Analyse

Nature-related financial risks in our own account investments: An exploratory case study and deep dive in electric utilities

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Abstract

The degradation of nature poses significant risks for business, the financial sector and society, both now and in the future. Awareness is growing in the financial sector of the importance of understanding and acting on nature-related financial risks. While further work is still needed on disclosures and data, financial institutions can leverage newly developed nature-risk frameworks to identify, assess and manage their linkages with nature. As this field is new territory, sharing experiences and knowledge is essential for building a collective understanding of nature-related financial risks. In this context, De Nederlandsche Bank (DNB) publishes a case study on an exploratory assessment of nature-related financial risks in its own account investments and a sectoral deep dive into electric utilities using coordinates of company assets. In the process, DNB has piloted the LEAP approach of the Taskforce on Nature-related Financial Disclosures (TNFD).

1. Introduction

The World Economic Forum (WEF) finds that approximately half of global GDP is moderately to highly dependent on nature. [1] We depend on nature for critical ecosystem services such as the production of clean water, air and timber and the pollination of crops.[2] However, the world is experiencing nature loss at a historical rate, mainly due to human interventions and activities.[3] According to the WEF, as nature loses its capacity to provide resources and ecosystem services, sectors dependent on nature could suffer significant losses. Additionally, the Network for Greening the Financial System (NGFS) finds that the decline of nature can influence the economy at micro, sectoral/regional and macro levels, and could even affect financial stability or price stability.[4]

The global economy is intertwined with nature through dependencies and impacts, which are sources of nature-related financial risks. According to the NGFS (among others) nature-related financial risks can be divided into physical risks – which result from the degradation of nature and loss of ecosystem services - and transition risks – which result from the misalignment of economic actors with actions aimed at protecting, restoring, and/or reducing negative impacts on nature.[5] Companies depend on nature for ecosystem services and they run physical risks when these services decline.[6] For example, farms depend on nature for various services including crop pollination, and may run a physical risk when bee populations decline. Likewise, businesses' activities may negatively impact nature and ecosystem services. For example, a farmer may use pesticides that harm local biodiversity. From this perspective, transition risks arise when, for example, governments increase their policy ambitions towards reducing companies' impacts on nature, and/or when consumers increasingly hold companies to account.[7] Negative impacts can also undermine the availability of ecosystem services on which companies depend. The dependencies and impacts of companies can be direct or indirect (via value chains). Through loans, insurance policies and investments in companies exposed to nature-related financial risks, the financial sector is also sensitive to the decline of nature and measures aimed at protecting, restoring or reducing negative impacts on nature.

[1] See the WEF report on nature-related risk. In addition, in their Global Risk Report 2024, the World Economic Forum puts 'biodiversity and ecosystem collapse' in 3rd position of global risks ranked by severity over a 10-year period.
[2] The NGFS defines nature as encompassing both living and non-living components of nature, including biodiversity and ecosystems.
[3] See Kunming-Montreal Global Biodiversity Framework.
[4] See the NGFS Conceptual Framework for a more detailed description of how the decline of nature may affect the global economy and financial sector at different levels.
[5] See also NGFS Conceptual Framework for more explanation on the origination of nature-related financial risks.
[6] The NGFS and the TNFD define physical risks as the result of the degradation of nature and consequential loss of ecosystem services, which can be acute or chronic. Because physical risks are the result of changes in local natural conditions, these risks are usually location specific.
[7] The NGFS and the TNFD define transition risks as arising from misalignment of economic actors with actions aimed at protecting, restoring and/or reducing negative nature impacts. These risks may be the result of regulatory/policy changes, legal precedents, investor sentiment or consumer preferences. Transition risk is further divided into e.g. policy, legal, market, technology and reputational risks.

There is growing awareness in the financial sector of the importance of understanding and acting on nature-related financial risks. Global policy agreements such as the Kunming-Montreal Global Biodiversity Framework[8] raise awareness of the significance of addressing nature degradation, while also assigning a clear role to the financial sector. Moreover, many actors including the NGFS emphasize that nature- and climate related financial risks are closely interconnected and that nature restoration and preservation can play an important role in combatting climate change, and vice versa. Even though further work is needed to better measure nature-related financial risks, financial institutions can already leverage existing frameworks and tools to start identifying, assessing and managing their linkages with nature. For example, the NGFS has developed a Conceptual Framework which seeks to create a shared understanding of nature-related financial risks.[9] Besides this, the Taskforce on Nature-related Financial Disclosures (TNFD) has developed a set of disclosure recommendations and guidance that encourage and enable business and finance to assess, report and act on their nature-related dependencies, impacts, risks and opportunities.[10] However, with both frameworks released in the second half of 2023, adoption and disclosure in line with these (and other) frameworks remains in its early stages.[11]

Sharing experiences and knowledge is essential to building a collective understanding of nature-related financial risks. While the case for action might be clear, assessing nature-related financial risks is new territory for the financial sector. Moreover, the multifaceted character of nature adds a layer of complexity to nature-risk assessment compared to, for example, climate-risk assessments. Organisations and initiatives such as the TNFD and the NGFS are promoting the international exchange of experience to drive progress in this area.

In this context, DNB in its role as investor, has prepared the present case study describing a first step towards exploring nature-related financial risks in its own account investments.[12] The case study describes an exploratory assessment of nature-related financial risks in a subset of our own account

[8] The Kunming-Montreal Global Biodiversity Framework (GBF) was adopted during the fifteenth meeting of the Conference of the Parties (COP 15). The GBF sets out an ambitious pathway to reach a global vision of a world living in harmony with nature by 2050.
[9] See the NGFS Conceptual Framework.
[10] See Recommendations of the Taskforce on Nature-related Financial Disclosures
[11] It should be noted that in January 2024, the TNFD announced that 320 organisations from over 46 countries committed to start making nature-related disclosures based on the TNFD Recommendations as part of their annual corporate reporting for FY2023, FY2024 or FY2025.
[12] At year-end 2023, we held approximately €8 billion in own account investments in various asset classes. We invest about half of these assets in bonds issued by (sub)sovereigns, supranational institutions and agencies, which we manage internally. We also invest in equities and corporate bonds, which are managed externally by various asset managers. For a further description of our own account investments, see our Sustainable and Responsible Investment policy.

investments, including a sectoral deep dive into the electric utilities subsector using coordinates of company assets. For the purpose of this pilot, we use the TNFD's approach for the identification and assessment of nature-related-issues, called the LEAP approach (Locate, Evaluate, Assess, Prepare).[13] This is geared towards application to investment portfolios, unlike the more general NGFS work aimed at creating a shared framework for central banks and supervisors.[14] The outcomes of the analysis improved our understanding of nature-related financial risks in our own account portfolios and how they can be managed. More specifically, we investigate nature-related impacts and dependencies for two of our externally managed global developed markets equity portfolios. These are our passively managed Broad-Market Fund – with an ESG (Environmental, Social & Governance) screening – (BMF) and our actively managed portfolio with a Paris-aligned objective (PAM).[15] The latter explicitly contributes to our objective of reducing the carbon footprint of our equity and corporate bond portfolios by 50% before 2030 and to reach net zero emissions by 2050 at the latest. The following chapters first describe the chosen risk framework and methodology, after which we discuss the analysis and results. Finally, we conclude with an overview of lessons learned and next steps.

[13] See the TNFD guidance on the LEAP framework.
[14] This is as result of the different target audiences and backgrounds of the NGFS and the TNFD. While the NGFS is a cooperation between central banks and supervisors and fosters collaboration between them, the TNFD is a market-led initiative which provides guidance mainly for corporates and financial institutions.
[15] Both these portfolios are invested in developed market equities with broad sectoral diversification. PAM is more concentrated in terms of constituents (BMF contains 1422 companies and PAM 48).

2. Risk Framework & Methodology

We follow the TNFD's LEAP approach for the identification and assessment of nature-related financial risks in a subset of our own account investments. The LEAP (Locate, Evaluate, Assess and Prepare) approach is designed to help organisations identify, manage, assess and report on their nature-related issues, including nature-related financial risks. As such, it can serve as a basis for engagement with investee companies or investment managers. Alongside publishing its final set of disclosure recommendations, the TNFD provided detailed guidance on how to undertake each component of the LEAP approach, which involves four phases, plus an initial Scoping phase (table 1).[16]

As advised by the TNFD's guidance, preceding the four phases of LEAP, we first scope our assessment. As noted, we investigate nature-related impacts and dependencies for two externally managed developed markets equity portfolios: BMF and PAM. For this pilot, we take a sectoral approach (e.g. investigate risks for specific sectors), rather than a thematic approach focussing on for example deforestation. As this pilot constitutes our first experience with assessing nature-related financial risks in our own account investments, we focus solely on direct linkages with nature and leave indirect linkages (e.g. through the value chain) out of scope. As this study is an exploratory assessment, we do not discuss the fourth phase of the LEAP approach (Prepare).

The assessment then takes the following approach to the different phases of LEAP:

- **Locate:** We apply the freely available ENCORE tool, which maps subindustries' impacts and dependencies on ecosystem services, to the above mentioned portfolios. In this way, we construct an overview of our exposure to high-impact and high-dependency sectors.[17] In doing so, we create an overview of those holdings that have the most *potential* to be exposed to nature-related financial risks. From this, we narrow the scope for

[16] See annex 1A for more detailed information on the TNFD and the LEAP approach. Financial institutions do not have to follow these phases in sequential order. For the TNFD's guidance on the LEAP approach, see TNFD guidance on the LEAP framework.
[17] ENCORE is maintained and continuously improved by Global Canopy, UNEP FI and UNEP-WCMC, who together form the ENCORE Partnership to help financial institutions map their linkages to nature. The tool was also used in our earlier nature-related work, such as our study exploring biodiversity risks for the Dutch financial sector. See annex 1B for more information on ENCORE.

Table 1 The LEAP approach

Phase	Description
Locate the interface with nature:	Filter and prioritise potential nature-related issues using three filters: sector, value chain and geography;
Evaluate dependencies and impacts:	Develop an understanding of the organisation's potentially material dependencies and impacts on nature;
Assess risks and opportunities	Identify, measure and prioritise risks originating from the dependencies and impacts on nature identified in the Locate and Evaluate phase, and understand which should be disclosed;
Prepare to respond and report	Decide how the organisation should respond to the material nature-related issues identified in the LEAP approach.

further assessment to the electric utilities subindustry, because i) this subsector has both high impacts and dependencies on nature, of which a substantial part occurs directly at power plants and not indirectly through the value chain, ii) we have exposure to this subsector in both portfolios, and iii) the location data of company assets is readily available. A detailed nature-related financial risk assessment requires data on i) locations of company assets, ii) what kind of activity is performed at each location and, iii) the relevance of each asset to the company. We use the Global Power Plant Database of the World Resources Institute (WRI) to obtain coordinates of power plants owned by electric utility companies held in our portfolios, as well as the kind of electricity generation at each power plant.[18,19] We compute the relevance of each power plant to the investee company by calculating its share of the company's total installed electricity production capacity.

- **Evaluate:** We use the WWF Biodiversity Risk Filter (WWF BRF)[20] to develop a deeper understanding of potential impacts and dependencies on nature of our holdings in electric utilities. The WWF BRF distinguishes between three types of electricity generation with different associated impacts and

[18] Access to asset location data is limited because companies do not usually disclose the exact coordinates of all their assets. However, for some sectors, asset location data can be obtained from open source databases. For more information, see WWF Biodiversity Risk Filter Methodology p. 77.
[19] The WRI Global Power Plant Database provides exact coordinates of almost 35,000 power plants around the world, and distinguishes between various types of electricity production such as hydropower, oil & gas, solar or tidal energy. See Annex 1C for more information.
[20] The WWF BRF is noted by the TNFD as a useful tool for conducting nature-related risk assessments. See Annex 2 for a more detailed description of the application of the WWF BRF.

dependencies on nature: combustion[21] & geothermal, ii) hydropower and iii) solar & wind. See Annex 3 for a more detailed overview of how these interact with nature.

- **Assess:** We use the WWF BRF to assess the interface with nature at each power plant. For each power plant, the WWF BRF calculates asset-location-specific physical and reputational risk scores.[22] Physical risk scores are driven by the condition (or health) of local ecosystems and how an asset depends on nature. Reputational risk results from a company's actual or perceived local impacts on nature (and by extension, people). Because dependencies and impacts are both local *and* driven by the type of activity conducted, the risk scores contain a business activity component and a local ecosystem condition component. Highly impactful or dependent business activities are associated with higher risks, as are activities in locations close to protected areas or fragile ecosystems.

[21] Combustion includes electricity generation via biomass, coal, gas, nuclear and oil.
[22] The TNFD subdivides transition risks into policy and legal, market, technology and reputational risks. Within transition risks, the WWF BRF currently focuses only on reputational risks. Other aspects of transition risks such as regulatory (i.e., policy and legal) and market risks are under development.

3. Analysis

Locate

At the subindustry level, potential nature-related impacts and dependencies of our assets are comparable to the broad market as proxied by the MSCI World Index (Table 2). Using ENCORE, we make an initial scan of potential nature-related impacts and dependencies of our portfolios and compare this with the MSCI World Index. Table 2 shows that PAM and the MSCI World have a similar allocation to sub-industries with a high/very high impact on nature, while this is slightly higher for BMF.[23] From a dependency perspective, both PAM and BMF have a lower allocation to subindustries that are highly/very highly dependent on nature relative to the MSCI World.[24] It is important to bear in mind here that these calculations are based on sector averages, and that actual dependencies and impacts are dependent on the actual company holdings, which may differ substantially from sector averages.

Table 2 Portfolio allocation to subindustries with a High & Very High Impact/Dependency

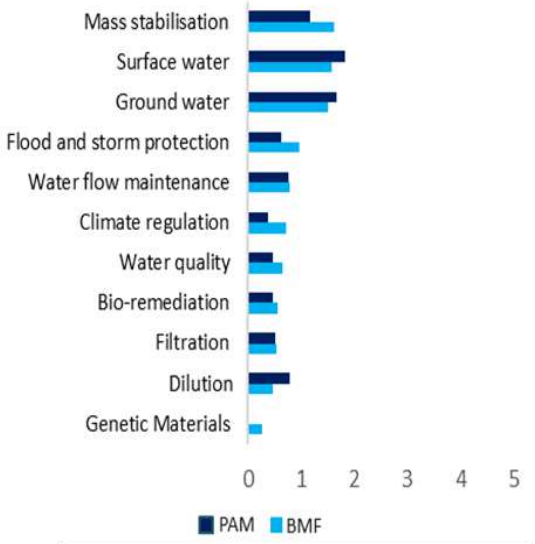
Type of Nature Linkage	**Portfolio**		
	BMF	PAM	MSCI World
High & Very High Impact	77%	73%	73%
High & Very High Dependency	32%	26%	36%

Both PAM and BMF potentially have high water-related impacts and dependencies on nature. In line with earlier work by the the Cambridge Institute for Sustainability Leadership[25] and others, we calculated a relative impact and dependency metric to assess the magnitude of potential linkages to ecosystems. Figures 1 and 2 zoom in on specific nature-related linkages for both portfolios. Figure 1 shows the dependencies and associated ecosystem services, while Figure 2 shows how the portfolios potentially contribute to different impact drivers. In both figures, scores range from 0 to 5. Higher values indicate greater portfolio dependencies on specific ecosystems or larger contributions to particular impact drivers. Figure 1

[23] An example of a subindustry with a high impact is oil and gas drilling, which has a negative impact on ecosystems. An example of a subindustry with a very high impact is mining, because it can degrade ecosystems over large areas, and spark forest fires where flammable liquids or explosives are used.
[24] An example of a subindustry with a high dependence is tyres and rubber production, which is highly dependent on surface water. The production can still take place through substitution of water, but is much more difficult. A subindustry with a very high dependency on nature is agriculture, which is almost impossible without pollination.
[25] See the publication on mapping exposure to nature-related risks across financial indices.

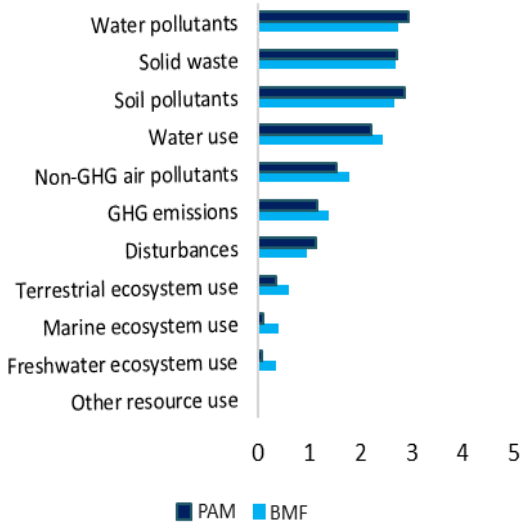
indicates that both PAM and BMF are highly dependent on "mass stabilisation", "surface water" and "ground water". At the same time, Figure 2 shows that both portfolios potentially contribute to nature loss mainly via "water pollutants", "water use", "solid waste" and "soil pollutants".

Figure 1: Portfolio ecosystem dependencies



Source: own calculations, ENCORE

Figure 2: Portfolio contribution to impact drivers



Source: own calculations, ENCORE

Because ENCORE only identifies potential and direct nature linkages, a more precise nature risk assessment requires company location data. ENCORE has two important limitations. First of all, ENCORE only indicates direct linkages with nature.[26] However, as large parts of company linkages with nature manifest themselves through value chains, it can be assumed that an ENCORE analysis underestimates real nature-related financial risks.[27] In addition, as noted above, ENCORE evaluates nature linkages at the subindustrial level and does not take into account any company specific characteristics (e.g. location, mitigating activities). Since ENCORE only explores potential risks, a more granular assessment is desirable. While nature loss is a global problem, impacts and dependencies are often local.[28] As such, assessing companies' interface with nature on individual company asset locations allows for a more detailed evaluation of nature-related financial risks.[29]

[26] Future updates of the ENCORE tool may also include supply chain linkages.
[27] See the NGFS Conceptual Framework.
[28] Although "with increasing global connections local impacts can be felt across long distances", NGFS Conceptual Framework, page 13.
[29] Such granular location data is limited for many companies, but there are public data sources for specific sectors. The Spatial Finance Initiative, for example, offers data on the Beef, Cement, Iron & Steel, Petrochemical, Paper & Pulp and Waste Management sectors. However, these public databases do not always provide global coverage.

We conduct a deep dive into the electric utilities subindustry for a granular and company-level nature-risk assessment using location data. We choose the electric utilities subindustry for three main reasons. First, ENCORE shows that this subindustry is very highly and directly linked to nature, both in terms of impact and dependency.[30] Second, both portfolios are exposed to this subindustry. The PAM exposure of approximately 2% is allocated to just one company, an energy company mostly operating in the UK. The BMF exposure of 1% is distributed among 19 companies located throughout Europe, the United States and Canada. Third, location data for most power plants is publicly available from the WRI Global Power Plant database, from which we obtain location data of all power plants connected to electric utility companies in our portfolios.[31]

From the WRI database, we link 1,200 power plants to the mother companies held in our two portfolios. Many power plants are owned by subsidiaries, rather than directly by the mother companies in our portfolio. Therefore, we link the local plant owners listed in the WRI database to the holdings in our portfolios. To do this, we match the local owners' names to a list of our portfolio holdings and their subsidiaries.[32]

For the power plants we matched, we extract data on coordinates, type of electricity generation and production capacity. Because we study two global developed market equity portfolios, the majority of the identified power plants are located in developed markets, primarily in North America and Europe. Roughly 80% of these power plants generate renewable electricity, but these plants generally produce less electricity than nuclear and fossil fuel plants (approximately 20% of total electricity production). The yearly production capacity of power plants ranges from 1 to 23,000 GWh.

Evaluate

The WWF Biodiversity Risk Filter distinguishes between three types of electricity generation with different associated impacts and dependencies on nature. These are i) combustion (biomass, coal, gas, nuclear, oil) & geothermal, ii) hydropower and iii) solar & wind. Relative to solar & wind energy, combustion & geothermal and hydropower have higher dependencies on water. This is because

[30] Ideally, one would also study companies' supply chains. There are tools available to estimate supply chain effects, such as EXIOBASE, which is used by the ECB in publication the impact of the euro area economy and banks on biodiversity. However, as a first assessment of nature-related financial risks in our own investments, this remained out of scope for this pilot.
[31] See Global Power Plant Database.
[32] For an overview of available datasets on subsidiaries, see Appendix step 1 of the WWF Biodiversity Risk Filter Methodology.

hydropower (e.g. dams) relies directly on river flows and water supply to generate electricity, while combustion plants use substantial amounts of water for cooling. In addition, while all three types of electricity generation can impact their surrounding environment, the potential impact is higher for combustion and hydropower. Combustion plants, for example, emit particulate matter and nitrogen oxides which can affect local ecosystems (as well as local communities). Hydropower dams can also seriously impact local ecosystems by forming lakes and altering river flows.

Assess

We use the WWF BRF to gain a deeper understanding of nature-related financial risks associated with the impacts and dependencies at each power plant. The WWF BRF assesses and distinguishes between physical and reputational risks. Because both the TNFD and the NGFS regard reputational risks as a subset of transition risks, this means that only a subset of transition risk is assessed. The physical and reputational risk scores consist of a business activity component and a location component. For each power plant, the WWF BRF calculates asset-specific physical and reputational risk scores based on 33 different nature metrics.[33]

Highly impactful or dependent business activities are associated with higher risks. The three types of electricity generation mentioned under 'Evaluate' receive different business activity scores. Due to their larger impacts and dependencies, hydropower and combustion receive higher reputational and physical risk scores than solar & wind.

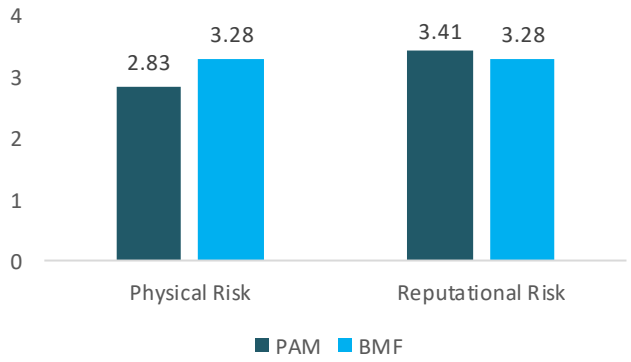
In addition, power plants receive a higher location-related score when they are situated in (the proximity of) protected areas or fragile ecosystems. The WWF BRF evaluates the location component with information on the intactness and importance of local ecosystems, including their ability to provide ecosystem services. Reputational risks are higher, for example, in (the proximity of) key biodiversity areas (KBAs), protected areas or sites of international interest such as World Heritage Sites. Physicals risk are higher where nature-related services are more fragile or less abundant, such as in areas of water scarcity, or where natural disasters are more likely to occur.

We aggregate physical and reputational risk scores of individual power plants to obtain company- and portfolio-level scores using the production capacity of each plant. Larger power plants contribute more revenue to a company, so physical or reputational risks at these locations may have a larger effect on the

[33] See Annex 3 for an overview of the business activity scores for each of the 33 nature indicators.

company as whole. Since we lack data on asset values or revenue generation, we approximate the relevance of each power plant to the company by the installed electricity production capacity (in MWh). We use this to aggregate the physical and reputational risk scores first to a company level and subsequently to a portfolio level, the latter of which are shown in Figure 3.

Figure 3: Portfolios aggregated risk scores



Source: own calculations, WWF Biodiversity Risk Filter

Compared to BMF, electric utilities in PAM exhibit lower physical risks but slightly higher reputational risks (Figure 3). Scores range from 0 to 5, where higher scores indicate higher risk. Relative to BMF, PAM performs better on physical risk. On the other hand, PAM has somewhat higher reputational risk than BMF.

PAM's lower physical risk and higher reputational risk is mostly driven by the locations of its power plants. As an example, Table 3 shows 2 out of 33 metrics used by the WWF BRF to calculate local physical and reputational risk. From a physical risk perspective, an important risk driver is whether the power plant is located in areas prone to ecosystem (service) degeneration such as water scarcity. Table 3 shows that, relative to BMF, PAM's power plants are located in areas less prone to water scarcity, leading to a lower physical risk score in Figure 3. This is because most of PAM's power plants are located in the UK, specifically Scotland, which has a low risk of water scarcity. From a reputational perspective, an important risk driver is whether the power plant is located in (the proximity of) protected areas, as negative impacts there are more likely to affect a company's reputation. Compared to BMF, a larger percentage of PAM's power plants are located near such areas (Scotland has a large number of natural parks). This leads to a higher reputational risk score.

Table 3 Selection of inputs into the WWF BRF risk scores

	BMF	PAM
Input in Physical risk Percentage of plants in locations with high or very high risk of water scarcity	16%	0%
Input in Reputational risk Percentage of plants in locations with high or very high risk of proximity to protected areas	41%	79%
% of total electricity production		
Combustion	73%	56%
Hydropower	11%	16%
Solar & wind	16%	27%

While relative to BMF, PAM's energy mix is less carbon-intensive, this does not substantially diminish its associated nature-related financial risks. As noted above, the WWF BRF distinguishes between three types of electricity generation, where combustion and hydropower are associated with higher physical and reputational risks. Table 3 displays the composition of the energy mix in both portfolios. The table shows that PAM's combustion generated electricity (56%) is lower than BMF's (73%), making PAM's energy mix less carbon-intensive. However, both portfolios generate most electricity from hydropower and combustion (84% and 72%). This leads to similar nature-related financial risk from the business activity component (i.e. the type of electricity generation) in both portfolios, despite PAM's energy mix being less carbon-intensive.

4. Lessons Learned & Next Steps

The assessment shows that assets in our own account investments are potentially exposed to nature-related financial risks. The scoping analysis showed that, in line with the broad market (as proxied by the MSCI World Index), a substantial part of the portfolios studied could have high/very high impact or dependencies on nature. The granular location data based assessment for electric utility companies further shows that risks can be both reputational and physical in origin.

The outcomes of this LEAP assessment can be used for engagement with our external asset managers on how they manage nature-related financial risks. The results give us more insight into possible nature-related financial risks in our own account investments. For example, the ENCORE analysis and the deep dive in electric utilities can serve as basis for further conversations with our external managers about how they assess and mitigate nature-related financial risks at the subindustrial level.

We have gained understanding and experience with nature-related financial risk analysis by starting simple and gradually expanding. Nature-related financial risks are a relatively new concept to the financial sector. Moreover, the multifaceted character of nature makes assessment of nature-related risks a complex task. Despite their complexity, these risks are expected to become better understood in the future. Organisations that wish to expand their knowledge may want to start with broad (sub)sectoral analyses (such as the ENCORE analysis in this pilot), which deliver quick insights into potential impacts and dependencies of assets. Building on this, an organisation can gradually expand and deepen its analysis, e.g. by conducting sectoral deep dives or investigating certain impact drivers (such as deforestation or water use). The current case study remains a partial analysis of the potential nature-related financial risks in our portfolios, as we conducted a single sectoral deep dive.

An improvement in the climate dimension does not necessarily translate into lower nature-related financial risk. As an example, while a hydropower plant may cause limited carbon emissions, it nevertheless may have a strong dependency and impact on local water-related ecosystem services. Indeed, from the deep dive into electric utilities we learn that while PAM's energy mix is less carbon-intensive than BMF's, this does not substantially diminish PAM's associated nature-related financial

risks, as reflected in the WWF BRF physical and reputational risk scores. This is consistent with the findings in the NGFS conceptual framework on nature-related risks, which emphasises the interconnectedness between nature- and climate-related risks and argues for an integrated approach towards understanding the interplay of these.

Location analysis is hampered by current data availability issues, but not impossible. For nature risk analysis at a location level, data is needed for local ecosystem conditions, as well as data on specific asset locations and business activities taking place at each asset location. While there are substantial data issues, a start can be made by using publicly available data. Asset location data is limited, but available for several high-risk sectors such as electric utilities, cement and iron & steel.[34]

Nature-related financial risk analysis is complex, and as such capacity-building remains important. This complexity is reflected in a multitude of tools, frameworks and approaches used by financial institutions. Especially for institutions that are just starting to assess nature-related financial risk, learning from others can provide valuable insights and make the process easier to navigate.

[34] For an overview of available asset-level datasets, see Appendix step 1 of the WWF Biodiversity Risk Filter Methodology.

5. Annex

Annex 1: Description and background of tools and frameworks used

A) The TNFD's LEAP approach

The TNFD has developed an integrated assessment approach called the LEAP approach (Locate, Evaluate, Assess, Prepare), to help organisations of all sizes and across sector and geographies identify, manage and assess their nature-related dependencies, impacts, risks and opportunities. It also aims to help organisations conduct due diligence and preparing disclosures aligned with the TNFD disclosure recommendations. In September 2023, following a two-year design and piloting process, the TNFD published version 1.0 of its guidance.[35]

The LEAP approach is designed to be used by organisations' internal (project) teams and involves four phases, plus an initial scoping phase:

1. **L**ocate your nature interface.
2. **E**valuate dependencies and impacts.
3. **A**ssess risks and opportunities.
4. **P**repare to respond to, and report on, material nature-related issues, in alignment with the TNFD's recommended disclosures.

B) ENCORE

We use the ENCORE database to analyse our assets' potential impacts and dependencies on nature. The ENCORE tool is maintained and continuously improved by Global Canopy, UNEP FI and UNEP-WCMC, who together form the ENCORE Partnership, previously known as The Natural Capital Finance Alliance (NCFA). The initial ENCORE tool was financed by the Swiss State Secretariat for Economic Affairs (SECO) and the MAVA Foundation.

ENCORE gives a materiality score that details how production processes have dependencies or impacts on ecosystems. ENCORE assesses how different subindustries (based on the Global Industry Classification Standard, or GICS) linked to 80 production processes depend on 21 ecosystem services. They consider two aspects to assess to what extent a production process is dependent on an ecosystem service:

[35] For detailed guidance on the different steps of the LEAP approach, see the TNFD guidance on the LEAP framework.

1. How significant is the loss of functionality to the production process if the ecosystem service is disrupted?
2. How significant is the financial loss due to the loss of functionality in the production process?

To assess the impact of a production process on an ecosystem, ENCORE looks at 11 impact drivers and links these to the subindustries. Impact drivers are defined as "a measurable quantity of a natural resource that is used as an input to a production or measurable non-product output of any business activity". ENCORE considers the following three aspects to assess the importance of a potential impact of a production process:

1. How frequently might the impact occur?
2. How quickly might the impact start to affect natural capital?
3. How severe might the impact be?

Like other tools, ENCORE has limitations. For example, it only maps direct impact and dependencies, and leaves supply chains out of scope. When taking carbon emissions as an analogy, an ENCORE assessment is similar to analysing carbon emissions from a scope 1 perspective rather than a scope 1+2+3 perspective. In addition, it should be noted that ENCORE only establishes potential impacts/dependencies of companies on nature. As ENCORE takes a subindustry perspective, it does not take into account company-specific factors such as locations or the measures companies undertake to mitigate impacts and dependencies on nature. During portfolio analysis, the ENCORE analysis should therefore be interpreted as a scoping exercise to identify potential nature related risks.

C) World Resources Institute Global Power Plants Database

The Global Power Plant Database from the WRI provides exact coordinates on the locations of almost 35,000 power plants across the world. It is freely available online from the WRI website. Through pooling data from government agencies, public utilities, power plant operators, multinational organisations and companies that build or provide components for power plants, the database contains data on power plants that together make up an estimated 85% of global installed capacity in 2021.

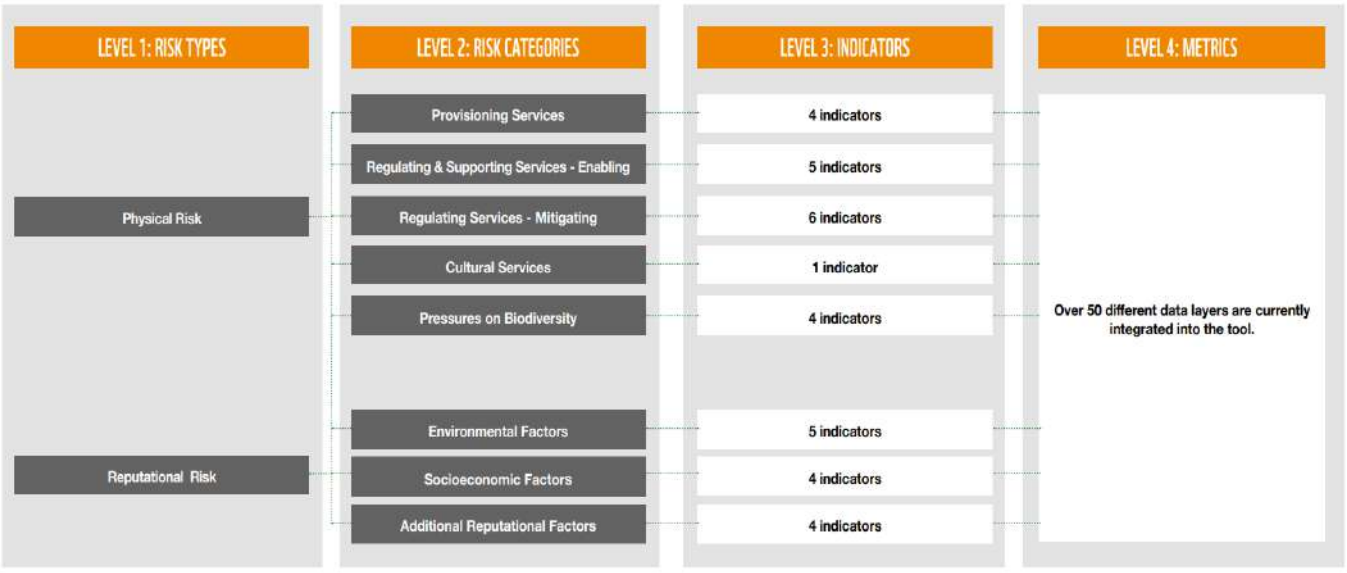
Crucially for our analysis, this database lists not only the geolocation of these plants, but also the capacity in MW, type of installed capacity and, in a majority of cases, the owner of the plant. For about 60% of the power plants in the database, information on the owner is available, which represents about 75% of installed capacity. This increases to 76% of plants and 87% of installed capacity for countries listed as Developed Markets in the MSCI World Index.

Annex 2: Calculating the risk scores in the Electric Utilities deep dive

We used the WWF biodiversity risk filter (WWF BRF) to evaluate the nature-related financial risks associated with the power plants owned by the companies in our portfolio. To do so, we uploaded the coordinates of all power plants mapped to our holdings to the WWF BRF tool, which is freely available online. The WWF BRF tool combines the coordinates and business activity input with local ecosystem conditions to assign a risk score to each power plant for both reputational and physical risk.

The physical and reputational risk scores are calculated for each plant using a layered approach starting with the calculation of 33 indicator scores. The indicators are the most granular level at which risk assessment is possible and are directly related to over 50 underlying data sets. They represent specific local ecosystem or socioeconomic conditions (where relevant for reputational risk). Examples include soil condition, invasive species, proximity to key biodiversity areas and local media scrutiny. See below the risk hierarchy of the WWF BRF tool.

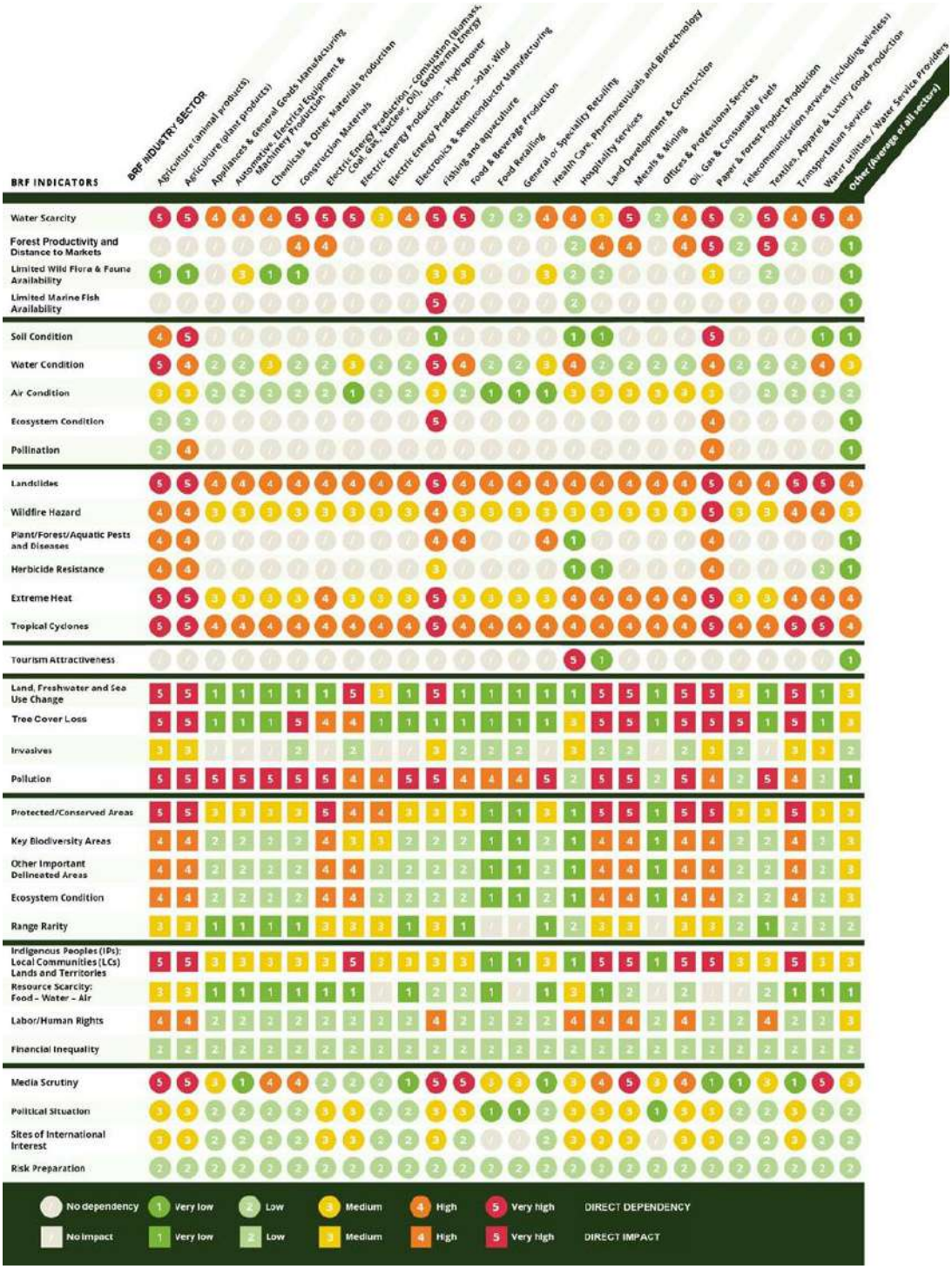
Figure 4: Hierarchy system of WWF BRF



The indicator scores, and therefore the reputational and physical risk scores, are made up of a business activity component and location component. The former reflects whether an activity is dependent or has an impact on nature. The WWF BRF sources these from ENCORE and the Science Based Target Network (SBTN). In total, WWF BRF includes 25 activities that each have an individual score for the 33 risk indicators. As noted, we follow the WWF BRF's classification and distinguish three types of electricity generation (Combustion & Geothermal Energy, Hydropower and

Solar & Wind). The locational component represents specific natural or socioeconomic circumstances on each location and are provided by the WWF BRF in the form of geospatial data. See the WWF Biodiversity Risk Filter Methodology for a more thorough explanation of the tool.

Annex 3: Business activity scores for the WWF BRF



Source: [WWF Biodiversity Risk Filter Methodology](#).
The first five groups represent physical risk scores and the last three represent reputational risk.