevant data and help integrate these data into the company's systems.
Human resources	The human resources team would develop training programmes to raise awareness of nature-related issues across the company and support capacity-building in the broader insurance context.
Public & regulatory affairs and legal & compliance	The public & regulatory affairs and legal & compliance teams would review emerging nature-related policies, regulations and requirements and ensure they are appropriately considered.
Investment management	The investment team could contribute results from sectoral impact and dependency assessments, share data used for location analysis, and provide insights on risk reduction measures expected from investee companies.
Board and executive management	The Board and executive management would be responsible for approving the approach to the nature-related assessment, allocating resources and budget, overseeing the assessment process, and approving its outcomes.

Potential external stakeholder groups to engage

Table 4: List of potential external stakeholder groups to engage in nature-related assessments

External stakeholder	Purpose of engagement as part of the assessment
Academic organizations or individuals	Academic organizations or individuals can provide scientific data and research insights on ecosystems, biodiversity, and nature-related issues. They can support insurers in understanding specific nature-related issues and offer frameworks for integrating these risks into business processes and risk models.
Local, national and international nature-focused Civil Society Organizations	Civil Society Organizations (CSOs) can provide access to on-the-ground knowledge of environmental challenges and the specific risks faced by ecosystems. Local CSOs are often embedded within specific landscapes and can help identify high-risk areas and ecosystems that are under threat. Large international CSOs can assist in identifying relevant thematic areas and facilitating engagement with key stakeholders.
Local, national and international regulatory and public sector authorities or government bodies	Public entities can provide guidance on regulatory requirements and frameworks to ensure that the nature-related assessment aligns with applicable environmental policies at local, national, and international levels.
Indigenous Peoples, local communities and other affected communities	Indigenous Peoples and local communities possess a deep understanding of their natural environment and can provide valuable insights into how ecosystems are affected by human activities and climate change. Engagement should be co-designed, continuous, culturally appropriate and properly resourced. They should be actively engaged throughout the nature-related assessment, also refer to the TNFD *Guidance on Engagement with Indigenous Peoples, Local Communities and Affected Stakeholders*.[44] For Indigenous Peoples, engagement should additionally be grounded in the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), including free, prior and informed consent (FPIC),[45] and in the guidance from the UN Permanent Forum on Indigenous Issues (UNPFII) on full and effective participation.[46]
Intermediaries (agents and brokers)	Agents and brokers act as intermediaries between clients and the insurance company and can help communicate nature-related issues to clients and provide feedback from clients on nature-related exposures.
Suppliers and contractors	Suppliers and contractors can provide information on the nature-related impacts of their operations and supply chains, enabling insurers to understand indirect negative impacts and identify opportunities to work with these business partners to avoid or reduce these impacts.
Customers—commercial and retail	While customer engagement may initially be limited, the nature-related assessment will increasingly require additional data from customers. This can increase data requirements during due diligence processes but can also create opportunities to engage customers on new risk transfer solutions and services and build their resilience (see also the *PSI Nature Action Guide*).[47]

External stakeholder	Purpose of engagement as part of the assessment
Insurance associations	National, regional and international insurance associations might already be working on or engaged in approaches and methodologies for nature-related assessments for the insurance industry (e.g., through tailored guidance or capacity building).
Sustainability- or nature-related platforms	Sustainability- or nature-related platforms and networks might already be working or engaged in approaches and methodologies for nature-related assessments for the insurance industry (e.g., through tailored guidance or capacity building).

4. Practical considerations and emerging approaches for nature-related assessments in insurance underwriting portfolios

4.1 Applying nature-related assessment frameworks to insurance underwriting portfolios

As described in Chapter 1, the TNFD LEAP approach is leveraged as the guiding framework for this report to present practical considerations and examples from insurers applying nature-related assessments. This report focuses on the Scoping, Locate, Evaluate, and Assess phases of LEAP. For a complete overview of the full LEAP approach, refer to the TNFD guidance documents.[48]

The figure below outlines how this chapter is structured. It indicates which LEAP components are covered and the corresponding insurance-specific sections, including practical considerations, observed approaches, illustrative outputs, and relevant resources.

Each component is considered in relation to the use cases and levels of application set out in Chapter 2. While the primary focus is on portfolio-level analysis, selected exceptions are included where relevant examples and case studies are available or early considerations may be helpful to insurers.

Emerging practices and examples from insurers are highlighted under each component. These case studies and examples were voluntarily contributed by members of the PSI Working Group for Nature and are available in their published nature-related/sustainability disclosures. For a more comprehensive understanding of an individual insurer's approach, please refer to their respective disclosures.

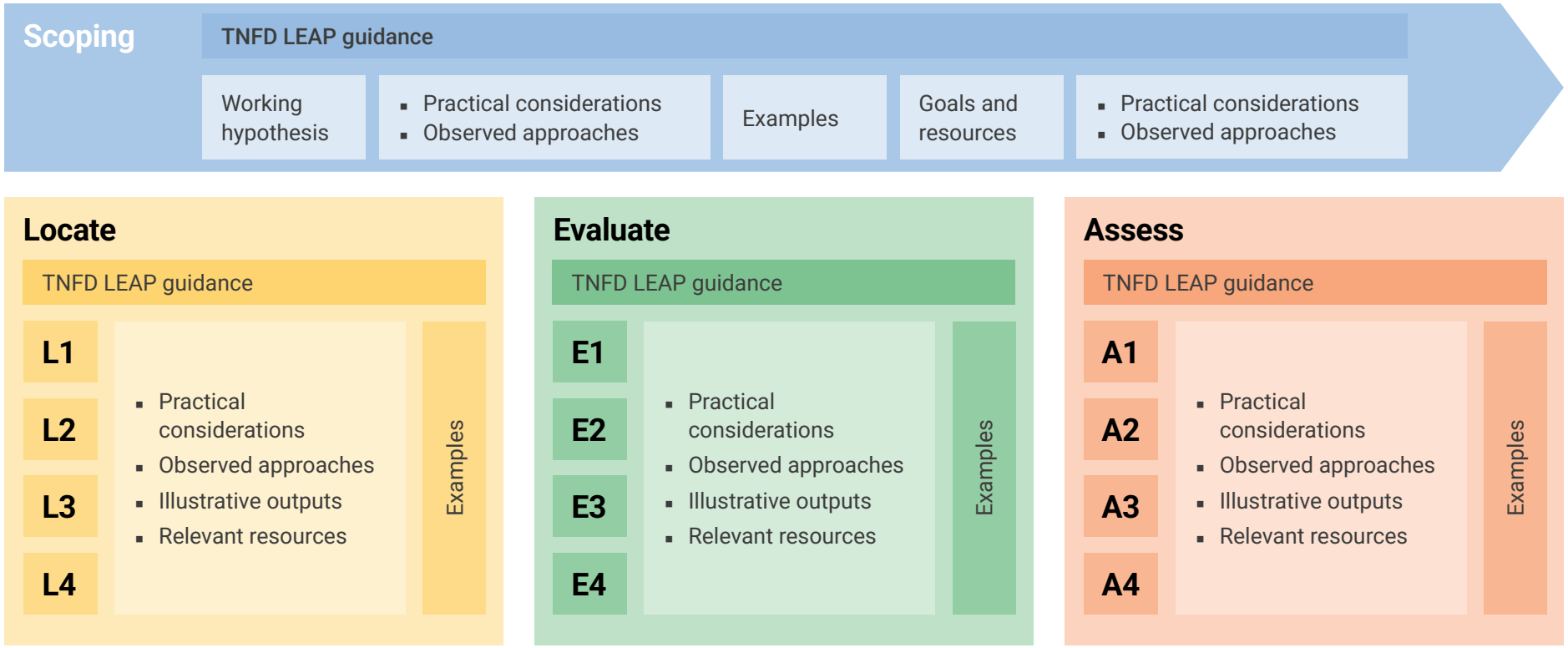


Figure 3: Navigation of Chapter 4—based on the key components of the TNFD LEAP approach

4.2 Scoping the nature-related dependency, impact, risk and opportunity assessment

4.2.1 Relevant guidance from nature-related approaches

Approach	Guidance and recommendations
TNFD LEAP—'Scoping'[49]	A high-level preliminary scan of internal and external data and reference sources to generate a hypothesis about the organization's potential nature-related dependencies, impacts, risks and opportunities. This will help define the parameters for a LEAP assessment and ensure managers and the assessment team are aligned on goals and timelines. Guiding questions: 1. Generate a working hypothesis: What are the organizations' activities for which there are likely to be material nature-related dependencies, impacts, risks and opportunities? 2. Aligning goals and resources: Given the current level of capacity, skills and data within the organization, and organizational goals, what are the resource considerations (financial, human and data) and time allocations required and agreed for undertaking an assessment? The TNFD LEAP supporting questions inform the insurance-relevant considerations in the next section.

4.2.2 Non-life insurance business—considerations and examples

1. Generating a working hypothesis

Table 5: Working hypothesis for the assessment for non-life insurance business

TNFD question[50]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
What does your upstream and downstream insurance value chain look like? Who are the actors within your operations, and upstream and downstream value chains?	▪ The insurance underwriting value chain is interpreted through process-based and stakeholder-based views. Refer to the first part of the series, *Rooted in Risk*, for an illustrative high-level overview of the value chain in scope.[51] ▪ Such an overview may be used as a starting point; however, each insurer should map its own value chain. Only a high-level view is expected at this stage; further detail is developed in Locate—L1 to map actors within the assessment scope. ▪ Insurers may consider distinguishing different tiers of the value chain in the initial mapping—such as direct relationships with suppliers or customers (tier 1) and relationships via intermediaries (tier 2). These actors may also have their own upstream or downstream value chains (tier 3) (see *Rooted in Risk*).[52] ▪ Downstream activities are typically categorized by business segment (e.g., non-life/P&C, life & health), customer type (e.g., personal, commercial), line of business (e.g., property, liability, motor), and insured sector/sub-sector.	For portfolio-level analysis: ▪ For scoping, a stakeholder-based mapping of the value chain is most commonly observed. High-level maps identify key stakeholder groups across tiers (see examples below). ▪ A multi-dimensional view—combining process steps and stakeholder-based mapping—has also been used to review against environmental IROs (impacts, risks, and opportunities, as per ESRS) (see example below). ▪ Value chains and stakeholder groups vary by business model (e.g., global presence or local focus, sector coverage, commercial focus, specialty lines, SMEs, or personal lines). Upstream actors likewise differ by business and service model and sectors insured (see examples below). ▪ An initial high-level map of the value chain is typically produced during the scoping, while greater granularity is applied in Locate—L1 (e.g., extended mapping of the value chain by business line in scope).

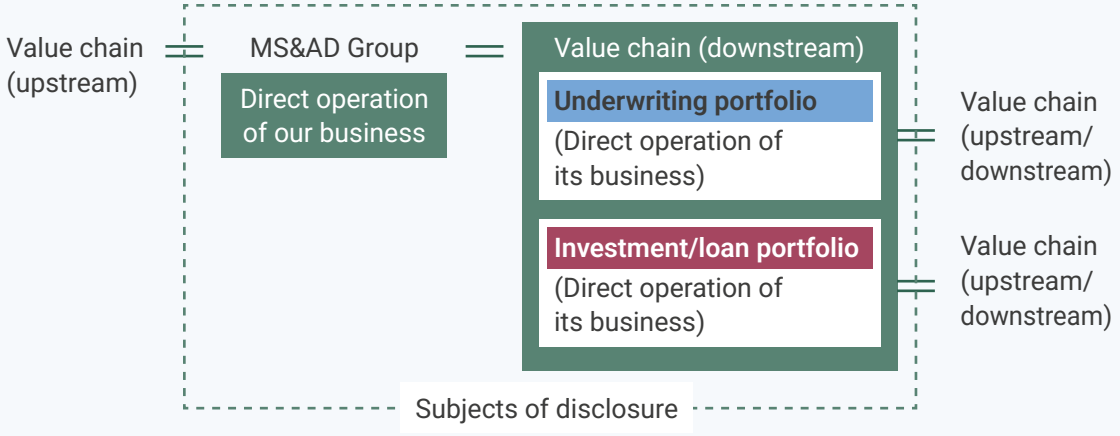
TNFD question[50]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
In which value chains (e.g., food production), sectors (e.g., mining) and geographies does the organization have a presence? And what will be the most appropriate approach to scope and assess your portfolio—by geography, by sector, by lines of business?	Insurers have exposure to a wide range of industry value chains, sectors, and geographies. The degree of exposure varies by business model, product/service offering, and geographical footprint. Scoping and assessment approaches may use one or a combination of the following criteria: business segment (e.g., non-life/P&C, life & health), line of business, customer type (e.g., commercial, personal), value chain components (upstream, downstream), stakeholder groups, sectors/sub-sectors or geography. For example: ▪ **Business segments/lines of business (LoBs):** Insurers can have multiple LoBs. The degree of interface with nature differs across LoBs and impacts and risks are transmitted differently by LoB (e.g., depending on what is insured, how it is insured, and which risks are covered). Accordingly, scoping and assessment by LoB is appropriate. ▪ **Sectors/sub-sectors:** Commercial insurance commonly uses sector classification systems. Sector-based scoping is therefore useful and consistent with many nature-related screening and assessment tools. Sector classifications are also relevant upstream, particularly for claims service providers. ▪ **Geography:** Insurers can operate across multiple countries and regions with different biomes and ecosystems. Initial scoping may be based on countries or regions with the largest business footprint or with concentrations of nature-related hotspots (see definition of sensitive locations in Locate phase).	**For portfolio-level analysis:** ▪ Published TNFD-aligned reports commonly scope by business segment/LoB and customer types (e.g., non-life and commercial customers). ▪ Scoping is also conducted along the insurance value chain and stakeholder groups, stating that both upstream and downstream actors are included. Scoped upstream actors included suppliers, repair companies and other contractors in the claims process. Scoped downstream actors included commercial customers. There is also early consideration of including risk management services. ▪ Several insurers have limited scope to tiers 1 and 2, explicitly excluding tier 3 (value chains of insured businesses) in initial assessments. ▪ Some assessments have initially been limited to domestic operations, with examples in which only commercial clients above a size threshold were included in the first TNFD LEAP assessment (see example below). **For product development and identification of opportunities to reduce risk:** ▪ Where the objective is to identify risk-reduction opportunities for the portfolio and for customers, LoBs and geographies have been scoped in areas where a notable rise in claims frequency or severity has been observed—or is expected—due to nature loss or climate-related risks (see example below).

TNFD question[50]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
Identifying where nature-related issues might exist across the business model and value chain	Significant nature-related issues for insurers are likely to arise through upstream and downstream activities, rather than through its own operations.[53] To understand where nature-related issues may arise, insurers can begin with: ▪ A preliminary scan of high-impact/high-risk (sub-)sectors and geographies across their upstream and downstream value chains. ▪ Understanding that some LoBs/products have a closer interface with nature or have a more direct connection to nature (e.g., agriculture insurance or environmental pollution liability insurance, versus cyber insurance). Relevant considerations to identify potential nature-related issues include: ▪ **Exposure to nature-related transition risks**—for example, where a significant share of the portfolio involves insuring activities potentially linked to environmentally harmful practices (e.g., deforestation, pollution), or where policymakers and regulators are more actively driving nature-positive change (e.g., new regulations or requirements). ▪ **Exposure to nature-related physical risks**—particularly in LoBs with insured activities or loss events that have a direct interface with nature and where nature loss is closely linked to increasing hazards of climate-related perils. ▪ **Geography**—using geographic filters to highlight areas where nature-related issues could be more pronounced, such as regions with many insured assets or activities relying on the same ecosystem service (e.g., coral reefs or mangroves protecting coastal properties). Only an initial analysis of potential nature-related issues is expected at this stage; further analysis is undertaken in Locate—L2 to identify potential moderate/high impacts and dependencies, and in Evaluate and Assess to determine material impacts and risks.	**For portfolio-level analysis:** Some insurers reported reviewing potential nature-related issues across stakeholder groups and sectors within their value chains, taking into account both data availability and their level of influence over value chains. Several also referenced the use of screening tools—most commonly sector-based—to identify potential nature-related issues and help define the scope of their nature-related assessments. Approaches and tools used for scoping include: ▪ Internal workshops to assess the business context (e.g., reviewing activities, business relationships), other contextual information and potentially affected stakeholders. ▪ Screening tools such as ENCORE, SBTN Materiality Screening Tool, Finance for Biodiversity Foundation Top 10 biodiversity-impact ranking of company industries. **For the underwriting process and client engagement:** Insurers are beginning to identify high-impact or high-risk customers for targeted engagement. This can be informed by an initial portfolio-level analysis, with prioritization based on geographic location or customer exposure to nature-related risks (e.g., using sector-based proxies or nature-related risk scoring methods). See also section 4.4.2 (Locate—L2) for further observations on screening and identifying nature-related dependencies and impacts.

TNFD question[50]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
How much revenue, expenditure or earnings is associated with each of these activities and assets?	▪ Insurers may consider financial significance in their scoping by reviewing business segments, LoBs, (sub-)sectors, or geographies based on their size, using indicators such as gross written premiums (GWP), insurance contract revenue (ICR) or net earned premium (NEP), net premiums written (NPW), net claims incurred, loss and combined ratio, or underwriting/insurance service results. ▪ Insurers should also consider and clearly define their approach to materiality when scoping the assessment.	▪ Observed approaches included insurers applying "business scale" or number of employees of the businesses in scope or operating expenditure. ▪ In some cases, business segments/LoBs were ultimately prioritized for assessment based on potential nature-related impacts and dependencies, as well as business scale, data availability, and the level of influence available to the insurer (e.g., a focus on tiers 1 & 2 value chain actors).

Examples "Scoping"—portfolio-level analysis

Scope for LEAP—Example 1: The **MS&AD Insurance Group Holdings** conducted its first nature-related risk and opportunity assessment in 2024 (covering the 2023 period), using the TNFD LEAP approach. The company prioritized the scope of analysis based on business scale, impact on natural capital, and evaluability—focusing on its non-life insurance, financial services, and risk-related services businesses.

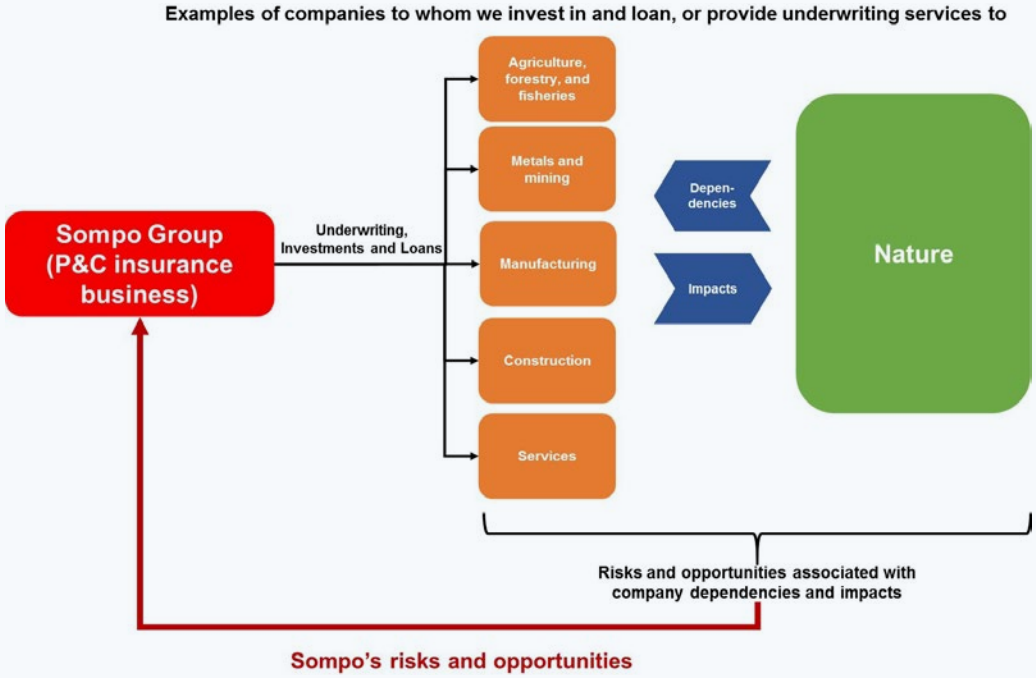


In its 2024 integrated climate and nature report, MS&AD outlined the assessment and disclosure scope along its value chain. The focus was on the company's own operations and downstream value chain, excluding the value chain of clients—covering only their direct business operations.[54]

Scope for LEAP—example 2: Tokio Marine Group provides insurance underwriting and investment and financing services across nearly all sectors. As a result, the focus was placed on identifying priority sectors within its portfolios to better manage nature-related risks and opportunities. In fiscal year 2023, Tokio Marine conducted an analysis of the insurance underwriting portfolio (corporate insurance policies*) and the investment and financing portfolio (domestic listed equities and bonds) of Tokio Marine & Nichido, which handles the majority of the Group's corporate transactions.[55]

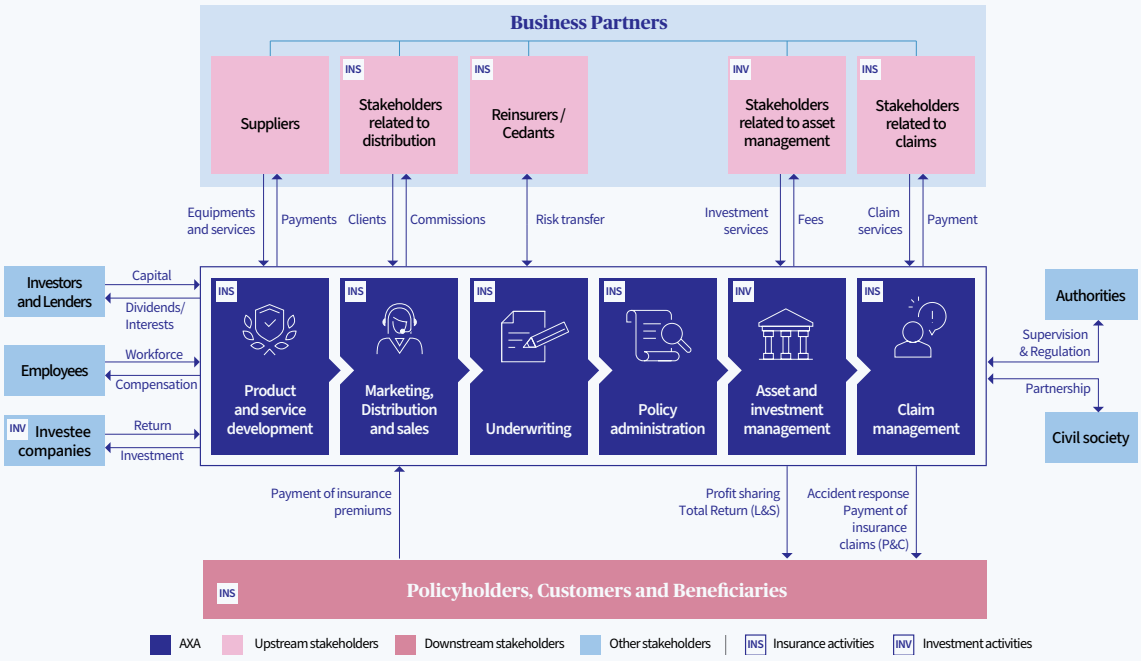
*Listed companies with 1,000 or more employees.

Scope for LEAP—example 3: To identify and assess their nature-related risks and opportunities, **Sompo Group** is assessing, analyzing, and taking action based on the TNFD LEAP approach with a focus on their domestic non-life/P&C insurance business (Sompo Japan Insurance Inc.) and consulting business (Sompo Risk Management Inc)[56]



Scope for LEAP—example 4: a.s.r. identified and assessed its biodiversity and nature-related impacts, risks and opportunities as part of its double materiality assessment in line with the EU Corporate Sustainability Reporting Directive (CSRD). This resulted in the identification of actual and potential material biodiversity and ecosystem-related impacts and dependencies in the value chains of a.s.r. asset management, and its real estate and P&C portfolio.[57]

Business model and value chain in scope—example 5: AXA provides a description of its value chain—considering a process and stakeholder-based view—in its CSRD-aligned report, providing further explanation of its relevance for each material IRO (impact, risk, opportunity as per ESRS).[58]

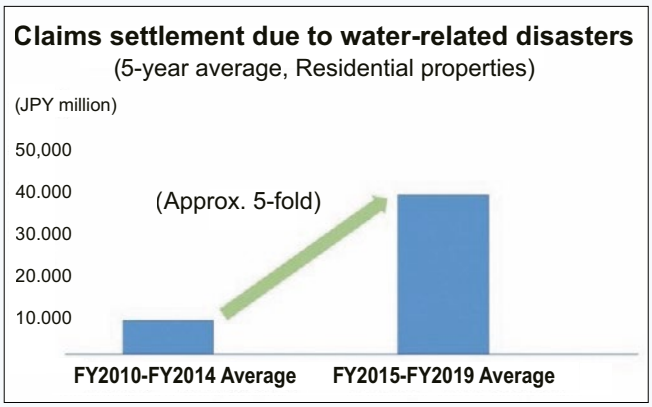


Example "Scoping"—product development and identification of opportunities to reduce risk

MS&AD Insurance Group Holdings:[59] The LEAP approach was applied to identify opportunities to reduce economic losses from flood-related disasters through the introduction of green infrastructure.

Scoping

Domestic fire insurance, which accounts for a large percentage of the Group's premium income, has seen a rapid increase in the number of claims settlement due to water-related disasters in recent years, as shown in the figure on the right.



Source: General Insurance Rating Organization of Japan

Accordingly, the assessment was scoped by line of business. Domestic fire insurance was selected due to a notable rise in claims frequency and/or severity.

Objective of applying the TNFD LEAP approach to identify opportunities for risk reduction

As short-term heavy rains increase due to climate change, urbanization leads to an increase in paved surfaces as a change in land use, a key impact defined by the TNFD. The loss of rainwater infiltration function by soils is considered to be a factor that increases flood disaster risk for non-life insurers.

Therefore, to promote measures to reduce the risk of water-related disasters through green infrastructure that exhibits flood prevention functions rooted in nature, MS&AD have assessed risks and opportunities associated with changes in land use (increasing paved surfaces/ installation of rainwater infiltration surfaces), using the chart of "dependencies and impacts on nature, and relationship between risks and opportunities" outlined in the TNFD LEAP approach. The insurer conducted a quantitative evaluation in accordance with the procedures of the approach and confirmed a reduction in the amount of flood-related damage.

2. Aligning goals and resources

Table 6: Objectives and resources for the assessment for non-life insurance business

TNFD question[60]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
What are the organization's goals and expected outcomes from a LEAP assessment?	For insurance companies, nature-related assessments can serve a range of objectives and benefits, including (see Chapter 2 for details): ▪ Identifying internal gaps, such as data availability and quality. ▪ Informing strategic responses and actions that contribute to nature-positive and resilient outcomes. ▪ Identifying and assessing potential financial risks and integrating them into financial risk management frameworks. ▪ Integrating nature-related considerations into due diligence and underwriting processes. ▪ Supporting the development of new and review of existing insurance products and identifying opportunities to reduce nature-related risks. ▪ Understanding the climate—nature nexus, including compounding climate- and nature-related risks and the role of nature-based solutions in reducing climate-related risks. ▪ Fulfilling disclosure expectations or requirements.	Insurance companies that have begun a nature-related assessment have typically done so with any or a combination of the following objectives: ▪ Build internal capacity through a preliminary assessment. ▪ Prepare for potential future mandatory nature-related reporting requirements (e.g., under the EU CSRD, where applicable). ▪ Become a TNFD adopter or to position themselves as leaders on nature-related issues. ▪ Identify relevant strategic responses and actions at an early stage. The scope and depth of nature-related assessments vary depending on the objectives, available resources and data, and the company's sphere of influence across its value chain.

TNFD question[60]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
What level of assessment is feasible or appropriate at this time given the complexity of the organization's value chain? Should it be by product, process, input, business unit or site?	The level of assessment depends on the objective of the analysis (see Chapter 2 for further details) and its feasibility within the insurance underwriting context. Relevant assessment levels may include: At sectors/sub-sector level At line of business/product level For stage in value chain e.g., claims At customer/stakeholder level At insured assets/activities level By insured risk/peril For each level, location-specific information will be at a different scale. For example, national or regional datasets, river-basin/catchment or coastal cells, administrative units (e.g., municipalities, postal codes/ZIP), customer addresses, site/parcel information, and latitude-longitude geocoordinates to allow for a decision-useful analysis. The granularity of assessment may differ across portfolios. For example: ▪ For small businesses, limited data availability might necessitate the use of proxies (e.g., sector classifications or postal code-level data). ▪ In contrast, coverage types such as insurance for infrastructure projects, environmental pollution liability insurance, and third-party liability insurance could involve more detailed assessments due to the nature of the exposure and data availability.	Insurance companies undertaking a LEAP assessment have applied varying levels of assessment, with differences observed across the four LEAP components. **For portfolio-level analysis:** Current approaches observed differ, for example, by: ▪ Sector: Screening of dependencies and impacts (in Locate—L2) will be conducted at the sector level, with risks identified based on sector-specific characteristics and production processes. ▪ Line of business (LoB): Dependencies and impacts are assessed qualitatively across LoBs, with some insurers beginning to adopt more detailed analysis by individual products and/or specific impact drivers. ▪ Specific parts of the value chain: Insurers have also selected to perform a more detailed analysis for the claims process, especially in relation to liability insurance (e.g., mapping out clear process steps and nature-related impacts and risks along the claims process). ▪ Insured activities: Organizations are assessing the extent to which insured assets and activities (e.g., physical assets) are located in sensitive areas. However, this location-specific information is not yet fully reflected in risk analysis. **For product development and identification of opportunities to reduce risk:** ▪ Insures have identified specific spatial areas (e.g., floodplains) where claims experience indicates a concentration of nature-related risks, such as increased frequency and severity of flood-related losses. These insights can support the development of new products or measures to reduce risks and exposure.

TNFD question[60]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
	Analytical approaches may be based on: ▪ Qualitative insights, such as materiality ratings or proximity to sensitive ecosystems. ▪ Quantitative metrics, such as datasets capturing impact drivers and state of nature metrics. ▪ Financial/monetary indicators, including insured losses or claims data. Insurers might also have to rely on secondary data (e.g., third-party datasets or proxies) given the current limitations on traceability across their value chain.	Insurers have noted that an iterative approach to the assessment will be essential. They emphasized the importance of refining the assessment process over time as data quality, tools, and internal capacity improve.
What are the baselines and time periods for the analysis?	For initial dependency, impact, risk and opportunity screening for prioritization, assessments tend to rely on qualitative methods and materiality ratings, with limited application of baselines and consideration of different timeframes. However, insurers should assess both actual and potential impacts within their underwriting context. Nature-related risks can emerge over multiple time horizons. Acute shocks (e.g., wildfire, pest outbreaks) and chronic degradation (e.g., soil and pollinator decline) are both relevant, with non-linear dynamics and tipping points potentially leading to abrupt and persistent effects. Nature-related approaches and supervisory guidance suggest assessing short-, medium- and long-term effects, with forward-looking analysis conducted through scenario-based assessments.[61]	Given that many insurance companies are undertaking their first nature-related assessment and disclosure, they are in the early stages of establishing a baseline for nature-related issues. Insurers often begin by screening material dependencies and impacts of business activities without referencing a specific timeframe. For risk identification, some insurance companies have indicated a defined timeframe—short-, medium-, and long-term—and specified the number of years associated with each period in which they expect identified risks to materialize, although these approaches are not yet widely applied in current practice.

TNFD question[60]	Practical considerations for non-life insurance	Observed approaches in non-life insurance
What are the current limitations and/ or constraints of the assessment? For example, skills, data, financial resources; and what are approaches to close the gaps/what is possible given the limitations/ what resources are needed?	Insights may be drawn from other insurers' experiences, both the limitations and constraints encountered, and the approaches used to address them—before getting started. See Chapter 3 for further considerations on getting started.	Insurers noted that data availability tends to be higher for larger customers, facilitating the identification of relevant information. In contrast, smaller customers often present data gaps. However, this also depends on the type of insurance cover provided. For example, property insurance usually includes location-specific data, whereas business interruption insurance covering multiple operational sites involves more complex and fragmented data collection. Some insurers have started working with local scientific institutions and universities to build internal capacity, strengthen technical expertise, and access location-specific data on the state of nature and ecosystem services relevant to insured assets and activities.

4.3 Locate the insurance company's interface with nature

4.3.1 Relevant guidance for nature-related approaches

Approach	Objectives and guidance
TNFD LEAP—'Locate'[62]	**Objectives** ▪ To identify an organization's potentially material sources of nature-related dependencies, impacts, risks and opportunities. ▪ The 'Locate' phase helps organizations filter—by sector, value chain, geography—and prioritize for the more detailed due diligence through the 'Evaluate' and 'Assess' phases of LEAP. **Guidance for financial institutions** ▪ It is suggested to start by focusing on financial institution portfolios. Heatmapping is one technique to identify qualitatively potential or actual exposure to nature-related risks, revealing whether activities materially depend on or impact nature, and a potential portfolio exposure to a range of nature-related dependencies and impacts across sectors.

4.3.2 Non-life insurance business—considerations and examples

L1: Span of the business model and value chain

TNFD: What are our organization's activities by sector, value chain and geography? Where are our direct operations?

Table 7: L1: Span of the business model and value chain—Non-life Insurance business

Practical considerations for non-life insurance underwriting business
For portfolio-level analysis While there is some overlap with the Scoping phase, L1 entails a more detailed examination of the business model and value chain for the portfolio segment in scope. The insurance industry operates across extensive value chains and a wide set of sectors and geographies, engaging a large number of customers and partner networks, and provides a variety of products and services. In practice, a full value chain mapping of every customer or business partner and their value chains is not undertaken. Instead, analysis is commonly performed by stakeholder groups and sectors. The depth of the value-chain assessment—including consideration of customers' and claims service providers' value chains—tends to be more relevant for certain lines of business or products, particularly where upstream and/or downstream dependencies could significantly affect insured activities and assets. For example: ▪ Food production systems dependent on upstream agricultural supply chains; ▪ Manufacturing industries that rely on upstream forestry products for raw materials.

Sectors whose upstream or downstream activities have significant impacts on nature may also merit attention. For example:

- In the fashion industry, brands influence upstream resource extraction and production processes, with potential impact on biodiversity and ecosystems; design choices can either contribute to waste generation or support waste reduction through circularity.

Claims service providers (illustrative): sourcing materials for repair or rebuild can generate nature-related impacts, and suppliers may themselves be dependent on the availability of relevant raw materials

In such cases, data on tier 3 value chains (of insured businesses or claims service providers) are often limited, and insurers typically have limited influence over these extended value chains. Nevertheless, cascading risks can arise along these value chains and affect insured assets or activities.

As outlined in component L2, qualitative ratings of the significance of dependencies and impacts in the extended value chain inform the extent to which value chain elements are included in the assessment. The level of influence should not be the driver for including value chain elements (refer for further information in *Rooted in Risk*).[63]

The geographical scope of insured assets and activities and of upstream actors is discussed in more detail under the L3 component.

For the underwriting process and client engagement

Insurers aiming to identify and assess nature-related DIROs of their (potential) customers as part of their underwriting process or client engagement would want to understand the value chain of the business activities or assets (to be) insured. Potential nature-related issues can emerge through their value chains and are, at this stage, not yet well considered in the processes.

Observed approaches in non-life insurance underwriting business

Insurers generally report a good understanding of their value chains. However, information is often fragmented across business lines.

- For sustainability teams in multinational groups, a comprehensive, centralized view of global value chains is often lacking.
- While group-level frameworks may exist, business lines tend to manage and document value-chain information in a decentralized manner.
- This fragmentation indicates value in establishing dedicated working groups to document and consolidate value-chain insights across business lines and geographies.

As outlined in Scoping, insurers have defined the initial breadth of value-chain coverage (upstream and downstream activities, by tier). In L1, this has generally been expanded only to a limited extent, with modest additional mapping of business models and geographies.

Example 1 below provides an illustrative outline of a more detailed value-chain view—including typical insured assets and activities, as well as the claims process—for a selected line of business.

Illustrative outputs

The outcome of this component may include, for example:

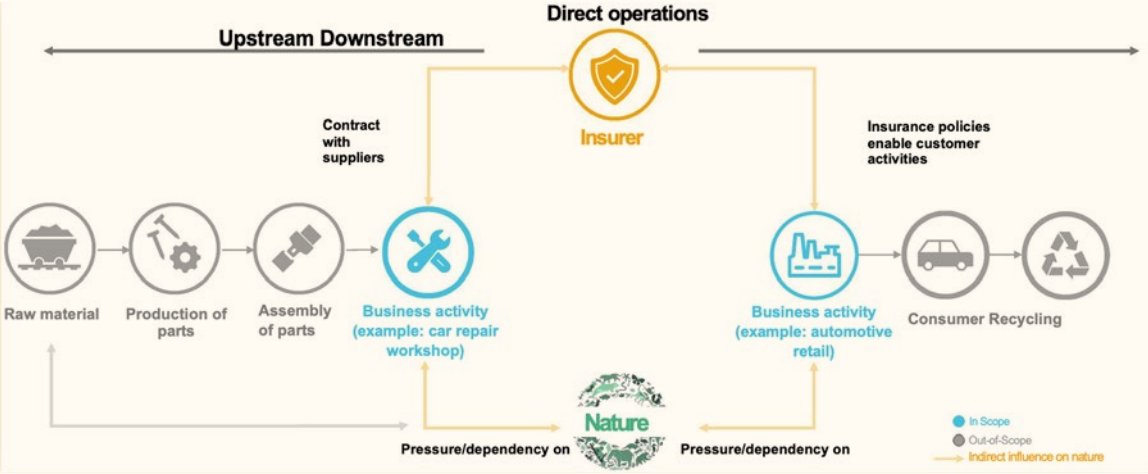
- An initial list of key actors—upstream (e.g., repairers and suppliers by sector classification) and downstream (e.g., customer types by sectors classification).
- An initial mapping of these actors against relevant geographies (e.g., by country, region).

Relevant resources

Internal documentation or internal workshops to obtain a comprehensive view of the value chain.

Example 1: Value chain mapping for non-life insurance business in scope

The value chain of non-life/P&C insurance activities: The value chain mapping involved pinpointing where non-life insurance interacts with nature within its value chain to determine the insurer's interface with nature-related dependencies, pressures, risks and opportunities.



Also refer to the examples in section 4.2.2, where insurers have published their TNFD-aligned report including illustrations of the scope of their assessments.

L2: Dependency and impact screening

TNFD: Are any of these sectors, value chains and direct operations associated with potentially moderate and high dependencies and impacts on nature?

Table 8: L2: Dependency and impact screening—Non-life insurance business

Practical considerations for non-life insurance underwriting business
While there is some overlap with the Scoping phase, the L2 component involves a more granular screening of the sectors in scope and their associated value chains (upstream and downstream) to identify where nature-related dependencies and impacts are potentially moderate or high. Insurers apply sector classifications to customers—particularly in commercial lines—and, where relevant, to upstream suppliers. Sector-level screening is therefore practicable. In personal lines, policyholders are households or individuals, so classification follows the line of business (e.g., homeowners/property, private-passenger motor), not an economic sector. For portfolio-level analysis, insurers can map these exposures to sector proxies (e.g., residential real estate for homes and road transport for private vehicles) to align with sector-based datasets. As noted under L1 on tier 3 value chain scope, screening may extend to tier 3 where moderate or high dependencies and impacts could transmit to insured activities or assets. (For example, ENCORE now provides value-chain information.)

As an additional consideration, a LoB/product overlay may be applied to L2 screening. Interfaces with nature vary by (i) the insured activities and assets, (ii) the claims process (e.g., repair/rebuild supply chains), and (iii) the specific risks or loss events covered. For example, environmental pollution liability or infrastructure covers have different dependency/impact profiles than some cyber or personal lines. This suggests that dependencies and impacts can be assessed not only at the sector level but also with a LoB/product overlay when determining their significance.

For more on how dependency and impact considerations apply to the insurance underwriting portfolios, refer to *Rooted in Risk*.[64]

Observed approaches in non-life insurance underwriting business

Insurance companies have begun applying sectoral screening to assess if they have sectors with potential moderate or high dependencies and impacts in their underwriting portfolios. Several insurers are using tools such as ENCORE and the SBTN Materiality Screening Tool. Screening is typically conducted across both upstream and downstream parts of the value chain.

In addition to sectoral screening, some scoping exercises incorporate financial exposure (e.g., based on transaction volumes).

Geographic or spatial screening is less commonly applied at this stage. Insurers have focused more on sectoral screening so far.

In many cases, insurers are approaching components L2, E1, and E2 in a similar way, as most have not yet integrated location-specific data on environmental assets or ecosystem services or customer/asset-specific information into their Evaluate or Assess phase. The examples provided in section 4.4.2 reflect these current challenges.

Illustrative outputs

These may include:

- Heatmaps (see examples below)—considering transaction volumes.
- An initial list of actors within the value chain identified as having moderate or high dependency or impact on nature.
- For insurance, this may also include a list of products or insured risks/perils with a significant interface with nature.

Relevant resources

Sector screening tools:

- ENCORE
- SBTN Materiality Screening Tool
- Finance for Biodiversity Foundation Top 10 biodiversity-impact ranking of company industries

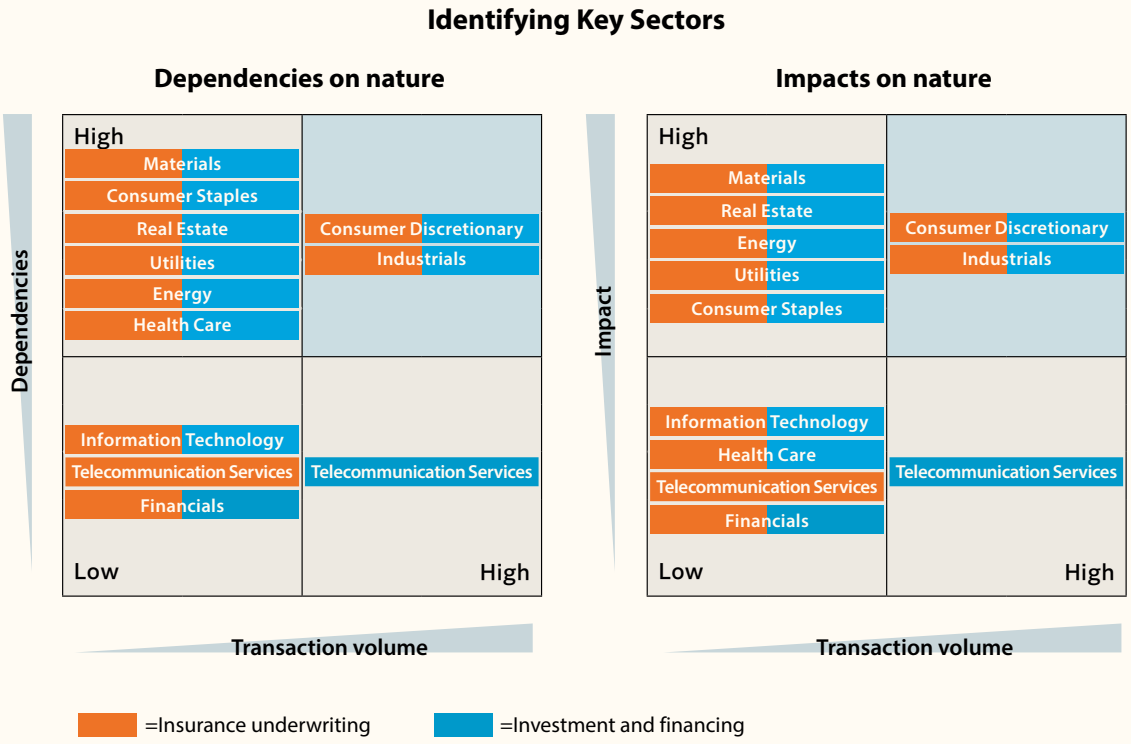
Spatial screening tools:

- Integrated Biodiversity Assessment Tool (IBAT)
- WWF Biodiversity Risk Filter
- UN Biodiversity Lab

Note: These tools are not tailored specifically to insurance underwriting but can support initial screening efforts.

Examples for initial dependency and impact screening—portfolio-level analysis

L2—example 1: Tokio Marine Group underwrites insurance and provides investment and financing for companies in almost all sectors. Hence, the Group identified priority sectors in their portfolios to appropriately respond to nature-related risks and opportunities.[65]



*The median line on the horizontal axis is based on 10% of the total transaction volume

In fiscal year 2023, they analyzed insurance underwriting (insurance policies for companies*[1]) and investment and financing (domestic listed equities and domestic bonds) portfolios of Tokio Marine & Nichido, which is responsible for most of the corporate transactions in the Group. The analysis was based on the LEAP approach, which is an integrated approach for assessing and managing nature-related issues recommended by the TNFD and was conducted using the two axes of "transaction volume in insurance underwriting and investment and financing portfolios" and "dependencies/impacts" as defined in the ENCORE analysis tool. Consequently, they identified "Consumer Discretionary*[2]" and "Industrials*[3]" as priority sectors.

1* Listed companies with 1,000 or more employees

2* Automobile Manufacturers, Auto Parts and Equipment, Household Appliances, etc.

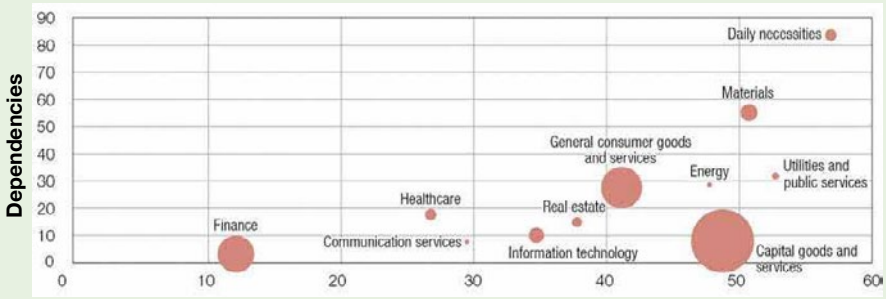
3* Trading Companies and Distributors, Industrial Machinery, Construction Machinery and Heavy Trucks, Air Freight and Logistics, Aerospace and Defense, etc.

L2—example 2: MS&AD Insurance Group Holdings[66]

MS&AD first created heat maps to better understand dependencies and impacts on nature, using "ENCORE" and the "SBTN Materiality Screening Tool".

- Based on the ENCORE analysis results, MS&AD identified business activities that depend on ecosystem services
- Based on the results of analysis using the SBTN Materiality Screening Tool, MS&AD identified business activities that have a significant impact on natural capital.
- Insurance retentions covered 73% of premiums written on corporate policies as of 31 March 2023.

Dependencies, impacts, and exposure by industry



[Method used to identify 6 key industries]

- Extract business activities that depend on ecosystem services and those that have a major large impact on natural capital, and then aggregate add up the evaluations for each item of dependencies and impact (with the impact of GHG emissions impact are calculated with double weighting of other items)
- Combine the percentage of insurance that accounts for 73% of premiums written for contracts with corporates as of March 31, 2023 with the percentage of investments and loans in force covering domestic and foreign listed stocks, domestic and foreign corporate bonds, and domestic and foreign corporate investments/loans as of March 31, 2023.
- Multiply the two combined values to identify the top 6 industries

As physical and transition risks vary greatly based on industry, MS&AD chose to perform the risk and opportunity assessment for six key sectors which have been identified as material based on the degree of dependencies and impact of their business partners on climate and nature, as well as the percentage of the Group's underwriting and investments/ loans held by these industries.

L3: Interface with nature

TNFD: Where are the sectors, value chains and direct operations with potentially moderate and high dependencies and impacts located? Which biomes and specific ecosystems do our direct operations, and moderate and high dependency and impact value chains and sectors, interface with?

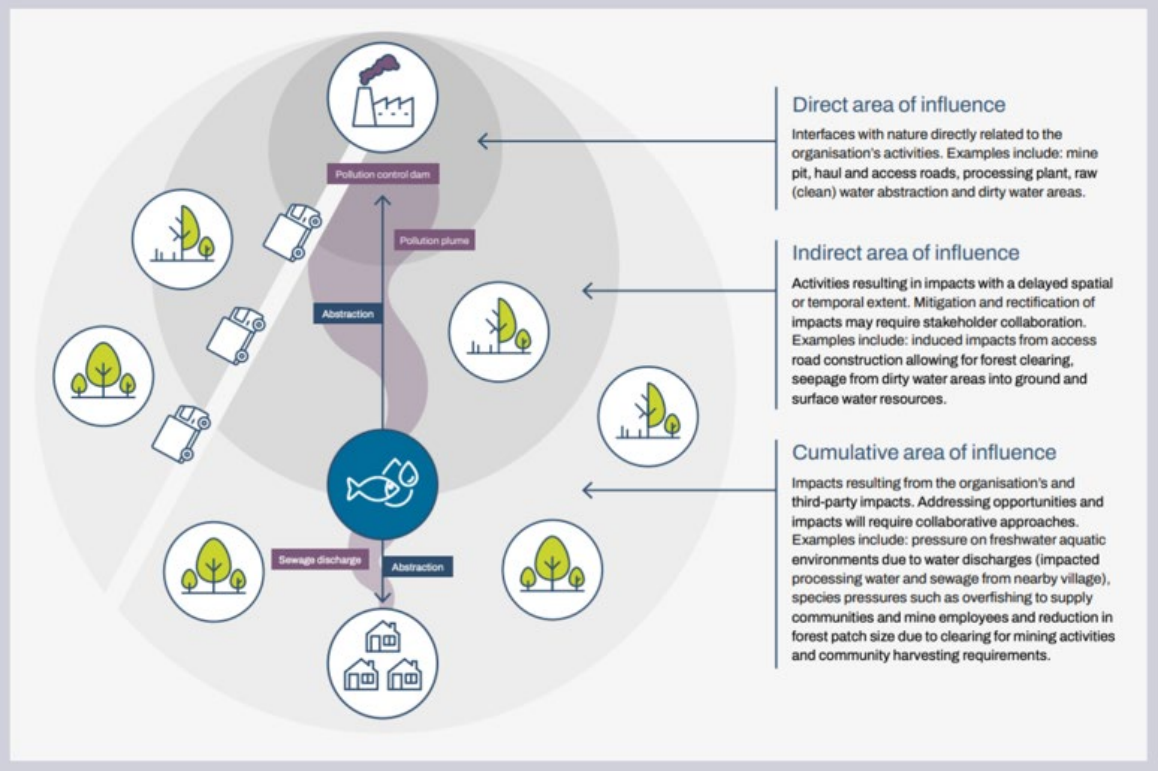
Table 9: L3: Interface with nature—Non-life insurance business

Practical considerations for non-life insurance underwriting business
Insurers often operate across thousands of locations through upstream and downstream value chain activities. Within these networks, identifying where interactions with nature occur can be challenging due to data gaps. Comprehensive due diligence on every direct, upstream, and downstream location is not always feasible or necessary at the outset. The depth of analysis typically reflects the objective of the assessment. **Geographical location can be determined at different spatial scales with varying granularity.** Below are examples of units that could be used to capture location information for insured assets and activities, enabling geospatial analysis, where possible: ▪ Location can be recorded across multiple scales—depending on the objective of assessment and data availability: ▫ countries/regions and states/provinces; ▫ administrative units such as municipalities, districts, and postcodes/ZIP codes; ▫ addresses; ▫ sites/parcels (reference or identifier); ▫ grids/rasters (e.g., regular cells, used for hazard mapping); ▫ linear features such as railways, roads, and transmission lines; ▫ GPS coordinates for address- or asset-level positioning. ▪ Ecological context may be already added by determining locations within ecological units such as river basins/sub-basins (catchments), coastal cells/shoreline segments, or ecoregions/biomes. ▪ When represented as geospatial data, these spatial units carry attributes.[67] These may describe the asset (e.g., parcel area, land use, construction type) and/or environmental conditions (e.g., land cover, proximity to wetlands), which is developed in "L4" and the "Evaluate" and "Assess" phases. **Different insured assets, activities, and customer types may call for different spatial units.** In practice, a gradual and hybrid approach is often required given data limitations: ▪ **Personal property:** postcode, home address; and, where available, parcel/building identifier or GPS coordinates. ▪ **Commercial property/engineering:** headquarters address, site address, and, where available, parcel/building identifier or GPS coordinates. ▪ **Infrastructure:** linear assets such as railways, roads, transmission lines with nodes such as depots or substations. ▪ **Agriculture:** field/parcel, farmsteads, ecological units (e.g., basin, floodplain). ▪ **Motor/aviation/marine:** bases, routes/lanes or, where available, GPS tracking. Note: Insurance products covering **"moving assets"** (e.g., marine, aviation, commercial fleets, personal vehicles) introduce additional considerations as assets interact with multiple ecosystems and biomes and can act as vectors for invasive species. For commercial transport covers, useful inputs include typical transport routes, port and terminal information, and GPS tracking.

The relevance of location information also varies by product and by stage in the value chain:

- **Property insurance/business interruption insurance:** The location of insured assets and activities is relevant, as the loss event typically occurs where the asset is located, or the activity is performed. However, where business interruption is triggered by supply chain disruption, upstream locations become relevant.
- **Liability insurance:** Both the location of the insured or enabled activity and the location where the loss event or insured risk may occur are relevant (i.e., where the affected third party is located).
- **Claims process:** For products involving physical repair or replacement, the locations of suppliers and other upstream actors in the value chain are particularly relevant. Where insurers provide **crisis management and response services**, the location of the incident will be relevant—especially for third-party liability and environmental pollution liabilities insurance (e.g., for aviation, marine lines).

For asset-level analysis, a deeper review may be needed beyond an address or coordinates, as operations and activities can create dependencies and impacts that extend beyond the site boundary. In such cases, an "area-of-influence" perspective—considering the wider surroundings in which those dependencies and impacts may occur, and stakeholders may be affected—may be appropriate.[68]



This consideration is particularly relevant for certain insurance products, such as third-party liability insurance, environmental pollution liability insurance, or engineering insurance for construction projects, where a "landscape-view" provides more clarity on their impact and dependency pathways.

Given potential data limitations, the WWF Biodiversity Risk Filter methodology suggests using **alternative data sources to supplement corporate location data**—particularly for commercial lines—including asset-level datasets, corporate structure data, headquarters location, or disaggregated revenue data by geography. These methodologies are proposed to help bridge existing data gaps while financial institutions work to expand the availability and granularity of location-specific information.[69]

As a result, different levels of location information may be used depending on data availability. **Currently, a hybrid approach is often necessary:**

- To overlay with ecologically-sensitive areas, more granular location data (e.g., postcodes, addresses, geographic coordinates) are needed.
- To derive dependencies and impacts, more contextualized geospatial information (i.e., location data linked to attributes) is needed; as in the Assess phase for risk identification, geospatial layers (e.g., hazard maps) become relevant.
- Where precise location data are unavailable, broader spatial proxies (e.g., country, region, or city level) may be used. Other approaches include proximity screening, engaging with corporate clients to obtain geolocation data, or, in some cases, temporarily excluding customers where spatial resolution is insufficient.

Understanding how insured assets and activities interact with biomes, the specific environmental assets and ecosystems (e.g., peatlands, riverine systems) in the relevant geographies or locations identified will be important inputs for the "Evaluate" and "Assess" phases. This supports the determination of ecologically-sensitive and material locations, as outlined in component L4 and helps identify specific dependencies or impacts of an activity on local ecosystems or environmental assets.[70]

For product development and identifying opportunities to reduce risk:

Mapping asset locations against hazard layers—especially for climate-related perils—and identifying interfaces with ecosystems can help pinpoint opportunities and priority locations for nature-based solutions (NbS) to reduce risks.

For the underwriting process and client engagement:

As part of the underwriting process or client engagement, insurers may, where not yet available, collect relevant information on the location of assets and activities that are (to be) insured. Improving the availability of asset-level location data will be important going forward. Depending on the type of asset or activity, it may also be relevant to consider a broader landscape perspective or potential exposures linked to value chain assets, particularly where this is deemed potentially significant.

Observed approaches in non-life insurance underwriting business

For portfolio-level analysis:

Financial institutions, including insurers, often have limited access to and limited consistency in location data on the operational sites of customers or suppliers, and even less visibility over the location-specific aspects (e.g., state of nature, company-/asset-specific data) of their customers' or suppliers' value chains.

Data availability and granularity varies by customer type/LoB (e.g., large corporates, SMEs, personal clients):

- **For large commercial customers**, insurers may hold only headquarters addresses rather than the locations of relevant assets and activities. In the case of global insurance contracts, multiple insured locations across different geographies may need to be considered. Where portfolios contain many asset locations, details are often limited—GPS coordinates are not consistently available. Insurers noted that data-sourcing efforts on the investment side for nature-related assessments can be leveraged for underwriting given the overlap between investees and insured clients.

- **For small businesses**, geography and sector information are typically available; however, granularity and completeness are often limited, and company-specific data are scarce (relevant for Evaluate and Assess phases).
- **Supplier/claims service provider data,** availability also varies by region, with some geographies benefiting from structured reporting frameworks and third-party rating/data providers.
- Some relevant location data may already exist from climate-related physical risk assessments; however, these rarely capture interfaces with ecosystems/biomes.

To date, assessments have largely focused on the locations of insurers' own operations and their direct interfaces with nature, reflecting limited location data for upstream and downstream activities within scope. Some insurers are progressing to extend analysis to upstream and downstream value chains. A few have begun geocoding in-scope customer addresses (business or residential) to latitude—longitude for use in L4.

The data used has largely been limited to postal codes, customer addresses or coordinates, without consideration of the wider area of influence or dependency. Approaches also acknowledge data limitations for customers and suppliers, such as where asset location information was unavailable. This was excluded from the initial analysis in some cases.

Only a few insurers are currently reviewing sectors and stakeholder groups/customers identified in L2 in terms of the location of assets and activities and their interface with specific biomes and environmental assets or ecosystems.

Insurers have taken an iterative approach, recognizing that the assessment of dependencies and impacts in the Evaluate phase may reveal new activities and locations not initially captured in the Locate phase. For example, dependencies or impacts extending beyond the insured's site boundary may only become apparent later. As a result, insurers may need to revisit and reassess findings in L3 and L4.

For product development and identification of opportunities to reduce risk:

- Some insurers are conducting in-depth analyses focusing on specific biomes or environmental assets and their interactions with insured assets.
- There is also a focus on key geographic areas, such as river basins and their interface with urban areas, where opportunities for risk reduction measures or risk transfer solutions may exist (see example in the section below).

Illustrative outputs

This may include information on:

- The approach used to select customers or policies as well as contractors, repairers, and suppliers in scope for asset location identification, including which customers or services were excluded from the assessment.
- Customer-specific location information for their operations, assets, and activities, including addresses or geographic coordinates. Similarly, location details of upstream actors' operations and activities, where available.
- Description of insured actors and activities that interact with nature, recognizing that different insurance products and insured risks/perils may involve varying degrees of interface with nature.

Relevant resources

Asset location data

- Internally available data should be prioritized. Where such data is not available, insurers may rely on corporate disclosures or secondary data sources, including both open-source and commercial data providers.

- Both open-source and commercial asset-level datasets exist, with commercial providers increasingly offering standalone asset-level data products. Note: An overview of open-source and commercial data providers to date can be found, for example, in the report by the "Spatial Finance Initiative"[71] as well as in the "WWF RFS Factsheet on Asset-Level Datasets".[72]

Ecosystem/biome data

- Information on the ecosystem types and biomes an asset or activity may interact with can be sourced from datasets such as the Global Map of Ecoregions along with other datasets referenced in the TNFD guidance on component L3.[73]

For a list of relevant tools for component L3, refer to the TNFD Tools Catalogue.

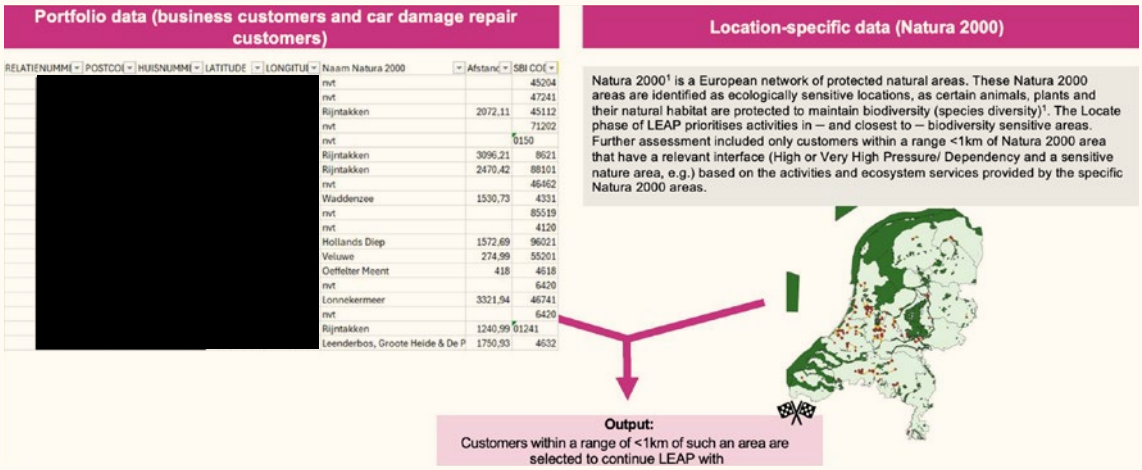
For insurers, the same data sources used by other financial institutions can be applied to source asset location data.

Example: Interface with nature and ecologically-sensitive locations—portfolio-level analysis:

Example 1—L3 and L4: a.s.r. specifically reviewed the non-life/P&C portfolio's interface with nature and ecologically-sensitive locations.

a.s.r. matched customers' and car repairers' locations with specific nature-related data to identify relevant customers and repairers within 1 kilometer from an ecologically-sensitive location (locations defined as "Natura 2000" area).[74]

The insurer only selected customers in sectors that have known pressures or dependencies on nature and car repairers as identified in the component L2.



*Selected example was provided directly, on a voluntary basis, by contributor and have been cleared internally for publication.

Note: This level of assessment is only feasible in countries where highly granular data is collected. The Netherlands is relatively unique in this regard and such an approach may not be easily replicable elsewhere.

Example: Interface with nature—product development and identification of opportunities to reduce risk

MS&AD Insurance Group Holdings:[75] Following the Scoping phase by line of business (domestic fire insurance) in section 4.2.2, the Group has determined a region that faces high-risk in relation to the insurance product.

Because the Group provides domestic fire insurance coverage without significant regional bias, the regions analyzed in this case focused on the high risk of damage due to water-related disasters, rather than on sales by region. In recent years, north-western Kyushu has already experienced severe flooding and is regarded as one of the regions where rainfall will increase the most (rainfall increases by 14 times in a 4°C rise scenario)* according to survey results by the Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). Accordingly, the Group decided to conduct the LEAP analysis on specific areas that meet the following conditions in north-western Kyushu:

- Regions with damage caused by inland flooding in recent years;
- Small and medium-sized river basins in cities to verify damage caused by inland flooding;
- Basins with significant land use alteration in recent years.

* MLIT's "Ideal Flood Control Plan Based on Climate Change" Recommendation (revised April 2021) "Concept for setting rainfall change multipliers for each regional classification"

L4: Interface with sensitive locations

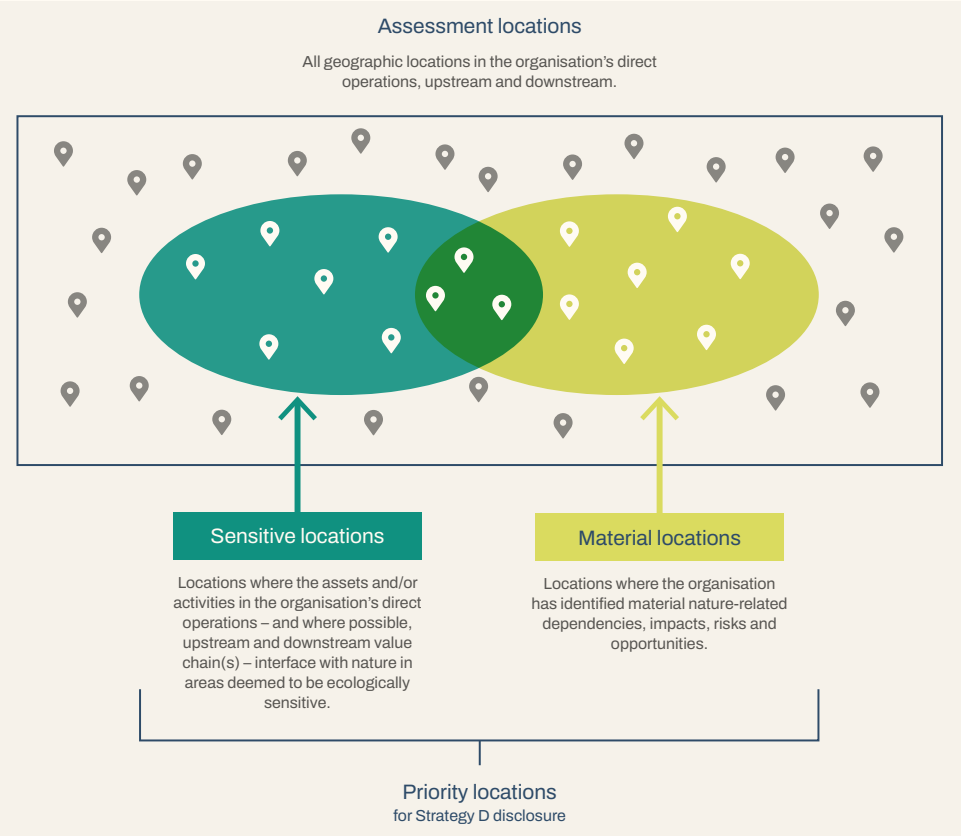
TNFD: For our organization's activities in moderate and high dependency and impact value chains and sectors, which of these are in ecologically sensitive locations? And which of our direct operations are in these sensitive locations?

Table 10: L4: Interface with sensitive locations—Non-life insurance business

Practical considerations for non-life insurance underwriting business

Insurance companies should identify and assess activities in ecologically-sensitive locations in line with the TNFD *Guidance on the LEAP Assessment*, considering:[76]

- Areas important for biodiversity, including species (covering both legally protected areas across all IUCN management categories and areas recognized under international and regional conventions and agreements);
- Areas of high ecosystem integrity;
- Areas of experiencing a rapid decline in ecosystem integrity;
- Areas of high physical water risks; and/or
- Areas important for ecosystem service provision, including those providing benefits to Indigenous Peoples, local communities, and other stakeholders.



Insurers may leverage multiple data sources (see below) or collaborate with national institutions, such as universities, to gain more granular insights into ecosystem conditions and services relevant to insured activities.

Material locations will be identified during the Evaluate and Assess phases (i.e., locations with potentially medium or high dependencies/impacts are screened in Evaluate/Assess; where impacts/risks are confirmed as material, the location is designated a material location).

Observed approaches in non-life insurance underwriting business

A limited number of insurance companies have disclosed information on insured activities located in ecologically-sensitive or material areas for both upstream and downstream value chains. However, more insurers have disclosed the locations of their own operations in such areas and have expressed an intention to expand disclosures to include upstream and downstream activities.

Some insurers have defined which ecologically-sensitive locations are applied initially by specifying the conventions or designations used—such as Natura 2000 sites[77] in Europe, Key Biodiversity Areas (KBAs)[78], and other types of protected areas[79] (see examples in the section below)."

Insurers have used tools such as the Integrated Biodiversity Assessment Tool (IBAT) and collaborated with national universities to gather insights on the condition of environmental assets with which insured operations, assets, and activities interact.

Some insurers who are more advanced already collect information on the condition of ecosystems interfacing with insured locations—already at L3—and go beyond a focus on area designations. This serves as an input for the Evaluate and Assess phases.

Some insurers have introduced proximity-based considerations, defining the distance between insured asset locations (e.g., address) and sensitive sites (e.g., Natura 2000 sites) as a relevant inclusion criterion.

Additionally, the *PSI Nature Action Guide* suggests enhanced due diligence for ecologically-sensitive and material locations as part of the underwriting process.[80]

Illustrative outputs

This may include:

- A description of the approach for the assessment, including the level of granularity used for asset location data and criteria applied for assessing the proximity of assets to ecologically-sensitive locations.
- The number of customers or stakeholders included in the assessment whose operations or assets are located within or near ecologically-sensitive locations.

Relevant resources

Sources referenced by insurance companies to identify sensitive locations include:

- Integrated Biodiversity Assessment Tool (IBAT)
- WWF Biodiversity Risk Filter
- Natura 2000 Viewer
- UN Biodiversity Lab

National sources, such as universities or national databases, may also be used to obtain more detailed information on the condition of ecosystems in scope.

For a list of relevant tools for component L4, refer to "TNFD *Guidance on the LEAP Assessment*" section 4.7[81] or refer to the TNFD Tools Catalogue.

Examples: Disclosure of insured assets and activities in ecologically-sensitive locations

L4—example 1: Tokio Marine Group[82]

Tokio Marine Group has reviewed and disclosed the activities of its business offices and insurance agents located in protected areas and key biodiversity areas (KBAs). The Group has used national registry and data surveys for the analysis.

Assessment result of our business operations in Japan (including the value chain)
The number of business offices located in protected areas and key biodiversity areas

The number of sites analyzed		Protected areas*1			Key Biodiversity Areas(KBA) *2
		Natural parks	Nature conservation areas	Wildlife protection areas	
Group companies in Japan	489	1	0	25	9
TMNF's insurance agents	665	2	0	29	20
Total	**1,154**	**3**	**0**	**54**	**29**

*1 A protected area is a natural park or conservation area designated based on a basic land use plan, or a wildlife protection area designated by the Minister of the Environment or a prefectural governor.
*2 KBA is an important area that is key to biodiversity conservation, and includes areas that are not included in existing protected areas. An area that has been selected as an area where endangered species on the Red List live, or an area that satisfies one or more of the five criteria of inhabiting only a geographically limited range.
[Date source]
• Protected areas: Processed and used "National Land Numerical Information (Protection and Conservation Data)" (Ministry of Land, Infrastructure, Transport and Tourism) (https://nlftp.mlit.go.jp/ksj/)
• KBA: Using Conservation International Japan's KBA survey results (https://kba.conservation.or.jp/)

L4—example 2: a.s.r [83]

In the reporting year 2023, **a.s.r** disclosed P&C insurance activities in proximity to 'Natura 2000 sites'.

6.3.2 P&C Insurance

Locate

Of all businesses that have P&C insurance with a.s.r., almost 16.5% are located within one kilometre of a Natura 2000 site.

4.4 Evaluate the insurance company's dependencies and impacts on nature

4.4.1 Relevant guidance nature-related approaches

Approach	Objectives and guidance
TNFD LEAP—'Evaluate'[84]	Objectives ▪ To develop an understanding of the organization's material dependencies and impacts on nature. Guidance financial institutions: ▪ For large portfolios, this analysis initially focuses on key companies and activities within priority sectors and companies with activities that are in, or have impacts and dependencies on, sensitive locations.

4.4.2 Non-life insurance business—considerations and examples

E1: Identification of environmental assets, ecosystem services and impact drivers

TNFD: What are the companies/activities in our portfolios that are in sectors, geographies and sensitive locations identified? What are the environmental assets, ecosystem services and impact drivers associated with these companies/activities?

Considerations for component E1 and E2 is covered together under E2.

E2: Identification of dependencies and impacts

TNFD: What are our dependencies and impacts on nature resulting from the dependencies and impacts of these companies in our portfolios?

Table 11: E2: Identification of dependencies and impacts—Non-life insurance business

Practical considerations for non-life insurance underwriting business
The focus is on nature-related dependencies and impacts arising through the insurance value chain—upstream and downstream—rather than from an insurer's own operations (see *Rooted in Risk*).[85]
For portfolio-level analysis
For insurers, it is important to contextualize environmental assets, ecosystem services and dependencies, impact drivers, and impacts within the insurance underwriting business. See *Rooted in Risk* for further details.[86]
For components E1 and E2, relevant inputs include sectors or stakeholders identified within potentially moderate and high-dependency/impact, geographies, and/or ecologically-sensitive locations, as determined in the Locate phase.

Insurers may apply different levels of analysis depending on the purpose (portfolio-level assessment or integration into underwriting), customer type, and data availability (e.g., company- or asset-specific data). Approaches can range from proxy-based to more granular:

1. (Sub-) sector-based analysis:
   - For priority (sub-) sectors identified, insurers can derive a list of ecosystem services and interpret dependencies in terms of relevance for insurance underwriting (e.g., ecosystem services contributing to reduction of natural hazards or of disturbances to production processes). This can also be reviewed in relation to specific business activities (e.g., flood reduction services enabling shipping routes).[87]
   - Similarly, for the same (sub-)sectors, insurers can derive a list of impact drivers and interpret impacts in terms of relevance for underwriting business (e.g., ocean ecosystem impacted by use of vessels linked to routing, vessel speed, anchoring).[88]
2. Analysis considering environmental assets and geographies:
   - Insurers can assess the biomes and environmental assets linked to the priority (sub-) sectors identified,[89] or those located within the key geographies outlined during the Locate phase.
   - They can further evaluate how dependencies and impacts vary depending on the specific environmental assets involved. For example, the construction sector has multiple dependencies and impacts, but these differ based on whether a project is located in a coastal area or inland—each posing distinct environmental interactions.
3. By line of business (LoB) or products:
   - Different LoBs involve distinct dependency and impact considerations, requiring more granular analysis over time (see first *Rooted in Risk*).[90]
   - Dependencies are closely tied to ecosystem services and the specific assets and risks covered. For example, flood insurance is inherently connected to ecosystem services that provide flood or storm protection.
   - Impact drivers and resulting impacts vary across different stages of the value chain (e.g., normal operations, loss events, and post-event recovery) (see example in the section below).
4. By component of the value chain:
   - Depending on the insurance product (e.g., third-party or environmental pollution liability insurance), greater focus may be needed on the full impact pathways.
   - In these cases, the claims process may be prioritized, with assessments conducted based on the claims service providers and the associated process, and may include crisis management and response services, where provided.
5. By individual customer:
   - The analysis above does not yet account for customer-, asset-, or activity-specific dependencies or impacts.
   - Where the assessment objective requires it, a more detailed review may be undertaken (e.g., as part of due diligence), identifying ecosystem services and impact drivers of the (potential) customer, including their management practices.
6. By specific location/spatial unit:
   - Dependencies and impacts can be assessed at the asset location level, considering both the insured activity or asset and the risk insured.
   - This approach is particularly relevant for integration into underwriting processes.

For the underwriting process and client engagement

As mentioned above, this refers to identifying dependencies and impacts of (potential) customers and the (potential) insured assets and activities—extending to their value chains where relevant—at specific locations.

Observed approaches in non-life insurance underwriting business

For portfolio-level analysis

Insurers have so far primarily applied levels 1) to 4) outlined above, with varying approaches depending on their business model and geographical scope. Examples of these applications are provided below.

Insurers have noted that the analysis is an iterative process. As new dependencies and impacts are being identified, assessments may return to components L3 and L4, requiring more detailed data on the locations of customers' assets and activities.

In current practice, L2 and E2 largely converge, as the examples below show, due to limited customer- and asset-specific data on associated impacts and ecosystem services. This prevails across most LoBs and customer segments, except where due diligence or environmental impact assessments are required (e.g., infrastructure insurance).

The assessment process typically combines tools and methodologies, including the use of sectoral and environmental asset-specific dependency and impact data, alongside internal workshops with business units. These workshops are used to develop long lists of dependencies and impacts, categorized by ecosystem services and impact drivers, sometimes with a specific focus on certain components of the value chain (e.g., the claims process).

A key takeaway from the workshop-based approach is that dependencies, impacts, risks, and opportunities should be assessed in an integrated rather than siloed manner, with the active engagement of relevant teams throughout the process.

Illustrative outputs

Potential outputs for portfolio-level analysis may include:

- A long list of impact drivers and impacts by (sub-) sector in scope, geography or LoB.
- A long list of ecosystem services and dependencies by (sub-) sector in scope, geography, or LoB.

Potential outputs as part of underwriting process or client engagement may include:

- A list of impact drivers and impacts and ecosystem services and dependencies by customer and/or insured assets and activities.

Relevant resources

Internal and external sources for dependency and impact analysis referenced by insurance companies:

Internal sources:

Internal workshops and documentation to assess impact drivers, dependencies, and relevant risk factors.

External sources:

The selection of external data sources will depend on the required level of analysis.

- Open-source tools for categorizing impact drivers and ecosystem services e.g.,
  - ENCORE
  - SBTN Materiality Screening Tool
  - WWF Biodiversity Risk Filter

- Tools or guidance providing information on environmental assets and ecosystems for specific sectors or at relevant locations e.g.,
  - TNFD guidance on biomes[91]
  - Global Map of Ecoregions
- Company- or asset-specific data on dependencies and impacts:
  - Commercial data providers
  - Customers' corporate sustainability disclosures or information derived from their environmental risk assessments

Note: These tools are not designed specifically for insurance underwriting applications but can support the initial stages of dependency and impact screening.

For a list of relevant tools for components E1 and E2, refer to the TNFD Tools Catalogue.

Examples: Identification of impacts and dependencies—portfolio-level analysis

E1 and E2—example 1: SOMPO Group[92]

Identified high-risk sectors for Sompo Japan Insurance by identifying and assessing dependencies and impacts in the sectors they invest in, have loans, and provide insurance underwriting services to, taking into account transaction amounts.

More specifically, they have implemented the following steps.

1. Using ENCORE, plotting the categories and magnitude of dependencies and impacts in each sector on a heatmap.
2. Reflecting insurance underwriting, investments and loan amounts at Sompo Japan Insurance into 1) above.
3. Creating heatmaps of the dependencies and impacts at Sompo Japan Insurance for insurance underwriting, investments and loans.

For **insurance underwriting**, SOMPO has assessed the sectors to which it is exposed to identify ecosystem services with high dependencies and significant impact drivers in order to identify potential risk sources for the Group.

Dependencies

We have assessed there to be the following high dependencies: "Climate regulation" in transportation services; "Groundwater" and "Surface water" in other services.

Classification of services	Ecosystem services provided directly/physically					Ecosystem services that enhance production processes						Ecosystem services that mitigate direct impacts				Ecosystem services that provide protection from disturbances					
Category / Sector	Animal-based energy	Fibers and other materials	Genetic materials	Ground-water	Surface water	Maintain nursery habitats	Pollination	Soil quality	Ventilation	Water flow mainte-nance	Water quality	Bio-remedia-tion	Dilution by atmosphere and ecosystems	Filtration	Mediation of sensory impacts	Buffering and attenuation of mass flows	Climate regulation	Disease control	Flood and storm protection	Mass stabilization and erosion control	Pest control
Oil, gas, metals and mining				2	2				1	2	2	1	1	1	1		2		2	2	
Chemicals and other materials production			1	3	3				1	2	2	2	2	2	2		2		2	2	
Paper and pulp		1		2	2					1		1	1				1				
Land development and construction				2	2			2	1	2		2		2	2		3		3	2	1
Transportation services				3	3				1	2	2		2	1	2		4		3	3	1
Automotive, electrical equipment and machinery production				3	3				1	2	2	2	2	2	2		1		2	2	
Appliances and general goods manufacturing		1		2	2				1	1	1	1	1	1	1		1		1	1	
Textiles		1		2	2					1	1	1	1	1					1	1	
Food and beverage production			1	2	2			1		1	1	1	1	1					1	1	
Agriculture, forestry and fisheries	2	2	1	2	2	2	2	2	1	2	2	1	1	1	1	2	2	2	2	2	2
Retail and wholesale												1								2	
Pharmaceuticals			1	1	2					1	1	1	1	1						1	
Electricity and energy production		2		2	2					2	1	1		1			2		2	2	
Telecommunication services (including wireless)								1			1					2	1		2	1	
Finance																				2	
Real estate				2	3							2		1	2				1	2	
Other services		3	3	4	4				1	3	2	1	1	2			3		3	2	

Key: 5 = very high; 4 = high; 3 = moderate; 2 = low; 1 = very low

Impacts

We have assessed there to be the following high impacts' "Water use", "Terrestrial ecosystem use", "Freshwater ecosystem use" and "Marine ecosystem use" in oil, gas, metals and mining; "Water use" in chemicals and other materials production; "Freshwater ecosystem use" and "Marine ecosystem use" in transportation services; "Terrestrial ecosystem use" in real estate.

Category / Sector	Water use	Terrestrial ecosystem use	Freshwater ecosystem use	Marine ecosystem use	Other resource use	GHG emissions	Non-GHG air pollutants	Water pollutants	Soil pollutants	Solid waste	Disturbances
Oil, gas, metals and mining	2	2	2	2		2	2	2	2	2	2
Chemicals and other materials production	4	3				3	3	3	3	3	3
Paper and pulp	2						1	2	2		
Land development and construction	3	4	3	4		3	3	2	3	3	3
Transportation services	3	3	4	4		3	3	3	3	3	3
Automotive, electrical equipment and machinery production	3					3	2	3	3	3	3
Appliances and general goods manufacturing	2	2				2	2	2	2	2	1
Textiles	2	2					2	1	1	2	
Food and beverage production	2				1	2		2	2	2	
Agriculture, forestry and fisheries	2	2	2	2	2	2		2	2		
Retail and wholesale	3						2	3	3	2	
Pharmaceuticals	2						1	2	2	2	
Electricity and energy production	2	2	2	2		2	2	2	2	2	2
Telecommunication services (including wireless)		2	2	2				2	1	1	2
Finance										2	
Real estate		4				3	2	2	2	3	
Other services	4			3		4	3	4	4	4	

Key: 5 = very high; 4 = high; 3 = moderate; 2 = low; 1 = very low

E1 and E2—example 2: Tokio Marine Group—Dependencies and impacts in nature-related key sectors.[93]

The Group analyzed nature-related dependencies and impacts in the identified key sectors for insurance underwriting and investment and financing portfolios and found that dependencies and impacts are high on the ecosystem services and impact drivers of natural capital mentioned below. They aim to perform a more in-depth analysis of dependencies and impacts on nature, mainly in the key sectors identified; and to apply the knowledge gained to engagements with Tokio Marine & Nichido's insurance customers and investment and financing recipients in order to contribute to "nature positive".

Dependencies on nature

Ecosystem Services	Flood & Storm Regulation	Ground Water	Surface Water	Water FlowRegulation	Mediation of Sensory Impacts	Climate Regulation	Water Quality	Dilution by Atmosphere & Ecosystems	Mass Stabilization & Erosion Control	Filtration	Ventilation
Consumer Discretionary											
Industrials											

Impacts on nature

Impact Drivers	GHG Emissions	Soil Pollutants	Water Pollutants	Water Use	Solid Waste	Non-GHG Air Pollutants	Light and Noise Pollution	Terrestrial Ecosystem Use	Marine Ecosystem Use
Consumer Discretionary									
Industrials									

Low — High

*Ecosystem services & impact drivers without "dependence" and "impact" are not shown.

E1 and E2—example 3: MS&AD Insurance Group Holdings:[94]

In order to specifically identify nature-related opportunities for the Group, it is important to understand the dependencies and impacts on nature in individual and corporate business activities that the Group's insurance products and services target. MS&AD has analyzed how these activities in the upstream and downstream of its value chain depend on various ecosystem services and how the insurance products and services can reduce the negative impacts they might have on nature. The results are shown in the table below.

Insurance Type	Individual and Corporate Business Activities	Dependencies upon Nature in Activities	Negative Impact on Nature	The Group's Insurance Products and Services That Mitigate Negative Impacts on Nature
Automobile	• Vehicular travel	◆ Land ◆ Mineral/ energy resources ◇ Prevention of floods/storms ◇ Stabilization/Erosion prevention	(i) Times of normalcy (no accidents): ● GHG emissions ● Air pollution ● Land use change (ecosystem fragmentation by roads) ● Noise, light pollution (ii) In the event of an accident: ● Pollution due to accident or damage (iii) After an accident: ● Utilization of resources for repairs ● Pollution due to waste generation	(i) Times of normalcy (no accidents): ○ Reduction of GHG emissions through promotion of safe driving by using Telematics technology such as dashcams ○ Prevention of roadkill with animal attention alert function (ii) In the event of an accident: Nothing in particular (iii) After an accident: ○ Resource conservation through utilizing recycled parts for repairs
Fire/ Facility owners (managers) Liability/ Erection All Risks	• Operation of business bases • Residence • Construction	◆ Land, ocean or freshwater area ◇ Textiles and other materials ◇ Prevention of floods/storms ◇ Stabilization/Erosion prevention ◇ Water cycle	(i) Times of normalcy (no accidents): ● GHG emissions ● Air pollution, water pollution / ocean pollution ● Use change of land, Ocean, freshwater area ● Utilization of resources (ii) In the event of an accident: ● Air pollution, water pollution ● Ocean pollution ● Pollution due to disaster-related waste generation (iii) After an accident: ● Utilization of resources for repairs, waste generation	(i) Times of normalcy (no accidents): ○ Reduction in GHG emissions through support for carbon- neutral initiatives ○ Mitigation of pollution and utilization of resources by proposing accident prevention measures ○ Water resources conservation through basic evaluation service for water-related risks ○ Conservation of biodiversity through biodiversity-conscious land-use consulting (ii) In the event of an accident: ○ Reduction in GHG emissions through offering the Carbon Neutral Support Endorsement ○ Preservation and restoration of ecosystems such as forest resources through rapid forest rehabilitation under the "Forest Keeper," Endorsement for forestry business operators, which covers reforestation costs ○ Endorsement for Extended Compensation for Pollution Damage for facility owners (managers) Liability Insurance (iii) After an accident: ○ Resource conservation through utilizing recycled parts and rebuilding
Hull/Cargo	• Land and ship transportation of cargo	◆ Land ◆ Ocean or freshwater area (river, lake) ◇ Mass flow rate mitigation ◇ Dilution by the atmosphere and ecosystem ◇ Prevention of floods/storms ◇ Stabilization/Erosion prevention ◇ Mitigation of sensory impacts	(i) After an accident: ● GHG emissions ● Air pollution, water pollution ● Ocean pollution ● Introduction of alien species ● Undersea noise, light pollution (ii) In the event of an accident: ● Pollution due to accident or damage ● Pollution due to waste generation (iii) After an accident: ● Utilization of resources for repairs	(i) Times of normalcy (no accidents): ○ Mitigation of pollution and utilization of resources by proposing accident prevention measures (ii) In the event of an accident: ○ Preservation and restoration of ecosystems through early removal of ocean pollution under Endorsement for Compensation of Additional Costs for Ocean Pollution (iii) After an accident: Nothing in particular

E3: Measurement of dependencies and impacts

TNFD: Dependency measurement—What is the scale and scope of our dependencies on nature as a result of the dependencies of our portfolio companies? Impact measurement—What is the severity of their negative impacts on nature? What is the scale and scope of their positive impacts on nature?

Table 12: E3: Measurement of dependencies and impacts—Non-life insurance business

Practical considerations for non-life insurance underwriting business

For portfolio-level analysis

For dependency and impact measurement, it is important to consider the dependency and impact pathways. See *Rooted in Risk* for further details.[95] However, financial institutions—particularly insurers—face limitations, as such a comprehensive assessment would require detailed location data, stakeholder/customer-specific data, and information on the state of nature and ecosystem services for all insured activities and assets.

Impact measurement

Several alternative approaches have been developed to address these challenges. For example, the methodology proposed by the "PBAF standard on biodiversity impact assessment"[96,97] account for the constraints faced by financial institutions. Alternative impact assessment and approaches to estimate nature-related impact can include:

- Potential impact drivers: qualitative information (e.g., sector proxies):
  - Based on qualitative information on impact drivers (e.g., sector/industry proxies)
  - Based on qualitative information by LoB/product, and part of the value chain (e.g., industry proxies, internal loss data)
- Potential impact: qualitative information (e.g., sector proxies, geospatial data):
  - Based on asset location and geospatial state of nature data (at different spatial scales)
  - Based on impact drivers combined with geospatial state of nature data
- Potential impact using a quantified biodiversity footprint as proxy:[98]
  - Footprint calculation at portfolio, company, or project level are based on environmental input/output data and pressure—impact modelling.[99] Their application to insurance underwriting portfolios remains limited.
- Actual/observed nature-related impact (impact measurement):
  - Measuring actual nature-related impact through on-site monitoring of changes in state of nature along the full insurance value chain.

For insurance companies, these considerations should align with the insurance value chain, encompassing insured activities and assets, loss events, and the claims process (refer to *Rooted in Risk*).[100] As such, the applicability of the approaches mentioned above remains limited.

Dependency measurement

Dependency measurement follows the dependency pathway, yet financial institutions and insurance companies face similar limitations as with impact measurement, particularly due to constrained access to company/asset-specific data and data on state of nature and ecosystem services.

Guidance on dependency measurement has been provided, outlining key components:[101]

- Consideration of (1) external drivers, (2) internal impact drivers, (3) state of nature, (4) ecosystem service availability and quality, and (5) reliance on ecosystem services (benefits derived from ecosystem services).

- Measuring these five components can enable companies to assess the extent and likelihood of changes in ecosystem service provision and, consequently, to evaluate dependency-related risks and opportunities (refer to Assess phase exposure analysis). However, comprehensive dependency measurement remains challenging for financial institutions.

For insurers, dependency measurement should differentiate between direct connection of ecosystem services and insured perils/risks, broader insured business activities of the customer, and claims services to effectively identify nature-related risks and opportunities—see *Rooted in Risk*.[102]

Financial institutions can apply different levels of dependency measurement.[103] PBAF provides guidance on maturity levels and spatial scale considerations.[104] In the context of insurance underwriting portfolios, this could involve:

Qualitative: Reliance on ecosystem services (5):

- Qualitative information includes significance of ecosystem service for production processes/business activities, or insured risks.

Qualitative: Reliance (5) and provision of ecosystem services (4)—by high-level geography:

- Qualitative information—as above.
- In combination with qualitative information on the availability and quality (e.g., resilience) of ecosystem services in the geography/area in scope (e.g., through hazard maps) (4), can provide exposure information (see Assess phase).[105]

Quantitative: Reliance on ecosystem services (5) and provision of ecosystem service (4)—at asset location:

- Quantitative information on the reliance on ecosystem services (e.g., protects x homes per year from floods), at different spatial scales.
- Quantitative information on the provision of ecosystem services (e.g., x billion m^3 of water flow regulated annually), at different spatial scales.
- This can be overlaid with the state of nature/ecosystem service capacity (3) to help indicate risks (see Assess phase).

Financial/monetary—Reliance on ecosystem services (5) and provision of ecosystem service (4)—at asset location:

- Financial/monetary information on the reliance on ecosystem services (e.g., avoided insured losses annually), at different spatial scales.
- This can be overlaid with the state of nature/ecosystem service capacity (3), which can help indicate risks (see Assess phase).

Assessment metrics and disclosure metrics for dependency and impact measurement in insurance underwriting portfolios have not yet been fully explored. This remains a key area for further development within the industry.

For the underwriting process and client engagement

It is important to consider different levels of analysis, distinguishing between portfolio-level assessments and the underwriting process or client engagement. Portfolio-level analysis may initially rely on more qualitative methods, while nature-related dependencies/impacts can be integrated into the underwriting process through enhanced due diligence, particularly for project-based activities such as infrastructure and construction.

At the underwriting or client engagement level, the focus is on the (potential) client and the (potential) insured assets and activities, including, where potentially material, their value chains.

This approach can also support the broader use of primary data sources and help identify areas that could avoid and reduce negative impacts and seize opportunities to support nature-positive transitions (see *PSI Nature Action Guide*).[106]

Observed approaches in non-life insurance underwriting business

For portfolio-level analysis

The scale of dependencies and impacts across insurers' upstream and downstream actors and activities (spanning indirect dependencies and impacts) has primarily been assessed using qualitative approaches. Current practice is largely based on sector-level proxies and ratings to evaluate impact drivers and ecosystem services.

In one example, an insurer adopted a more advanced approach by assessing the importance and value of ecosystem services linked to specific environmental assets within a priority geography (see example below).

For product development and identifying opportunities to reduce risk

One example involves an insurer assessing how understanding the dependency of assets and activities on nature can help reduce risk. In this case, the dependency of residential houses in a specific area on flood mitigation services was examined, along with how nature-based interventions could enhance ecosystem services such as flood mitigation and rainwater conservation (see example below).

Illustrative outputs

Typically aligned with outputs from components E1 and E2, such as:

- A table describing dependencies and impact drivers by LoB or product.
- A list of customers, insured assets/activities, and the (potential) scale of their dependency and impact.

Relevant resources

Data required for this component may include primary or secondary data, sourced either internally or externally. To date, insurers have primarily relied on open-source and proxy data.

Primary data—collected directly from customers or other tools:

- Customers' corporate sustainability disclosures, including information provided through environmental risk assessments. This may cover specific impacts and dependencies at particular locations, along with relevant management practices and plans.
- Monitoring or observation data, such as satellite imagery.

Secondary data—including modelled data or third-party sources:

- Data providers offering information on the status of environmental assets and ecosystems at relevant locations e.g.,
  - Data on the state of nature, such as ecosystem integrity (e.g., Integrated Biodiversity Assessment Tool (IBAT), Biodiversity Intactness Index (BII)) or ecosystem service capacity (e.g., Biodiversity and Ecosystem Index (BES index)).

Commercial data providers:

- Company-specific data on pressures, including quantitative metrics (e.g., impact driver metrics aligned with TNFD disclosure recommendations[107]), or scores/scales for company-level dependencies and impacts.
- Biodiversity "footprinting" tools: Tools that aggregate company pressures using input/output models and to generate modelled estimates of biodiversity impact.

Note: These tools are not specifically designed for application to insurance underwriting portfolios and have limitations due to their reliance on modelled estimates.

For a list of relevant tools for component E3, refer to the TNFD Tools Catalogue.

Examples: Impact and dependency measurement—portfolio-level analysis

E3—example 1: Evaluation of dependencies

The insurance company, **a.s.r.**, conducted an analysis of environmental assets associated with insured assets and activities in ecologically-sensitive locations. In collaboration with a university, a.s.r. gathered information on the significance of these environmental assets for ecosystem service provision, as well as the valuation of these services.

Nature Type		Importance Score Naturetype					
		Flood and storm protection	Ground water	Water quality	Climate regulations	Pest control	
IndexNL		Potential as water barrier	Water retention capacity	Purification of surface water Nitrate	CO2 Capture (average)	Potential for pest control & pollination	Air purification
Code	Management types	Score	Score	Score	Score	Score	Score
N01	Large-scale, dynamic nature						
N01.01	Sea and tidal flats	5	5	2	1	2	1
N01.02	Dune and salt marsh landscape	4	2	1	1	2	3
N01.03	River and marsh landscape	3	3	1	2	2	2
N01.04	Sand and chalk landscape	2	4	1	2	2	4
N02	Rivers						
N02.01	River	2	1	2	1	2	1
N03	Streams and springs						
N03.01	Stream and spring	1	1	2	1	2	1
N04	Still waters						
N04.01	Chara waters	2	5	3	1	2	1
N04.02	Freshwater lake	2	5	5	1	2	1
N04.03	Brackish water	2	5	2	1	2	1
N04.04	Enclosed sea arm	2	5	2	1	2	1
N05	Marshes						
N05.02	Mown reed land	3	5	5	5	3	3
N05.03	Peat marsh	3	5	5	3	3	3

*Selected example was provided directly, on a voluntary basis, by contributor and have been cleared internally for publication.

E3—example 2: Evaluation of impacts[108]

Following the Locate and Evaluate phases, a.s.r. analyzed companies in priority sectors and their interface with Natura 2000 sites. The analysis considered potential impacts and dependencies through the company's insured activities in Natura 2000 sites. The analysis was performed based on data from financial year 2023.

6.3.2 P&C Insurance

Locate

Of all businesses that have P&C insurance with a.s.r., almost 16.5% are located within one kilometre of a Natura 2000 site.

Evaluation of impacts

In three steps, we then further prioritised companies with a high (potential) impact on or dependence on nature loss in nearby Natura 2000 sites.

1. **Sector selection:** As a first step, companies were selected from the 10 sectors that, according to the Finance for Biodiversity Foundation, have the greatest potential impact on or are most dependent on nature loss.
2. **Pressure analysis:** Next, using the database from Encore, we investigated what ecosystem services the production processes of the selected companies impact or depend on.
3. **Natura 2000 linkage:** As a third step, based on research by Wageningen University & Research (WUR), we examined which Natura 2000 sites were located close to the selected companies providing ecosystem services.

Some 3% of the companies insured with a.s.r. meet the above criteria. This includes, for example, an insured construction company active in the field of infrastructure maintenance. As this involves the use of large quantities of (ground)water, the company could have a major impact on the water supply function of a nearby Natura 2000 site.

E4: Determination of impact materiality

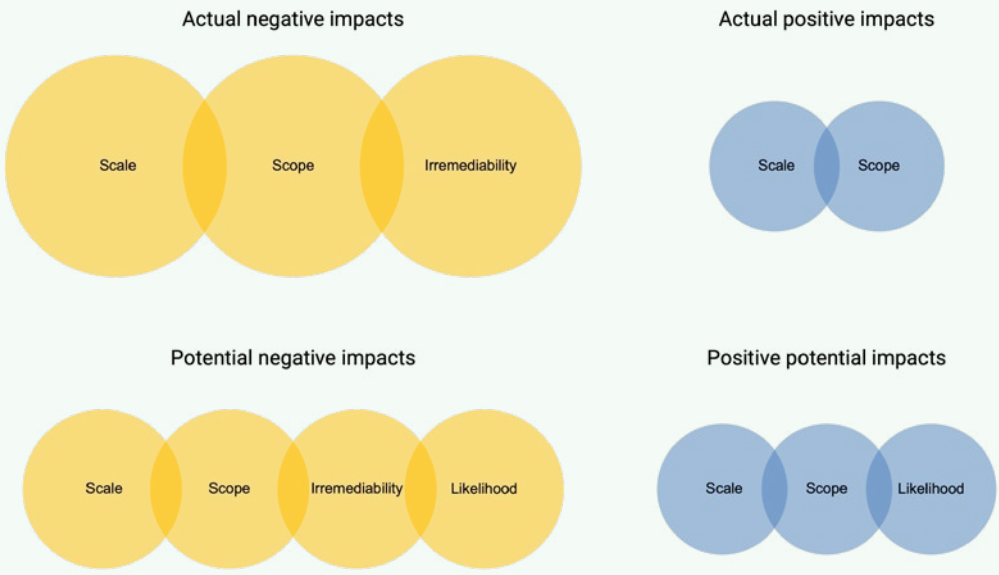
TNFD: Which of the identified impacts are material?

Table 13: E4: Determination of impact materiality—Non-life insurance business

Practical considerations for non-life insurance underwriting business
For the assessment of impact materiality, insurers can apply the GRI[109] and ESRS[110] approaches to identify and determine materiality of actual and potential impacts. The scope of the materiality assessment should cover the full insurance value chain, including insured assets and activities, loss events, and the claims process.
Observed approaches in non-life insurance underwriting business
Insurers have conducted their assessments using the definitions and criteria outlined by the GRI[111] and ESRS,[112] distinguishing between actual and potential impacts. Materiality is typically determined from a long list of impacts identified under component E2 and E3, which are then evaluated and scored through organization-wide workshops.
Illustrative outputs
Potential outputs may include: ▪ A list of customers with moderate or high nature-related dependencies and impacts, as input to derive strategic responses, client engagement and/or underwriting guidelines. ▪ A list of material nature-related dependencies and impacts across the value chain to be reported in line with relevant disclosure frameworks (e.g., TNFD-aligned disclosures).
Relevant resources
Internal workshops conducted to support the materiality assessment process.

Example: Material impacts—portfolio-level analysis

The insurer has applied the following criteria to define materiality for actual and potential negative impacts, as well as actual and potential positive impacts. The criteria were applied to the "long list" of impacts derived through a series of workshops and used to generate the "short list" of impacts deemed material and to be disclosed.



4.5 Assess the insurance company's nature-related risks and opportunities

4.5.1 Relevant guidance nature-related approaches

Approach	Objectives and guidance
TNFD LEAP—'Assess'[113]	Objectives ▪ To understand which nature-related risks and opportunities are material and should be disclosed by the organization. This is done through the identification, measurement and prioritization of nature-related risks and opportunities originating from the dependencies and impacts on nature identified in the Locate and Evaluate phases. Guidance for financial institutions: ▪ Financial institutions will identify the risks their own organization faces through their portfolio companies. ▪ For financial institutions, this will involve assessing whether the nature-related risks and opportunities should be identified as new risk and opportunity categories or aggravating/mitigating factors for the prudential risk categories already covered by the risk management system. ▪ A financial institution will also reflect on the opportunities, such as new service offerings.

4.5.2 Non-life insurance business—considerations and examples

A1: Risk and opportunity identification

TNFD: What are the corresponding risks and opportunities for our organization?

Table 14: A1: Risk and opportunity identification—Non-life insurance business

Practical considerations for non-life insurance underwriting business
The focus is on nature-related risks and opportunities arising from the insurance value chain (upstream and downstream) rather than from an insurer's own operations (see *Rooted in Risk*).[114] **Risk identification by insurers can follow two steps, depending on the purpose of the assessment:** ▪ First, sources of nature-related risk (physical and/or transition) are identified for (potential) customers, the (potential) insured activities and assets, and claims service providers and their activities. ▪ Second, the analysis considers how these risks could lead to physical damage or loss; yield/revenue loss and business interruption/loss of use; financial claims/expenses; and bodily injury or third-party property damage—affecting assets/operations, infrastructure, human health, or natural assets and environmental resources. These risks are interpreted in the context of the insurer's business model and LoBs (e.g., property, agriculture, liability). Sources of nature-related risk can be identified using three lenses: 1. Value chain activities located in ecologically-sensitive areas (e.g., protected ecosystems or regions experiencing rapid declines in ecosystem integrity) (see Locate phase). 2. Indirect dependencies and impacts on nature (see Evaluate phase). 3. Broader contextual factors, particularly relevant to identify systemic risks, e.g.,:[115] ▪ Local and international policy and regulatory developments ▪ Technological innovation ▪ Market dynamics ▪ Shifts in consumer preferences and demand ▪ Planetary tipping points and ecosystem collapse **On this basis, potential financial risks to the insurer may be identified (see Rooted in Risk).[116] For example:** ▪ Where policies include nature-related physical risks (e.g., drought/water scarcity in crop-yield covers) or nature-related transition exposures (e.g., D&O or professional indemnity responding to non-compliance with new deforestation-free rules), nature loss or responses to it may increase claims frequency and severity. ▪ Via (potential) customers' activities and assets, where nature-related physical and/or transition risks can impact business viability and, in turn, insurability or availability of assets, activities or locations, and may disrupt claims service provision. ▪ Via direct business relationships and irrespective of the insured peril, underwriting high-impact actors/activities or issues within upstream suppliers (e.g., claims service providers) can create reputational risks linked to nature-related impacts.

Following the two steps above on risk identification can lead to insurers identifying opportunities. For example:

- Opportunities to reduce hazards, such as through nature-based solutions (NbS).
- Identification of new perils, presenting potential opportunities to develop new insurance products, both for new business models and in response to nature-related physical risks.

Opportunities can also be identified following the impact assessment. For example:

- Opportunities to support incentives/activities that help avoid or reduce negative impacts on nature.

Portfolio-level analysis:

1. Identification of sources of nature-related risks:

Different approaches can be applied. The examples below show how outputs from Locate and Evaluate phases identify sources of risk, while a broader context is considered to identify potential systemic risks.

a. Identification by priority geographies or ecologically-sensitive areas:

- Sources of risk may be identified by geography, particularly where the insurance value chain interfaces with ecologically-sensitive areas flagged in Locate (e.g., high physical water risk or declining ecosystem integrity), with specific environmental assets, or with concentrations of customer activities; and where Evaluate highlights locations with material dependencies and impacts or areas critical for economic activities. This can extend across the wider value chain, beyond existing customers or currently insured assets. For example:
  - The Colorado River Basin may be selected as a priority geography given its role as a key water source for agriculture, hydropower and municipal supply in the United States of America and Mexico. Sources of risks are identified by considering pressure from multiple users and climate-related flow reductions, which can influence water availability, access and cost for nearby insured assets and activities.[117]

b. Identification following the dependencies and impacts of the insurance value chain:

- Sources of physical and transition risks can be identified based on sector/production processes (see *Rooted in Risk*[118]), including through "what-if" scenarios. For example:
  - Physical risk—Agriculture (arable crops): Dependency on flood- and storm-mitigation services. "What if" those services are disrupted? Acute risks (e.g., crop loss, storm damage) and chronic risks (e.g., topsoil loss, contamination reducing productivity) could result.
  - Transition risk—Construction & Engineering: Impact drivers on groundwater and freshwater supply. "What if" excessive water use affects other stakeholders? Reputational risks may result. External factors such as water-use restrictions or rising prices may also affect project viability or operations.
  - Sector-specific research, including TNFD's "Additional Guidance by Sector"[119], can support the identification of potential sources of nature-related risks by applying sector-specific assumptions and characteristics.

c. As suggested in the Scoping phase, risk identification can also be carried out at the line of business or product level, or by value chain component. For example:

- At the LoB/product level, opportunities and potential financial risks can be more evident when linked to insured risks. For climate-related perils (e.g., flood, wildfire, storm, landslide), assessments can set out the ecosystem services whose disruption would affect loss experience (e.g., flood mitigation by wetlands/floodplains, coastal protection by reefs and mangroves, slope stabilization by forests).
- At specific stages of the insurance value chain: (i) within the claims process (e.g., loss-event response/crisis management), where additional impacts on nature and related risks may materialize; and (ii) within the repair/replacement supply chain, where material sourcing may be constrained by environmental-resource availability or regulatory restrictions.

d. Risk identification through a wider context:

- National risk registers (e.g., Green Finance Institute's UK nature-related risk inventory[120]) can be used to provide a national context.
- For transition risks, broader external factors (e.g., regulation, policy, market trends, technological developments and consumer demand) can be considered, informed by National Biodiversity Strategies and Action Plans (NBSAPs). For physical risks, dependencies at national or global scale can be translated into risk categories using existing taxonomies[121], complemented by research on wider environmental factors, including ecosystem tipping points.

e. A forward-looking dimension through **nature-related scenarios** can be used to help derive sources of risk that may occur in the future. For physical risk, sources may reflect extrapolated trends or hypothetical shocks involving ecosystem degradation or collapse.[122] Consultations with scientific institutions and governmental bodies can inform future sources of transition risk (e.g., new technologies or legislation).

2. Translation into potential financial risks

- Nature-related risks have financial implications for insurers via transmission channels that map to traditional risk categories. Mapping these pathways—through effects on economic factors—forms the basis for financial risk measurement and management (see *Rooted in Risk*). [123]
- Financial risks arise both from nature loss affecting the insurer ("outside-in") and from the insurer's impacts on nature ("inside-out"); with both dimensions considered when assessing material financial risks.
- These risks, their pathways, and potential impacts on the insurer's business should be reflected in the risk taxonomy and captured in the insurer's risk register (see Assess—A2).

3. Identification of nature-related opportunities

Opportunities for insurers include risk reduction to support insurability, resilience-building through risk transfer, and support businesses to avoid and reduce negative impacts and contribute to nature positive.

Potential approaches to identifying opportunities may include:

1. Opportunities for new risk transfer solutions:
   - Identifying nature-related risks can serve as input to determine which risks need insurance cover. This may include cover for transition risks arising from shifts to lower-impact business activities leading to revenue loss (e.g., nitrogen insurance), and cover for physical risks, such as soil degradation, water availability, and increased vulnerability to pests and diseases.
2. Opportunities for hazard prevention or reduction:
   - Where there is strong dependence on an ecosystem service, assessing—via dependency pathways—how conserving or enhancing the underlying ecosystem could prevent or reduce the frequency and severity of losses.
   - From a geographic perspective, identifying areas with high-risk concentrations and assessing where risks are increasing, where they cluster, and the potential to mitigate them through nature-based solutions.
3. Opportunity identification through a broader context:
   - Leveraging external resources such as the "PSI Nature Action Guide".
   - Opportunities to avoid and reduce negative impacts and increase positive impacts—including insurance for nature-positive and insuring the transition—derived from National Biodiversity Strategy Action Plans (NBSAPs), regulatory changes, sectoral pathways, new technologies and innovations.

Risk identification for product development

- Opportunities at portfolio level can provide a basis for product development.
- Analysis of links between specific sources of risk (e.g., mandated nitrogen-use reductions) and consequences (e.g., reduced crop yields), including vulnerability criteria. For example, opportunities have been recognized to offer insurance cover for farmers transitioning from conventional to organic or regenerative practices. Emerging products such as nitrogen insurance illustrate how these risks and associated exposure and vulnerabilities can inform product design and risk modelling.

Risk identification as part of the underwriting process and client engagement

- Risks can be identified using customer- or asset-specific information (e.g., business activities, processes, and locations), while considering the customer's value chain and potential risks beyond the immediate vicinity. Assessment can follow dependency and impact pathways, consider assets or activities in ecologically-sensitive areas (e.g., declining ecosystem conditions or critical service provision, leveraging hazard maps), and account for external factors. Scenario analysis may also support the assessment of emerging nature-related risks for specific locations.
- Cases may be identified where a customer's exposure to nature-related risks presents opportunities for proactive engagement by promoting risk reduction measures or developing solutions to underwrite emerging nature-related risks.
- Client engagement can, for example, focus on physical risks such as reliance on groundwater in areas of water scarcity. Building on initial risk identification (e.g., component A1), engagement may reveal that at specific sites groundwater levels are declining rapidly, increasing exposure to operational disruption and potential financial losses.

Observed approaches in non-life insurance underwriting business

Portfolio-level analysis

Insurers have so far approached this step by compiling a long list of potential sources of nature-related physical and transition risks and corresponding financial risks:

- Based on sector/production processes.
- Based on specific LoBs or stages in the value chain, such as the claims process.
- Including a description of how nature-related risks translate into financial risk categories, considering short-, medium-, and long-term time horizons.

Most organizations have applied workshop-based assessments, with some incorporating combined impact and risk assessment workshops involving various business functions and teams.

Approaches are also evolving to integrate climate- and nature-related risks, recognizing that climate-related risks can be amplified by nature loss and the degradation of ecosystem services.

Identification of opportunities for risk reduction

See examples for identifying risk reduction measures in section 4.4.2. In this case, a river basin in a specific area was identified as repeatedly experiencing flooding and damage, and the use of rain gardens and their ability to reduce flood risk was assessed.

Illustrative outputs

Potential results may include:

- A comprehensive "long list" or register of physical and transition risks categorized by sector, high-level geography, with a description of how these risks could affect the insurer's business activities.
- A risk register mapped against potential impacts on financial risk categories and/or LoBs.
- A similar register for potential opportunities.
- Risk registers by (potential) customer.

Relevant resources

Potential sources to identify nature-related risks:

Physical risks

- Goals and Targets of the Global Biodiversity Framework (GBF) and respective National Biodiversity Strategy Action Plans[124]
- National nature-related risk registers, where available[125]
- Risks and opportunity registers by initiatives (e.g., "TNFD nature-related risk & opportunity register") [126]
- Additional sectoral guidance (e.g., TNFD's "Additional sectoral guidance") [127]
- Academic studies or other relevant research providing lists or examples of nature-related hazards or risks[128]
- Guidance from insurance regulatory and supervisory authorities (e.g., EIOPA's "Report on Biodiversity Risk Management by Insurers")[129]
- Tools providing physical risk indicators (e.g., WWF Biodiversity Risk Filter)
- Direct engagement with (potential) customers

Transition risks

- Goals and Targets of the Global Biodiversity Framework (GBF) and respective National Biodiversity Strategy Action Plans (NBSAPs)[130]
- National risk registers, where available [131]
- National environmental policies and regulations
- National sustainability-related regulations for corporate and financial sector
- Sectoral pathways and guidance documents (e.g., TNFD's "Additional sectoral guidance"[132] or WBCSDs "Nature-Positive Roadmaps" [133] or WEF's "Nature Positive Transitions: Sectors"[134], "Nature Positive: Financing the Transition in Cities"[135])
- Tools providing transition risk indicators (e.g., WWF Biodiversity Risk Filter)
- Direct engagement with (potential) customers

Note: These tools and registers are not designed for specific application to insurance underwriting portfolios.

For a list of relevant tools for component A1, refer to the TNFD Tools Catalogue.

Examples: Nature-related risks and opportunities identification—Portfolio-level analysis

A1—example 1: Tokio Marine Group[136]

The chart shows nature-related risks and opportunities anticipated for key sectors identified by the analysis using the ENCORE tool. Going forward, Tokio Marine plans to conduct a more in-depth assessment based on these risks and opportunities and use the results in efforts related to insurance products and services as well as investment and financing.

	Examples of Risks and Opportunities in the Consumer Discretionary/Industrials Sector	
	Risks	**Opportunities**
Physical risks	• Leakage of hazardous substances due to natural disasters or equipment failure (soil contamination, groundwater contamination) • Disruption of business activities due to the increase in typhoons, floods, and droughts	• Development and implementation of technologies aimed at preventing soil and water contamination • Review and diversification of supply chains
Transition risks	• Increased risk of regulated substances being mixed into products or violations of labeling regulations	• Enhancement of product value and increase in profits through the use of environmental certifications
	• Increase in research and development costs for the development of environmentally friendly technologies	• Enhancement of competitiveness through technological development aimed at improving recyclability • Cost reduction through improved resource efficiency
	• Customer attrition, reputation damage, and divestment from investors and financial institutions when seen as having a passive approach	• Enhancement of products, corporate value, and reputation through sustainable procurement and reduction of environmental impact • Expansion of sustainable finance for technological development aimed at achieving a circular economy

Risks•Opportunities		Examples of events	Examples of risks to the Group's business activities	Time frame
Physical risks	**Acute**	• Growing frequency and severity of typhoons, floods, and bushfires due to climate change. • Occurrence and expansion of damage due to the reduction in soil water retention capacity and coastal erosion.	• Decrease in insurance profits (impact on claims payments, etc.) • Impact on business continuity caused by disasters to sales operations and other facilities.	Short term
	Chronic	• Occurrence and expansion of damage due to the rise in average temperature, changes in weather patterns such as droughts and heatwaves, and sea level rise.		Medium to long term
Transition risks	**Policies and regulations**	• Strengthening of nature-related regulations and standards and increase in nature-related litigations.	• Decrease in corporate value of investee companies and the value of assets held due to increased costs for policy and regulatory compliance and deterioration of business performance. • Impact on liability insurance payments.	Medium to long term
	Technology	• Progress in technological innovation toward the transition to a decarbonized society in harmony with nature and improvement in resilience.	• Decrease in insurance profits due to inadequate measures to the transition to a decarbonized society inharmony with nature and improving resilience among customers.	Medium to long term
	Markets	• Changes in demand and supply of goods and services, and transition to a decarbonized society in harmony with nature. • Deterioration of business performance and changes in business models for customers, investees, and business partners due to shortages or depletion of raw materials and price surges.	• Decrease in corporate value of investee companies and the value of assets held due to inadequate responses to the transition to a decarbonized society in harmony with nature and to improving resilience. • Decline in revenue due to the inability to capture technological innovation, technological development, and customer needs	Short term
	Reputation	• Changing customer and societal awareness of initiatives to transition to a decarbonized society in harmony with nature and to improve resilience.	• Reputational damage due to our initiatives being deemed insufficient or inappropriate	Short term

Risks•Opportunities		Examples of events	Examples of risks to the Group's business activities	Time frame
Opportunities	**Resource efficiency, energy sources, products and services, markets and resilience**	• Recovery of business performance and changes in business models for customers, investees, and business partners due to shortages or depletion of raw materials and price surges. • Changing product and service demand and societal awareness towards the transition to a decarbonized/environmentally symbiotic society, and towards improving resilience.	• Increase in demand for nature-related goods and services. • Increase in insurance profit opportunities and investment and financing opportunities due to transition, rise in insurance demands to improve resilience, and funding requirements accompanying the transition. • Improvement in customer evaluations from our initiatives to transition to a decarbonized society in harmony with nature and improvement of resilience.	Short term

Note: Short term: less than 3 years, Medium term: 3–10 years, Long term: 10 years or more
* Please refer to our TCFD Report for climate-specific risks and opportunities.

Tokio Marine further evaluated the nature-related risks and opportunities identified in terms of their impact on the Group's business activities (underwriting and investments) and estimated the timeframes in which these effects can materialize.

A1—example 2: MS&AD Insurance Group Holdings[137]

Climate- and nature-related risks include the direct impact of climate change and damage to nature (physical risk) and the impact of rapid social change towards net zero and nature positive (transition risk). As an insurance and financial group centered on non-life insurance business, MS&AD evaluates risks from both underwriting and investment (asset management) perspectives.

The Group is already seeing a financial impact on its underwriting business due to increased natural disaster risks linked to climate change, such as forest fires and hailstorms, and wind and flood damage caused by typhoons and torrential rains. Beyond climate-related risks, various nature-related risks, such as the depletion of water resources, are expected to have an increasing impact on society and business activities over the medium to long term.

H+: Very High H: High M: Medium L: Low

Classification	Event	Examples of main impacts on policyholders and investment and financing recipients	Examples of main impacts on the Group and degree of impact ◆Underwriting ◇Investment and financing		Period of manifestation: Short term	Medium term	Long term
Acute risks	Typhoons, hurricanes, storm surges	Stronger tropical cyclones cause significant damage to homes and businesses. Depending on their course, such cyclones could cause damage over a wide area. Storm surges also cause significant damage to coastal areas	◆Insurance claims payouts occur, particularly concerning many homes, businesses, vehicles, and other property ◇Asset management returns deteriorate owing to large-scale damage affecting important business sites at the recipients of investment and financing	H+	●	●	●
	Torrential rain, flooding	Increased temperatures increase the amount of water vapor in the atmosphere, causing torrential rainfall. Extensive flooding caused by improper land use or flood control conditions cause significant damage. Lack of soil stability due to deforestation and vegetation removal, or cutting and reclamation of slopes, causes landslides triggered by torrential rainfall		H	●	●	●
	Hail and snow damage	Hailstorms are caused by active convective activity due to warm, moist air currents in the updrafts generated by strong solar radiation and cold air inflows into the sky. Falling hail damages vehicles and buildings. Many facilities of non-heavy snowfall areas are not strong enough to withstand, and heavy snowfall damages facilities	◆Insurance claims payouts occur for damage to vehicles and facilities ◇Not likely to lead to a significant deterioration in asset management returns	H	●	●	●
	Forest fires	Heat waves and extreme heat cause forest fires. Insufficient tending to forests, such as the neglect of dead trees and underbrush, increases the risk of fire. Fire spreading to surrounding urban areas, etc.,will lead to significant damage	◆Insurance claims payouts occur for forests, as well as homes and businesses in the event of fires spreading ◇Asset management returns deteriorate owing to large-scale damage affecting important business sites at the recipients of investment and financing	M	●	●	●
	Heat wave, cold wave	Severe heat and cold waves cause human suffering, sudden strains on energy and water resources, and logistical disruptions such as traffic paralysis	◆Not likely to result in large insurance claims payouts ◇Not likely to lead to a significant deterioration in asset management returns	M	●	●	●
Chronic risks	Dry spells and droughts	Agriculture, food, and water-intensive businesses experience increased costs and losses owing to difficulties in procuring materials and interruptions in manufacturing. In addition, the interruption of water transportation and the shortage of cooling water could affect a wide variety of industries	◆Not likely to result in large insurance claims payouts ◇Asset management returns deteriorate as performance worsens at companies dependent on water resources	L		●	●
	High temperatures (heat)	Disruptions due to rapid increases in energy demand could occur. Data centers, power plants, and other facilities face an increased burden for cooling. Labor efficiency falls as outdoor activities, such as construction sites are restricted, and there is an impact on health, such as increased stress due to heat and the spread of infectious diseases	◆Not likely to result in large insurance claims payouts ◇Asset management returns deteriorate as performance worsens at companies for which high temperatures can be a risk	L		●	●
	Depletion of water resources	The depletion of water resources, such as excessive groundwater pumping and development in groundwater recharge areas, significantly impacts the business activities of companies that use a lot of water for raw materials and manufacturing processes	◆Not likely to result in large insurance claims payouts ◇Asset management returns deteriorate as performance worsens at companies dependent on water resources	L		●	●
	Degradation of other ecosystem services	Serious losses might occur when ecosystem services on which livelihoods and business activities depend, such as pollination for agriculture, are degraded or destroyed owing to damage to natural capital	◆Not likely to result in large insurance claims payouts ◇Asset management returns deteriorate as performance worsens at companies overly dependent on ecosystem services where natural capital is severely damaged	L			●

The Group analyzed physical risks, transition risks, and opportunities for each of the six industries identified in the chapter on climate- and nature-related dependencies and impacts. They also assessed the associated risks and opportunities for the Group within these industries. Going forward, they aim to continue working with their customers to create opportunities and countermeasures against climate- and nature-related risks.

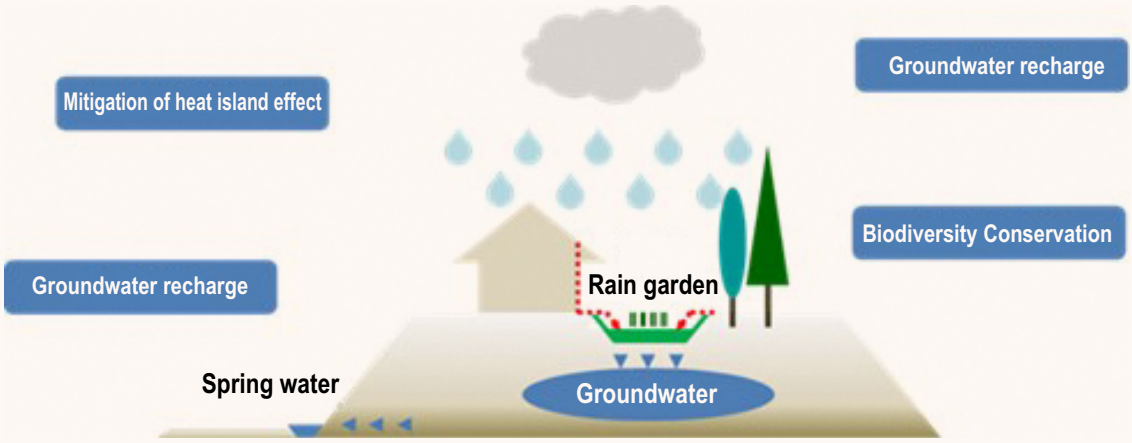
a. Automobile/parts industry

	Companies in the automotive/parts industry Risk: ◆Upstream ■Own operation ◇Down stream Opportunity: ◆Upstream ■Own operation ◇Down stream	Our Group Risk: ●Underwriting ○Investment/Loan ◎Consulting service Opportunity: ●Underwriting ○Investment/Loan ◎Consulting service
Physical Risk	◆ Supply chain disruptions such as damage to suppliers and manufacturing contractors and suspension of logistics functions due to natural disasters ◆ Increase in costs of materials caused by reduced yields and quality deterioration of natural rubber and other raw materials due to temperature rise, drought, and ecosystem deterioration ■ Losses and decreased sales incurred by damage to facilities and equipment production suspension due to natural disasters ■ Increase in energy costs and employee health risks, and decrease in productivity associated with deterioration of quality, factory operation rate and cooling efficiency of air conditioning equipment due to extreme temperature rise ◇ Loss of customers due to damage, shutdown of operations and disruption of store operations caused by natural disasters and delays in taking countermeasures for business partners and delivery destinations ■ Gaining customer trust and increasing orders by strengthening BCP response to large-scale disasters caused by extreme weather ■ Increase profits through added value by enhancing the durability of products that can withstand rising temperatures, precipitation, and changes in weather patterns	● Increase in claims settlement due to natural disasters ● Decline in premium income due to poor business performance ○ Decrease in asset value or deterioration of business performance in our investment/loan portfolio companies due to damage from natural disasters ◎ Support for developing BCP in preparation for natural disasters, extreme temperature rises, water shortages, etc. ◎ Increase in revenue by providing services related to adaptation measures, disaster prevention and mitigation, and environmental preservation.
Transition Risk	■ Decrease in demand for conventional internal combustion engine vehicles due to increased environmental awareness among consumers ■ Increase in the cost of responding to stricter environmental regulations such as exhaust gas regulations, fuel efficiency standards, GHG emissions, and water resources and waste management, and an increase in the burden of capital investment for energy conservation and renewable energy ◆ Increased in nature-related due diligence in procurement of mineral resources, etc. and procurement costs of sustainable raw materials ◆■ Increase in costs due to introduction of carbon tax ■ Loss of revenue due to reputational damage caused by air pollution, water pollution, plastic pollution, and emissions associated with business operations ■ Decline in reputation and sales from stakeholders and investors due to delays in responding to climate change measures and ESG information disclosure ■ Increase in sales due to increased demand for EVs and FCVs ■ Gain in market share through successful introduction of technologies with lower environmental impact, such as use of renewable energy and reduction of water and plastic use ■ Increase in sales through cost reduction and value appeal by using recycled materials and reusing resources ◇ Reduction of transportation costs and GHG emissions by improving logistics efficiency (shared transportation, modal shift)	● Decline in premium income due to business downturn in the relevant companies and markets ● Decrease in insurance premiums due to stricter underwriting standards and conditions as a result of tightening of environmental regulations ○ Decline in investment returns due to business downturn in companies and markets that are not adequately addressing climate and natural issues ●○ Reputational damage due to involvement in businesses that lead to global warming and destruction of nature ● Increase in sales by providing insurance products that support new technologies such as EVs and FCVs, value chain probability, and introduction of new business models such as recycling ○ Business leap forward in the relevant companies and markets that have made progress in addressing climate/ nature-related issues ◎ Increased revenue from intermediaries such as credits to offset GHG emissions ◎ Development and provision of new services that mitigate negative impacts on the natural environment related to raw material procurement, etc. ◎ Increase in revenue by providing services related to information disclosure and business strategy based on climate/ nature-related risks

Example: Assess phase—product development & identification of opportunities to reduce risk:

MS&AD Insurance Group Holdings:[138] The example below follows the Locate phase in section 4.3.2.

Effective measures to control inland flooding include drainage to outside waterways through the construction of pumping stations, drainage through underground discharge channels, as well as storage and infiltration of rainwater at various locations. For rainwater storage and infiltration, there are infiltration systems such as rainwater infiltration basins and rainwater tanks, but recently, green infrastructure such as "rain gardens" that use natural functions have been attracting attention. These approaches to storage and infiltration are in line with the concept of "River Basin Disaster Resilience and Sustainability by All," promoted by the Japanese Ministry of Land, Infrastructure, Transport and Tourism , which calls for flood control in entire river basins, not just river areas.



In addition to mitigating flood damage, "rain gardens" are expected to provide various ecosystem services to the region, such as enhancing biodiversity, conserving water basins, and mitigating the heat island effect. However, until now, the accumulated effects of rain gardens in basins have not been quantitatively evaluated. In order to clarify the effectiveness of rain garden developments on reducing the amount of damage caused by flood-related disasters, the insurer carried out a quantitative analysis using the Rainfall-Runoff-Inundation (RRI) model at actual locations.

A2: Adjustment of existing risk mitigation and risk and opportunity management

TNFD: What existing risk mitigation and risk and opportunity management processes and elements are we already applying? How can risk and opportunity management processes and associated elements (e.g., risk taxonomy, risk inventory, risk tolerance criteria) be adapted?

Table 15: A2: Adjustment of existing risk mitigation and risk and opportunity management—Non-life insurance business

Practical considerations for non-life insurance underwriting business

When considering risk mitigation, insurers can distinguish between measures that avoid and reduce risks to (potential) customers and measures that reduce financial risks to the insurer. Increasingly, loss prevention and risk reduction at the insured level also lowers expected losses and volatility for insurers.

To adjust risk and opportunity management, insurers can integrate nature-related risks into existing governance and risk management systems by:

- Aligning risk taxonomies and risk registers, risk appetite definition, strategies and policies with nature-related risks and opportunities.
- Enhancing internal and external reporting mechanisms to include decision-useful nature-related metrics.
- Integrating nature-related considerations into key decision-making points along the insurance value chain, such as underwriting and due diligence, product development and review, or procurement.
- Clarifying roles and responsibilities across the first, second and third lines of defence.

Refer also to available supervisory guidance on integrating sustainability-related risks into governance and risk management systems (e.g., EIOPA's "Report on Biodiversity Risk Management by Insurers").[139]

Risk reduction measures may include:

- Addressing nature-related risks of insureds through risk analysis, conducting enhanced due diligence, setting expectations on environmental standards, and enabling nature-based risk reduction (see the *PSI Nature Action Guide* for additional suggestions).[140]
- Applying financial risk reduction strategies including, for example, adjustments to risk appetite and strategy, underwriting policy and strategy, risk diversification strategy, reinsurance strategy and policy, concentration/accumulation policy, product oversight and governance, and model governance.

Observed approaches in non-life insurance underwriting business

Insurers have noted that involving a range of internal stakeholders helps identify relevant risk reduction measures and ensures alignment with existing risk management frameworks. Insights shared on current measures include:

- Underwriting policies—One-year contracts that allow for annual adjustment based on evolving risk conditions.
- Underwriting adjustments—Policy terms and conditions that can be adapted to reflect changing risk landscapes.
- Risk diversification—Managing exposure by distributing risk across sectors and geographies to avoid concentration.
- Reinsurance strategies—Using reinsurance to manage nature-related exposure, while acknowledging potential premium increases and residual risks.
- Risk inventories—Providing customers with inventories of their risks to support them proactively reduce of dependencies and exposures.

Illustrative outputs

- Inventory and description of current risk and opportunity management processes.
- Overview of how existing processes could be adapted to incorporate nature-related risks.
- Proposed new risk reduction measures.
- Outputs aligned with relevant disclosure frameworks (e.g., TNFD disclosure recommendations under the "Risk and Impact Management" pillar)[141].

Relevant resources

Internal governance, risk management frameworks, and existing procedural documentation.

A3: Risk and opportunity measurement and prioritization

TNFD: Which risks and opportunities should be prioritized?

Table 16: A3: Risk and opportunity measurement and prioritization—Non-life insurance business

Practical considerations for non-life insurance underwriting business

This step involves measuring nature-related risks and associated financial risks identified during the identification phase (A1) and prioritizing them based on their severity for disclosure or further action.

For insurers, risk measurement can be understood in a dual context: (see *Rooted in Risk*)[142]

- Nature-related risk defined as the potential financial loss to the (potential) insured based on the function of hazard (e.g., physical events), exposure (degree of interaction with the hazard), and vulnerability (sensitivity and capacity to adapt). This can serve as a basis for measuring nature-related risks (especially in the context of physical risks) and is relevant for integrating nature-related risks into product development, underwriting and risk models, and as input to portfolio risk management.
- Financial risk, referring to the potential implications for the financial position of the insurer when nature-related risks materialize within underwriting portfolios (e.g., loss of premiums or changes to insurance liabilities).

The granularity and measurement methodology will vary by intended use:

- Portfolio risk management or disclosure—applying exposure analysis and financial risk assessments.
- Product development or integration into underwriting processes—including quantification of nature-related risk (or nature's risk reduction value) within the insurer's risk models.

Across all use cases, further development is required to advance methodologies for measurement of nature-related risks.

Portfolio-level analysis

Various approaches and levels of analysis to assess nature-related risks are emerging in the financial sector, but these have not yet been widely tested within insurance underwriting portfolios.

Different methods and analytical levels are applicable, such as those outlined in the TNFD LEAP guidance on risk measurement methods. These include heatmaps, asset tagging or exposure analysis, and scenario analysis, which aim to define the severity of nature-related financial risks.

Other insurance-specific approaches are outlined in EIOPA's "Report on Biodiversity Risk Management by Insurers", including an initial narrative and exposure assessment to identify potential material risks, followed by financial risk assessment using scenario analysis.[143]

For financial risk assessment, the NGFS "conceptual framework on nature-related risks" provides a structured approach across three phases: identifying sources of physical and transition risks (scenario narratives), assessing economic risks, and evaluating impacts to, from, and within the financial system.[144]

These different approaches and steps have been integrated into this report within the TNFD LEAP "Assess" phase as follows: identifying sources of risks (and initial input to scenario narratives) corresponds to A1 (risk identification); exposure analysis and financial risk assessments using scenario analysis correspond to A3 (risk measurement); and determining material risks aligns with A4 (materiality assessment).

Exposure assessment

Following the identification of sources of risk in component A1, exposure assessments help understand insurers' exposure to nature-related risks:

- Sector-based exposure: For insurers, this involves mapping upstream stakeholders and customers and insurance policies against sectors, subsectors, or production processes with moderate or high dependencies or impacts on nature, including a more granular analysis by insured risks (see "Evaluate" phase). Example outputs can include:
  a. Gross or net written premium (GWP/NWP)/sum insured in sectors with high or very high nature-related dependencies or impacts.
  b. Percentage of insurance products with high or very high dependency on ecosystem services for hazard reduction (e.g., flood and storm mitigation services).
  c. High dependency or impact can imply exposure to physical and transition risks, although the approach shown does not go beyond the Evaluate phase.
  d. Insurers can also consider value chains of stakeholders and customers as risks can materialize through indirect transmission channels.
- Geographical exposure: Assessing exposure at different scales—national, regional (e.g., using regional land-use data), or specific asset locations—enables insurers to identify insured activities and assets in ecologically-sensitive or high-risk areas (see Locate phase)—considering geospatial data that reflect ecosystem condition and the capacity status of ecosystem services (e.g., leveraging hazard maps). Example outputs can include:
  a. Gross or net written premium/sum insured in high water-risk locations.
  b. Gross or net written premium/sum insured in protected areas or key biodiversity areas (KBAs).
- Dependency- or impact-based risk exposure analysis:[145] This assesses insured assets or activities with high dependency on ecosystem services in areas where ecosystem conditions and services are deteriorating (e.g., water security, soil fertility, erosion control), or with significant impacts in locations subject to a changing policy or regulatory environment (see Evaluate phase). Example outputs can include:
  a. Exposure in areas experiencing high ecosystem degradation affecting flood or storm mitigation services relevant to a percentage of GWP.
  b. Value of liabilities assessed as vulnerable to nature-related physical or transition risks.[146]
- Static analysis: Current exposure assessment offers a static, short-term view, but is forming a foundational step towards more dynamic, scenario-based analyses for quantifying nature-related risks. [147]

According to EIOPA, conducting a narrative and exposure assessment constitutes the materiality assessment. If risks are identified as material, a financial risk assessment should subsequently be performed as part of the ORSA (see section A4).[148]

Financial risk assessment

Financial risk assessment involves quantifying potential financial implications of nature-related risks and the metrics to monitor financial risks.[149] This can be done through forward-looking scenario analysis. The process provides insights into the severity of nature-related risks under various exploratory scenarios, informing strategic direction, identifying emerging opportunities, and evaluating business and strategic risks to business models and value chains.

Emerging scenario narratives, such as those highlighted in the UK Green Finance Institute's study[150], are pertinent to the insurance industry. However, further exploration is necessary to develop methodologies to apply scenario analysis effectively at the underwriting portfolio level.

The NGFS outlines a three-step approach to assess nature-related financial risks for financial institutions by applying nature-related scenarios:[151]

- Scenario narrative:
  a. A scenario includes a narrative that covers risk drivers and how they evolve, often involving multiple risk drivers simultaneously (e.g., UK GFI study).[152]
  b. Scenario design envisions different possible pathways the world could take before assessing the economic and financial implications of these pathways.
  c. While global scenarios remain limited, there is the understanding of the need to adapt or develop scenarios for national/regional contexts. The NGFS provides additional discussions on scenario development.[153]
- Economic risk assessment:
  a. Considering the effect on micro- (business/household)/meso- (local government) or macro-economic level such as loss of or impact to assets, business activities, stranded assets, or in case of large-scale effects, also wholesale geographic or sectoral implications, leading to macro-economic effects such as prices or productivity.
  b. Considering compounding risks, especially climate and nature-related risks and cascading effects throughout the value chain and spillover within and from the financial sector, as described in the first part of this report series, *Rooted in Risk*.[154]
- Financial risk assessment:
  a. Multiple metrics are required to capture nature-related risks and their translation into decision-useful financial risk metrics (e.g., total insured losses (annual average loss or probable maximum loss), loss of premiums, total gross and net claims) under relevant scenarios remains a challenge and is an area wherefor further development is needed.[155]
  b. Scenario analysis requires models for the interplay of interconnected biological systems as well as between nature and the economy, and the translation into financial implications for insurers. The NGFS provides further information on scenario development and modelling approaches.[156]
- Scenario analysis provides a forward-looking and long-term perspective, enabling a dynamic approach to financial risk assessment. Initial tailored scenarios for specific LoBs or sectors, or prioritization of ecosystems or of insured risks/perils could be applied to identify nature-related financial risks and guide effective decision-making.[157]

Following risk measurement, the TNFD suggests prioritization of risks by magnitude (qualitative and/or quantitative) and likelihood, alongside other criteria. Magnitude is primarily based on potential financial impact.[158]

For product development and integration into the underwriting process

- The ability to quantify nature-related risks (as per the risk function) is relevant for developing risk models for new insurance products, as well as for integrating nature-related hazards and nature's risk reduction value into underwriting processes and risk models.
  - For example, natural erosion control provided by a forested area may help protect nearby houses from landslides, limiting potential damage. If the forest is degraded, this protective function is reduced, potentially resulting in more assets at risk, increased damages, and higher insured losses. Scenario analysis can support the estimation of how varying levels of degradation could affect the scale of potential losses (see more examples in *Rooted in Risk*).[159]

Identification of opportunities for risk reduction

- The ability to quantify the effect of nature-based solutions for hazard reduction is especially relevant in relation to climate-related perils, and their potential to reduce insured losses under different scenarios (see example below).

Observed approaches in non-life insurance underwriting business

Currently, quantitative approaches to nature-related financial risks remain limited in the context of insurance underwriting portfolios. Work has centred on exposure assessments and qualitative analysis to indicate magnitude or severity. Portfolio-level, scenario-based financial risk assessment has not yet been implemented, and portfolio-level measurement of nature-related opportunities is likewise limited.

Prioritization of identified risks and opportunities commonly occurs through workshops that integrate internal expertise and stakeholder inputs, aligning with materiality assessments (see component A4).

Further development is required in quantitative financial risk assessment, particularly through scenario-based analysis. Challenges have been noted in relation to the use of global scenarios, reflecting local/regional specifics and in translating nature-related risks into decision-useful financial metrics for insurance activities (for further information on challenges by insurers shared, see EIOPA's "Report on Biodiversity Risk Management by Insurers").[160]

By contrast, quantification has progressed further for specific applications such as developing new insurance products (e.g., insuring natural assets, nature-based solutions (NbS), or transition risks such as nitrogen insurance). Examples demonstrating quantification of risk reduction and damage reduction from nature-based solutions are emerging (see example below). However, broad integration into underwriting risk models has not yet been feasible.

Illustrative outputs

- A description of shortlisted material nature-related risks and opportunities.
- Exposure to nature-related physical and transition risks (e.g., by sector, geography, LoB)
- Metrics for financial risks and opportunities (e.g. level of magnitude and likelihood) remain under development

Relevant resources

Various resources and tools are available to enhance understanding and application of risk assessments.

Resources

- TNFD—Discussion paper on conducting advanced scenario analysis[161]
- NGFS—Recommendations on the development of scenarios for nature-related risk assessment[162]
- NGFS—Conceptual framework for nature-related financial risks[163]
- EIOPA—Report on Biodiversity Risk Management by Insurers[164]
- EC—Study for methodological framework for BES risk assessments[165]
- UK GFI—Nature-related risk assessment for the UK economy[166]

Tools for exposure analysis:

- This can be based on physical or transition risk indicators for a given area—such as ecosystem condition or the provision of ecosystem services—using tools like the WWF Biodiversity Risk Filter, or the Biodiversity and Ecosystem Index (BES index) or other spatial/hazard maps.

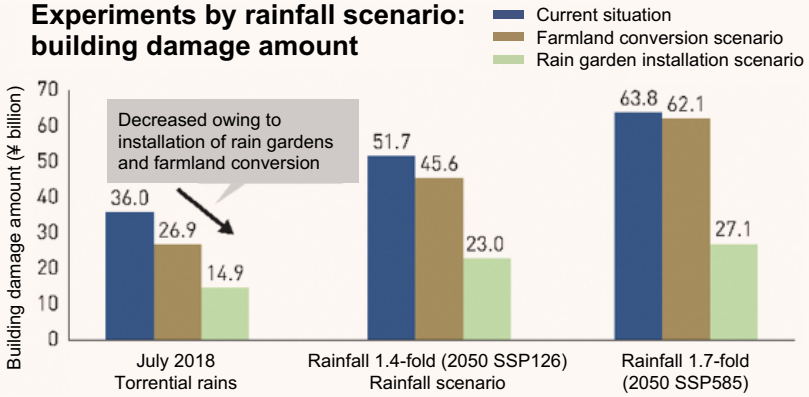
Note: These tools are not specifically designed for application to insurance underwriting portfolios.

For a list of relevant tools for component A3, refer to the TNFD Tools Catalogue.

Example: Assess—product development and identification of opportunities to reduce risk

MS&AD Insurance Group Holdings[167]

In order to clarify the effectiveness of "rain gardens" in reducing the amount of damage caused by flood-related disasters, MS&AD carried out a quantitative analysis using the Rainfall-Runoff-Inundation (RRI) model at actual locations.



Regarding the amount of building damage, we calculated asset values by multiplying the total floor area (3D urban model data) by the house asset table value per unit area for 2018, and then applied the house damage function from the Manual for Economic Evaluation of Flood Control Investment (2020) of MLIT

- In the case of the torrential rainfall in July 2008, the amount of damage was reduced by JPY910 million by converting land to farmland, and by JPY2.11 billion by installing rain gardens.
- In both rainfall scenarios, the rain garden installation measure led to greater reduction in the amount of damage.

A4: Risk and opportunity materiality assessment

TNFD: Which risks and opportunities are material and therefore should be disclosed in line with the TNFD recommended disclosures?

Table 17: A4: Risk and opportunity materiality assessment—Non-life insurance business

Practical considerations for non-life insurance underwriting business
Additional guidance is available on materiality for disclosures, and there is emerging guidance for materiality within prudential risk management frameworks: ▪ According to the TNFD, identified and quantified risks and opportunities should be assessed against the materiality criteria provided by the ISSB's IFRS S1 guidance, or equivalent regional or national frameworks (e.g., ESRS), to determine disclosure obligations.[168] ▪ According to EIOPA's "Report on Biodiversity Risk Management by Insurers", within the ORSA process, insurers are expected to identify all material sustainability risks relevant to their business. Undertakings should carry out a materiality assessment—comprising both narrative and exposure analyses—and, where risks are deemed material, conduct a financial risk assessment within the ORSA. Under Solvency II, materiality refers to information whose omission or misstatement could influence users' decision-making or judgement.[169]
Observed approaches in non-life insurance underwriting business
Approaches to date have largely been workshop-based, drawing on internal expertise and stakeholder engagement. Materiality assessments are typically undertaken by cross-functional groups (e.g., finance, legal, underwriting, claims). Insurers suggested to leverage existing internal risk assessment frameworks, such as the Operational Risk Assessment Framework, to apply structured scoring methodologies (e.g., using a matrix that evaluates probability alongside expected financial impact). To date, as analysis has been predominantly qualitative and exposure-focused, financial materiality assessments have likewise been qualitative (e.g., using scoring). Insurers are considering extending assessments to more quantitative analysis and financial-risk metrics (as per TNFD-aligned or mandatory disclosures).
Illustrative outputs
▪ A short list of nature-related risks and potential financial risks. ▪ Metrics for nature-related risks and opportunities, aligned with relevant disclosure frameworks.

Example: Assess—portfolio-level analysis

Unipol Assicurazioni[170]

Material impacts, risks and opportunities in relation to biodiversity and ecosystems.

The materiality analysis highlighted significant impacts with regard to biodiversity and ecosystems at Group level and major risks at Unipol Assicurazioni level, also reported in the table in light of the central role that the parent plays in the core insurance business.

Sub-topic	IRO description and effects	I / R / O	Time horizon*
Direct impact drivers of biodiversity loss Impacts on the state of species Impacts on the extent and condition of ecosystems Impacts and dependencies on ecosystem services	(E4 - I1) Underwriting of policies or investments in counterparties that cause loss of biodiversity and ecosystems and do not undertake protection actions, enabling and supporting economic players that contribute to ecosystem degradation.	Negative impact (potential)	ST MT
	(E1 - R1) Risks linked to different "traditional" risk categories as a result of the progressive loss of biodiversity and ecosystem change: - non-life and health underwriting risk (for example, higher claims rate for policies that cover sectors exposed to the above-mentioned phenomena); - life underwriting risk (for example, increased mortality and morbidity risks following ecosystem degradation); - reputational risk (for example, due to investing in and insuring companies whose biodiversity protection measures are considered insufficient by stakeholders).	Risk (potential)	ST MT LT

* ST = Short Term; MT = Medium Term; LT = Long Term

4.6 Current limitations and the way forward

While extensive literature exists on the economic value of biodiversity, natural capital, and the services they provide, research that quantifies the financial risks arising from biodiversity loss and the degradation of ecosystem services remains at an early stage. To date, studies have mostly focused on direct risks to specific ecosystem services or particular sectors and/or potential economic impacts.[171] Analysis of how these risks transmit to the financial sector—including implications for the stability of financial institutions—remains limited. Although the evidence base is expanding,[172] coverage of the insurance industry is still limited, particularly in translating these risks into insurers' risk profiles and financial risks.[173]

As limitations exist in the maturity of nature-related assessment practices for insurance underwriting portfolios, this report highlights four priority areas for further development:

- Advancing nature-related assessments, particularly through scenario analysis and quantitative methodologies for assessing nature-related impacts and risks for non-life insurance underwriting portfolios.
- Integrating nature-related dependency, impact, risk and opportunity considerations into client engagement and underwriting processes.

- Enhance and extend the application of methods for quantifying the state of nature and the risk-reduction value of nature-based solutions within insurers' risk models.[174]
- Developing dedicated approaches and methodologies for assessing nature-related risks in life & health insurance underwriting portfolios.

The continued advancement of this work will benefit from insurers and key stakeholders exploring this report's suggestions and sharing insights from practical application to support ongoing technical development. Please consider providing feedback and sharing your case studies through this survey link.

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UNEP Finance Initiative (UNEP FI) brings together a large network of banks, insurers and investors that catalyses action across the financial system to deliver more sustainable global economies.

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