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October 2026

Executive summary

Scenario analysis provides organisations with a structured way to explore plausible futures and consider how uncertainty may affect their strategy and decision-making. But developing scenarios for nature is challenging. Ecological change is multidimensional, spatially differentiated and shaped by interconnected environmental, social and economic drivers. This makes it difficult to reduce nature-related change to a single pathway or metric ([IPBES, 2016](#); [NGFS, 2023](#)).

This report examines how organisations are addressing these challenges in practice. It builds on our [earlier Pentland Centre work](#), and the subsequent [ICAEW-Pentland Centre briefing](#) on nature scenario analysis.

Our starting point for this work was 478 Taskforce on Nature-related Financial Disclosures (TNFD) reports published between March 2022 and June 2026. We identified that 127 of these reports contained nature/biodiversity scenario analyses. We selected 29 of these reports for detailed analysis; based, in our opinion, on being comparatively stronger and with more substantive scenario disclosures. Our analysis should therefore not be read as representative of all 127 reports with scenarios. The subset itself illustrates that using scenarios to understand nature is a new practice, and we hope our analysis supports understanding of current best practice.

Finally, two financial institutions: Norinchukin Bank, Dai-ichi Life Holdings; and two non-financial institutions: Oji Group and Kyuden Group were examined in greater depth. This analysis demonstrates how scenario design can work for companies with operational assets, value-chain exposures, and/or portfolio-based assets. They also illustrate how local as well as global spatial scales can be combined.

Our key findings can be summarised as follows:

1. To get the value of undertaking a scenario analysis, the work should not be layered on top of existing corporate approaches to nature. We saw too many responses that articulated existing corporate goals and ambitions on nature, giving the impression of existing activities being repurposed to fulfil a new reporting requirement. Scenarios should be a starting point to understand the interconnection of the business and nature, and should substantively guide business responses.
2. Data availability may no longer be a constraint for sophisticated value chain and location-specific analyses. Caution needs to be applied, therefore, where companies are relying upon aggregated or global data for their analysis. That said, accessing and interpreting the available data requires skills and expertise, and we witness external consultants and academic partners supporting companies' in-house capabilities. In-house capability is a critical gap and/or asset.
3. It is important to keep the balance between nature and climate, recognising they are both connected but distinctive. The stronger approaches build meaningful nature-specific content rather than simply extending existing climate scenarios. The latter approach tended to dominate the reporting we observed.

4. The TNFD 2x2 matrix is a common starting point, with companies typically selecting two scenarios. However, it is important that nature scenarios incorporate connectivity to other relevant topics. We found that combining TNFD scenarios with the [Forecast Policy Scenario](#) or [Shared Socio-economic Pathway](#), and/or incorporating water analysis provides a deeper level of insight into the consequences that matter to the organisation, and is more likely to keep the nature-climate nexus in balance.
5. Insights from scenarios are not always clearly connected to management decisions. This is, in some cases, clearly a function of the evolving nature and early stage of scenario development. We can expect the results of scenarios to influence future business strategies, but only if companies are able to reset their approach to nature targets and risk management. For example, while a no-deforestation commitment is a suitable operational response to address damaging practices in supplier value chains, it is not an appropriate response to a multidimensional, spatially differentiated ecological change.
6. There is a difference in how (and why) scenarios are both developed and used between financial and non-financial companies. This is understandable, in that non-financial companies are using scenarios to understand enterprise-level risk. Financial institutions, meanwhile, wish to understand individual corporate-level risk to guide investment priorities, and they are also concerned at a broader level about systemic risk posed by changes in nature across the economy.

1. Introduction: Scenarios and Nature Scenario Guidance

Scenario analysis has a long history in strategic planning. Its value lies in exploring uncertainty rather than predicting a single future (Duinker & Greig, 2007). TNFD (2023a, p.4) describes scenarios as "a set of plausible descriptions or narratives about how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces and critical uncertainties".

Our earlier Pentland Centre primer emphasised that the value of scenario analysis also lies in identifying knowledge gaps and challenging existing assumptions across a range of plausible futures (Ciftci et al., 2024). This then helps organisations develop more resilient strategic thinking (Cumming, 2007; TNFD, 2023a).

Nature scenarios place environmental systems at the centre of the analysis, rather than treating them simply as external context. Because dependence on nature, the state of nature and related risks can vary across places and over time, IPBES stresses that scenarios should be designed at relevant spatial and temporal scales and around the decisions they are intended to inform (IPBES, 2016).

TNFD operationalises this logic for organisations. Its core guidance recommends exploratory¹ scenario analysis and offers a practical 2x2 architecture around two critical uncertainties: ecosystem-service degradation (which is related to physical risk); and the alignment of market and non-market forces (which is related to transition risk) (TNFD, 2023a). The guidance takes an intentionally adaptable and participatory approach that organisations can tailor to their own context.

¹ Descriptive scenarios with a range of plausible outcomes, in contrast to normative scenarios that are more commonly used in climate disclosures, e.g. 1.5° or 3° Celsius.

TNFD's advanced discussion paper then broadens the approach: organisations can move from qualitative narratives to more specified qualitative or quantitative outputs, but should retain the nature-specific drivers and mechanisms that standard climate scenarios often omit (TNFD, 2023b).

In particular, climate pathways alone do not capture drivers such as land-use change, pollution, direct resource use or pollinator decline. Contrasting scenarios can be useful for challenging strategy, but contrast alone is not enough: the futures still need to be plausible and supported by a coherent account of how change could unfold.

Our subsequent ICAEW-Pentland Centre briefing turned these ideas into practical principles for business and finance (ICAEW, 2025). It emphasises tailoring the approach to organisational context, starting simply and adding complexity over time, focusing on what is material, integrating climate where useful without losing nature-specific features. It also advised resisting premature quantification, treating scenario analysis as an iterative learning process and using cross-functional expertise. These principles matter because the scenario should be designed around the decision being informed, not around whichever model or dataset happens to be available.

The disclosure architecture is also evolving. A recent International Sustainability Standards Board (ISSB) paper highlighted investor interest in how nature-related scenario analysis is constructed, and how its results inform decisions. It recommended disclosure of key inputs, assumptions and the scope used to assess nature-related risks (ISSB, 2026). This supports a shift from whether a company has simply 'done a scenario' to whether the analysis can be understood and used.

For financial institutions, work by the Network for Greening the Financial System (NGFS) adds an important macro-financial and prudential perspective. NGFS guidance cautions that nature-related risk cannot be reduced to a single carbon-like metric. It notes that the transmission from ecosystem change to firms, sectors, portfolios and the financial system is geographically heterogeneous and interconnected (NGFS, 2023). Further, the NGFS describes a 'local-global trade-off': local detail is important for understanding location-specific nature risks, whilst global scenarios can help capture systemic and cross-border transmission.

For universal asset owners, regulators and central banks: company-level scenarios therefore need to be sufficiently interpretable to help identify how nature-related exposures and transmission channels may accumulate across the financial system.

2. Overview of Our Findings

Our initial dataset comprised 478 TNFD reports published between March 2022 and June 2026. Of these reports, 127 included nature scenarios, of which 29 were included in the assessment.

Table 1: Overview of the review dataset and case selection

478	127	29	4
TNFD reports identified March 2022-June 2026	Nature scenarios identified	Comparatively stronger scenarios selected	Deep-dive cases - 2 financial & 2 non- financial

Source: Authors' TNFD report dataset and scenario review.

The 29-organisation sub-set is not a market-representative sample. It was selected because these disclosures appeared more substantive than the other 98 scenario analyses. The purpose of the

29-case review is therefore to learn from 'better' emerging practice, not to estimate average market quality or prevalence. We selected the four companies to carry out deep-dives because they provided clear illustrations of the potential for nature scenarios, and the benefit they can bring to companies and financial institutions.

We based our analysis on guidance and methodological work from TNFD, IPBES, ISSB and NGFS (TNFD, 2023a; TNFD, 2023b; IPBES, 2016; ISSB, 2026; NGFS, 2026).

Across these 29 selected reports, three themes emerge as central to robust scenario exercises:

1. Ensuring that the exercise is locally specific or relevant at the company level. This may be obvious, but it is not clear for some companies that nature is truly salient to the company. In these cases, the scenarios appear 'forced' and performative.
2. Nature and climate are connected but distinctive. The stronger approaches build meaningful nature-specific content rather than simply extending existing climate scenarios. The latter approach dominates current nature scenario development.
3. Scenarios are a business tool. The findings should deliver insights that are meaningful for the business or financial institution. The best analyses connect scenario insights to sourcing, portfolio engagement, risk management or emerging opportunities.

Recurrent weaknesses are also revealing:

1. A common gap is between the detailed nature assessment that precedes the scenario, and the scenario itself: information on locations, dependencies, impacts and nature-related pressures is often simplified or aggregated.
2. Nature-specific pressures are often reduced to broad concepts such as ecosystem degradation, or represented through climate and water variables.
3. Reliance on global narratives ignores the real regional/national variation in the status of nature, declining in some places, but recovering in others. In only a few cases did we witness companies aligning their work to the priorities of national Biodiversity Strategy and Action Plans.
4. In several cases, causal links, assumptions and limitations are not explained in enough detail to show clearly how future conditions translate into specific and relevant business or financial consequences.
5. Reports often name frameworks, tools and external scenarios without fully explaining how they were adapted, what important limitations remain or how the outputs influenced management.
6. Finally, interpretation and organisational use of scenarios in decision-making remain uneven.

The persistence of these gaps among the stronger selected cases suggests that a key development priority is not simply 'more scenarios', but better integration between ecological understanding, organisational exposure, future thinking and decision-making.

A further weakness may be a function of the recent move to incorporate scenario analysis into business processes. Many companies already have corporate targets and ambitions on nature. Scenario analysis is in most cases currently being treated as a new reporting overlay rather than a

means of testing the assumptions behind corporate dependencies on nature. Scenario analysis is more valuable when it is allowed to challenge, refine or confirm existing strategic choices.

3. What Stronger Practice Looks Like

We selected four cases for deeper analysis because they illustrate different connections to and dependencies on nature, as well as different ways of benefiting from nature scenarios. In two financial cases, the scenario analyses primarily examine exposure through financed or investment portfolios; the two industrial company cases focus on operational and supply-chain interactions with nature. The cases are not presented as flawless best practice. Rather, each illustrates design choices that work well, and areas where even relatively strong practice can improve.

Table 2: Overview of four deep-dive cases

Case	Scenario scope and architecture	What is particularly useful	Future development points
Norinchukin Bank (2024)	Food/agriculture investment and lending; Scenarios built upon IPR FPS + Nature; water scarcity and pollination; 2030/2050; focused on three regionals in Japan, (grouped with South Korea in FPS + Nature), North America and EU.	Clear transmission from nature drivers and ecosystem-service change to borrower/investee impacts and portfolio risk; broader geospatial analysis adds borrower-site and protected-area detail beyond the regional scenario.	The report identifies strategy and risk-management use as a next step, rather than demonstrating that the specific scenario findings already changed decisions.
Dai-ichi Life Holdings (2025)	TNFD 'Ahead of the Game' and 'Sand in the Gears' scenarios applied to 3 high-impact sectors: electricity, packaged food/meat and chemicals with separate geospatial water-risk analysis.	Strong logical connection from the state of nature to investee sales/costs, business performance and investment value.	The sector and geospatial water analyses provide complementary insights, but the relationship between the two analytical layers could be made more explicit.
Oji Group (2024)	CENIBRA (Celulose Nipo-Brasileira S.A.) forestry operations in Minas Gerais with two exploratory climate-nature futures for 2030 and 2050.	Location-based foundation linking land, water, soil, biodiversity and ecosystem services to physical and transition risks, opportunities and formal restoration targets.	A very large forestry estate is still treated largely as one future exposure; the connections to, and actions of neighbouring properties in the landscape are not considered; future ecological variation and methodological assumptions could be more explicit.
Kyuden Group (2024)	Electric-power business; 2050 Status Quo and Nature Positive transition futures with land, water use, supply chain, conservation & restoration.	Broad nature-specific risk and opportunity coverage, with financial-impact bands, technology, and supply-chain relevance.	The two endpoint scenarios are simplified; causal development, spatial differentiation and transparency on construction/uncertainty could be strengthened.

Financial Institutions: Portfolio Level Granular Analysis

Norinchukin Bank provides a useful example of how a financial institution can combine portfolio-scale scenario analysis with more granular geospatial nature assessment. Its IPR Forecast Policy Scenario (FPS) + Nature scenario differentiates Japan, North America and the EU across six food-and-agriculture subsectors across 2030- and 2050-time horizons. In the report, the bank maps borrower facilities and other key sites against protected areas and water-related risk conditions (Norinchukin Bank, 2024). This is a notable strength because it shows that a regionally aggregated portfolio scenario can sit alongside much more location-specific evidence. That said, the report does not show how this site-level evidence was directly incorporated into the FPS + Nature scenario.

The scenario process is still a work in progress, as the results have not yet been embedded into the business strategy or risk management. Norinchukin states that it will continue to develop the analysis and discuss how the evaluations should be used in strategy formulation and risk management (Norinchukin Bank, 2024). This provides evidence of intended use, but not that the scenario results had already changed a specific management decision. It does, however, demonstrate that an analytically useful scenario can (and should) precede its full integration into management processes.

Dai-ichi Life Holdings illustrates a different strength: explicit financial transmission. Its scenario applies the TNFD 'Ahead of the Game', and 'Sand in the Gears' scenarios to three selected sub-industries within previously identified high-risk sectors: electricity, packaged food and meat, and chemicals.

The analysis traces a series of 'spreading routes' from changes in the state of nature to investee risks and opportunities, sales and costs, business performance, and ultimately the Group's investment value (Dai-ichi Life Holdings, 2025). This provides a clear example of an investee-to-portfolio financial transmission chain.

Dai-ichi also uses a second, complementary, water-risk scenario analysis. It combines geospatial information on investee sites with water-risk and dependency data to assess present (2025) and future (2030 and 2050) water risks before aggregating the results to company and portfolio-level (Dai-ichi Life Holdings, 2025).

Dai-ichi's dual approach therefore provides different but complementary insights: the first makes financial transmission explicit, while the second adds location-sensitive analysis. An opportunity for further development is to integrate the outputs of these approaches more explicitly within the same decision process.

Industrial Companies: Anchored in Location

Oji Group's CENIBRA operates a large forestry estate in Minas Gerais, Brazil. Its analysis demonstrates the value of grounding a scenario in a real operating landscape, where there is detailed information on forest management, water, soil, biodiversity and ecosystem services.

Two exploratory futures for 2030 and 2050 are used to combine nature-related regulation, consumer and investor preferences, conservation/restoration conditions and climate pathways. These are translated into physical risks, transition risks, opportunities and financial effects.

Alongside the scenario analysis, Oji reports restoration, native-tree planting and ecological-corridor targets for CENIBRA that were formulated in consideration of its broader risk and opportunity assessment results (Oji Group, 2024).

The case also illustrates the difficulty of defining the spatial scope when it comes to nature. CENIBRA spans roughly 250,000 hectares within a larger landscape/landscapes across 54 municipalities, and the results are presented largely for CENIBRA as a whole, rather than differentiated across the different forest blocks within the estate (Oji Group, 2024).

A stronger next iteration could retain the strategic simplicity of the two futures while differentiating the forest clusters, catchments or other ecological areas where location-specific variation is most relevant to decision-making. It could also incorporate the connectivity to the broader landscape(s), taking into account the actions of neighbouring farmers and land holdings, and how nature functions across the landscape(s).

Kyuden Group takes a different route. Faced with an extensive supply chain, many operating sites and multiple physical and transition factors, it simplifies the exercise into two normative 2050 futures: a 'Status Quo' scenario and a 'Nature Positive' transition scenario. It examines land, water use, supply chain, and conservation/restoration, and it assesses risks across fuel procurement, power generation and transmission/distribution with financial-impact bands. The exercise captures nature-related regulation, due diligence, reforestation obligations and business opportunities as well as physical risks (Kyuden Group, 2024).

This is a useful example of proportionality. Simplification can make an initial scenario exercise more manageable, particularly where organisational and nature-related complexity is high. But simplification should not become an endpoint. A useful next development step would be to deepen the causal story between the 2050 assumptions and the intermediate ecological and business changes. From that it could differentiate locations or sourcing areas where the nature mechanism is inherently location-specific. In other words, start simple, but preserve a pathway for progressive refinement, which is a principle also emphasised in the ICAEW briefing (ICAEW, 2025).

What the Four Cases Tell Us Together

The four cases demonstrate how different levels of quantification can be useful. Norinchukin combines regional scenario analysis and portfolio exposure with separate geospatial client-site evidence; Dai-ichi combines structured transmission routes with a separate quantitative water-risk analysis; Oji combines narrative futures with risk ratings and targets; Kyuden uses simplified scenario charts and financial-impact bands.

The four cases also show that the appropriate level of geographic detail depends on the use case. Broad portfolio analysis and location-based operational analysis may require different forms of spatial evidence, and these can be combined where location materially changes exposure.

The lesson that comes from this is that neither data nor analytical capability is a constraint to carrying out sophisticated scenario analyses that just a few years ago would be considered too complex and resource intensive. Such scenario analyses can now deliver decision-relevant insights not just at the level of individual corporate value chains, but also at the portfolio level for financial institutions. This is an important finding for central banks, regulators and universal owners.

4. Recommendations for Practical Future Development

Organisations should avoid two opposite mistakes: treating nature scenario analysis as a highly technical modelling exercise that cannot begin until perfect data exists; or treating it as a disclosure label that can be satisfied by adding biodiversity language to a climate scenario. The

more useful route is staged, decision-led and transparent (Ciftci et al., 2024; ICAEW, 2025; TNFD, 2023a).

Table 3: Three Practical Steps on Nature Scenarios

Principles	Financial institutions	Industrial Companies
1. Start from the decision and material exposure	Use scenario analysis to illuminate a defined portfolio, counterparty, sector or risk-management question. Begin at a scale that is workable, then deepen the analysis where exposure or materiality warrants it.	Consider the saliency of nature for the company. Focus on the assets, operations, commodities, sourcing areas or value-chain interfaces where changes to nature could materially affect performance or resilience.
2. Build plausible nature futures at an appropriate level of detail	Adapt external scenarios and sectoral information to the institution's actual exposures. Add more local evidence where a specific borrower, project or physical risk requires it.	Keep the future anchored in the ecological processes and locations that matter to the business. Integrate climate where it is useful. Focus on other relevant dimensions of nature.
3. Translate insight into management and learning	Connect scenario insights to guide portfolio weighting, portfolio monitoring, engagement, due diligence and risk-management processes. Revisit the analysis as data improves, and the status of nature changes.	Use the analysis to inform strategic and operational choices such as sourcing, site planning, resilience measures, restoration or capital allocation. Update the scenario as conditions change.

Across both financial and non-financial organisations, the emphasis should remain on a process that delivers useful and appropriate insights. Future conditions should be credible enough to challenge current assumptions; the analysis should be transparent enough for users to understand its broad basis and limitations; and the level of detail should increase where it changes a real decision. Scenario-specific assumptions, limitations and implications, are generally more useful than lengthy explanations of frameworks (e.g. LEAP) that are already publicly well documented.

Cross-functional participation can strengthen a scenario process. Finance, strategy, risk, sustainability, procurement and operations often see different parts of the same exposure. Scientific, local and stakeholder knowledge can challenge assumptions that are invisible in portfolio averages or corporate datasets (ICAEW, 2025; IPBES, 2016). Participation is most useful when it improves the quality and usability of the scenario rather than becoming a procedural exercise.

5. Conclusion

Nature scenario analysis is still an emerging organisational practice: this should not be an excuse for either inaction or false precision. Stronger TNFD disclosures already show that useful analysis can begin with qualitative exploratory futures, material nature drivers, and a clear question about

how plausible changes in nature could affect the organisation and its decisions. Refining the work spatially, quantitatively or financially will improve the usefulness of the answer. The central task is not to predict the consequences of biodiversity loss with certainty; it is to make uncertainty a lens to look at the resilience or performance of the business.

Our review also suggests that key development priorities are:

1. How to better integrate nature and climate, without allowing climate to crowd out nature (and the same principle for nature and water).
2. Better linkage of global or sector narratives to actual ecological change, recognising the differential regional status of nature loss and nature recovery, and priorities within national Biodiversity Strategy and Action Plans;
3. Linking ecosystem change to operational aspects as well as actions of neighbours and other actors in the landscape.
4. Integrating scenario findings into actual management decision-making. If companies build those connections explicitly, nature scenario analysis can move from an experimental disclosure practice to a practical tool for resilience, capital allocation and strategic adaptation

Recommended citation: Ciftci, N. and Pollard, D. (2026). Nature Scenario Analysis in Practice. The Pentland Centre for Sustainability in Business, Lancaster University.

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