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SUSTAINABLE BY NATURE SEQUEL: EXPLORING THE ROOTS OF OUR EXPOSURE TO DEFORESTATION

BNP PARIBAS
ASSET MANAGEMENT

The sustainable investor for a changing world

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EXECUTIVE SUMMARY

Since 2021, we have been analysing the exposure of our corporate universe to deforestation risk through different approaches such as the evaluation of deforestation policies[1] of our corporate holdings or the assessment of the potential impact of our corporate holdings on land use and land use change using the Corporate Biodiversity Footprint methodology of Iceberg Datalab[2].

This year, we want to go further and **quantitatively assess the exposure of our corporate holdings to potential deforestation and conversion of natural ecosystems through corporate production and consumption[3] of forest and ecosystem-risk commodities (FERCs)**. The objective of this analysis is to further assess the current state of quantitative data and set a precedent for the industry, but also to identify companies we hold and FERCs that are driving deforestation and conversion of natural ecosystems.

To do so, we established a **proprietary methodology[4] based on publicly available datasets developed by NGOs** (i.e., CDP, Trase, Forest 500 and Forest IQ) to estimate the potential deforestation and conversion of natural ecosystems, in hectares, linked to our corporate holdings production and consumption of selected FERCs[5], by combining 1) disclosed production and consumption data for each FERC and 2) deforestation risk coefficient estimates for these FERCs.

This work is exploratory and among the 171 billion euros of our corporate assets under management[6] (AUM), we manage to retrieve estimates of deforestation and conversion of natural ecosystems in hectares for 6% of these AUM. Even though narrow, this perimeter is still interesting considering that we focused our analysis on four sectors consuming or producing the highest share of FERCs (the consumer staples[7], consumer discretionary[8], materials and energy sectors). They represent 24% of our corporate holdings. Outside of these sectors, the exposure to deforestation is limited. It is important to note that this analysis presents the total exposure of all investors in the companies we assessed, since we did not consider our ownership share in each company.

Results show **our corporate holdings are mainly exposed to potential deforestation and conversion of natural ecosystems associated with palm oil in Indonesia, Malaysia and Colombia, as well as cocoa in Ivory Coast**. Palm oil have been on investors' radar for some time, but these results suggest cocoa should be a priority too. We find that **a large share of the potential deforestation and conversion of natural ecosystems is declared 'deforestation-free' by companies, but few of them have strong traceability systems in place**, which raises questions over the credibility of these claims.

This study enables us to **further delineate the companies on which we want to focus our research and engagement**, such as 1) companies in relevant sectors that report only partial quantitative data and/or no quantitative data, 2) companies in our portfolios that potentially drive the largest share of deforestation and conversion of natural ecosystems and that do not have strong No deforestation, no peat, no exploitation (NDPE) policies or traceability systems, 3) **companies that claim deforestation-free production** and consumption, but have not put in place strong traceability systems. In addition, to close the data gap, we urge companies to further disclose quantitative information related to their FERCs sourcing and production. Finally, we plan to apply this methodology to specific portfolios, and use this information to **engage and educate portfolio managers and clients about deforestation-related risks in their portfolios**, and identify potential investment opportunities in companies that are managing their FERC impacts and risks appropriately. Lastly, we will continue to **leverage the six pillars of our approach to sustainability** to reduce the environmental impact of our investments with a focus on forests.

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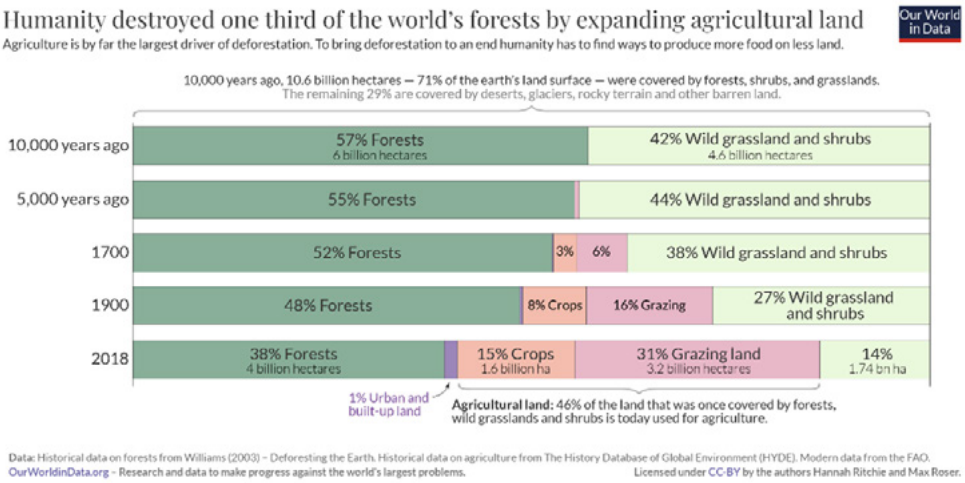
1 As part of our whitepaper Sustainable by Nature: Our Biodiversity Roadmap
2 Sustainable By Nature Sequel: Our Portfolio Biodiversity Footprint
3 Consumption meaning companies sourcing/processing the FERC, irrespective of geographical location.
4 With contribution from Julie Raynaud, independent consultant, Julie Raynaud | LinkedIn
5 Beef and derived products, cocoa and derived products, coffee and derived products, palm oil and derived products, rubber, soy, timber and derived products. We have quantity data on production and consumption of these seven FERCs; but have deforestation risk coefficients estimated for only six FERCs (i.e., the commodities listed excluding timber).
6 Please note this scope does not include residual exposures in some funds delegated by BNPP AM or managed by BNPP AM affiliate entities.
7 Manufacturers and distributors of food, beverages and tobacco and producers of non-durable household goods and personal products. It also includes distributors and retailers of consumer staples products including food & drug retailing companies.
8 Manufacturing segment includes automobiles & components, household durable goods, leisure products and textiles & apparel. The services segment includes hotels, restaurants, and other leisure facilities. It also includes distributors and retailers of consumer discretionary products.

INTRODUCTION

Let's set the scene in a few charts.

- Humanity has been converting forest and natural ecosystems for 10 000 years, mostly for agricultural use[9] (figure 1). The so-called soft commodities have been found to contribute to 90% of tropical deforestation[10] and almost 90% of all deforestation worldwide[11].

Figure 1: Largest drivers of deforestation for 10 000 years

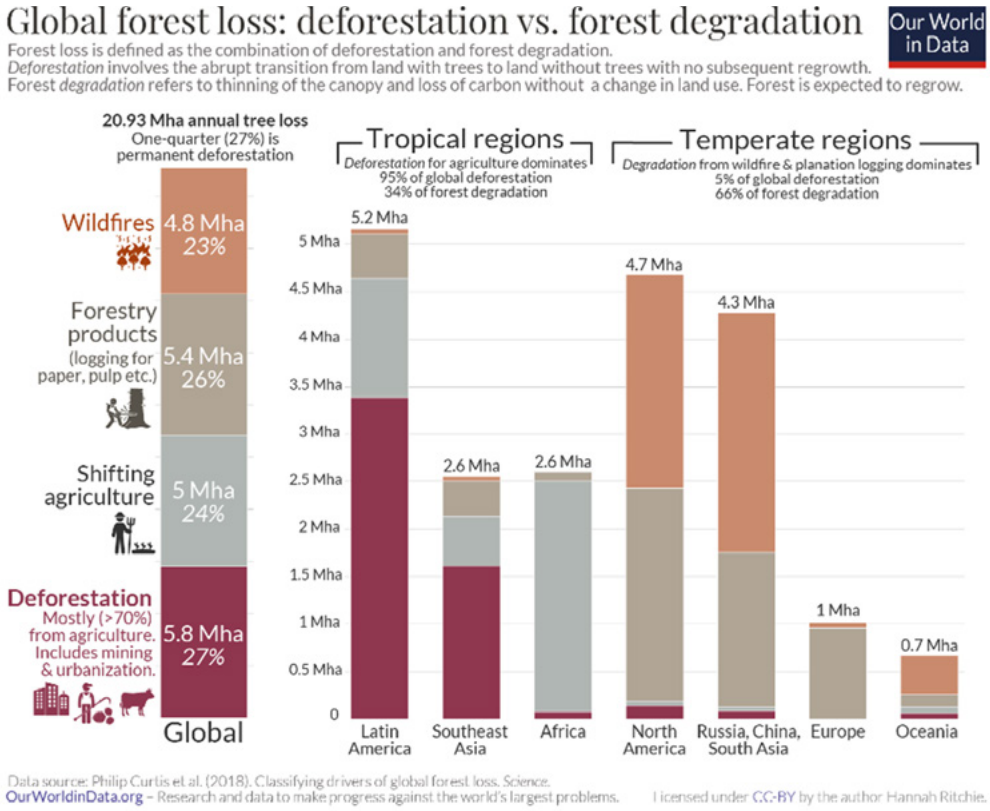


- 95% of the world's deforestation[12] occurs in the tropics and is due to agriculture, and in contrast; two thirds of forest degradation occurs in temperate countries, mostly due to wildfires and logging (figure 2).

- Even though temperate regions have seen a net gain in forest since 1990, it is important to remember that deforestation in the world's temperate forests peaked in the first half of the 20th century.

9 Max Roser, 2022. Humans destroyed forests for thousands of years – we can become the first generation that achieves a world in which forests expand
10 Pendrill et al, 2022. Disentangling the numbers behind agriculture-driven tropical deforestation
11 FAO, 2022. How much do large-scale and small-scale farming contribute to global deforestation?
12 Hannah Ritchie and Max Roser, 2021. Deforestation and forest loss

Figure 2: Causes of forest loss – deforestation and forest degradation



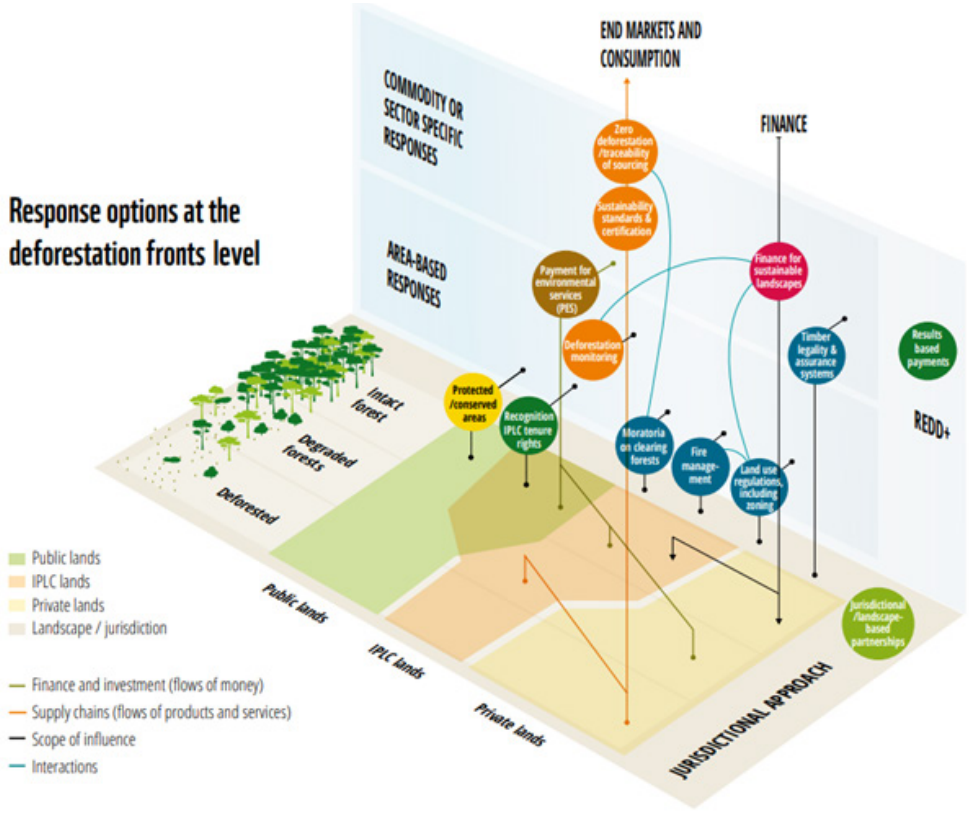
- Global forest loss keeps increasing. In 2022, tropical primary forest loss totalled 4.1 million hectares, up from 2.7 million hectares[13] in 2002.

- According to a WWF report[14], there are 24 'deforestation fronts' globally, i.e., places that have a significant concentration of deforestation hotspots.

- Different 'response options' to deforestation include commodity or sector specific responses that involve the private sector and investors (figure 3).

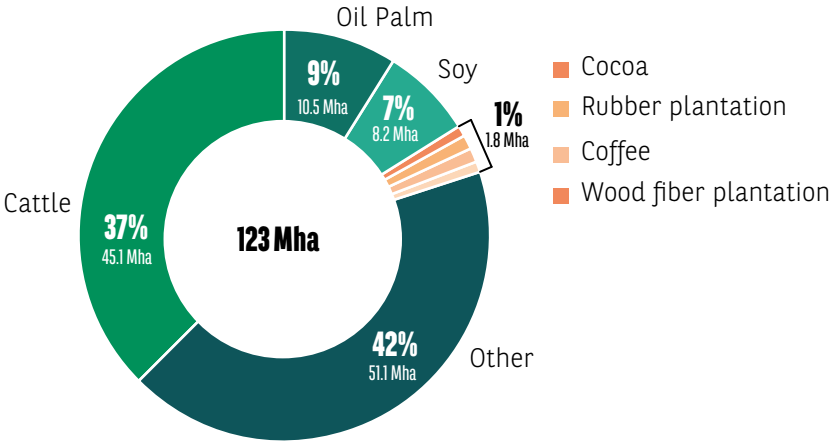
13 World Resources Institute, 2023. Tropical Primary Forest Loss Worsened in 2022, Despite International Commitments to End Deforestation
14 WWF, 2021. Deforestation fronts: drivers and responses in a changing world

Figure 3[15]**:** Response options at the deforestation fronts level



- Focusing on the private sector, just a few agricultural commodities produced and consumed by companies are driving most of the deforestation and conversion of natural ecosystems in the world, with cattle, palm oil and soy being the top three contributors[16] (figure 4).

Figure 4: Agriculture driven deforestation per commodity



15 IPLC: Indigenous people and local communities REDD+: Reducing emissions from deforestation and forest degradation in developing countries. The '+' represents activities related to the sustainable management of forests, and the conservation and enhancement of forest carbon stocks.

16 WWF, 2022. Seeing the forest for the trees - a practical guide for financial institutions to take action against deforestation and conversion risks

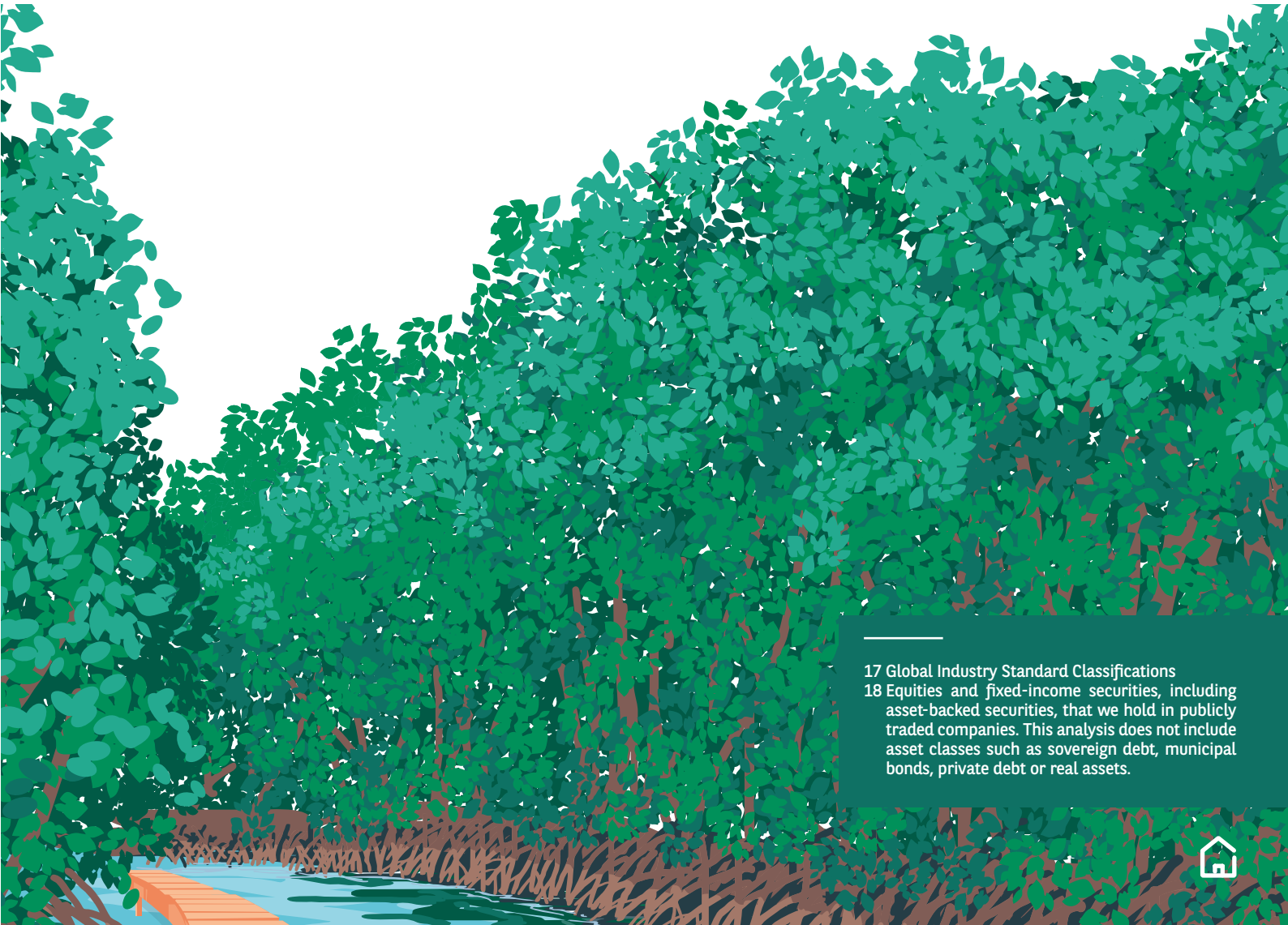
How has BNP Paribas Asset Management addressed this systemic risk so far?

Conscious that deforestation and conversion of natural ecosystems is a systemic risk, we set ambitious targets in our 2019 Global Sustainability Strategy to reduce the environmental impact of our investments, with a focus on forests: "To support global efforts to halve forest loss by 2020 and end forest loss by 2030, we have set targets for relevant companies in our portfolios to comply with NDPE commitments by 2020 for agricultural commodities (palm oil, soy, paper, timber, and beef products) and by 2030 from non-agricultural sectors (mining, metals, infrastructure)."

As part of our 2021 white paper Sustainable by Nature: Our Biodiversity Roadmap, we published a first assessment of our exposure to deforestation. We analysed the disclosure, deforestation policies and processes of our investees in three GICS[17] sectors representing 48% of our corporate AUM[18], namely consumer staples, consumer discretionary and financials. We used selected indicators from the CDP Forest, Forest 500 and SPOTT databases.

We believe this policy-based assessment was a good first step in understanding our exposure to deforestation, but it did not allow us to quantify the extent to which our corporate holdings are driving potential deforestation and conversion of natural ecosystems, in hectares. Indeed, some commodities contribute more than others to deforestation and conversion of natural ecosystems, with large variations at the country, subnational, municipality and field levels.

In 2022, we analysed the biodiversity footprint of our corporate AUM using the Corporate Biodiversity Footprint methodology of Iceberg Datalab. The methodology assessed the impact on biodiversity arising from the use of natural resources and land, including land conversion and deforestation, and emissions of pollutants by the companies in our investment portfolios. We found that land use and land use change accounted for 78% of these corporates' potential impact on biodiversity.



17 Global Industry Standard Classifications
18 Equities and fixed-income securities, including asset-backed securities, that we hold in publicly traded companies. This analysis does not include asset classes such as sovereign debt, municipal bonds, private debt or real assets.

OBJECTIVE

This research paper aims to quantitatively assess the extent to which our corporate holdings are driving potential deforestation and conversion of natural ecosystems, in hectares, through their production and consumption of selected forest and ecosystem risk commodities (FERCs) and their derived products[19]. We focus on soft commodities as they have been found to contribute the lion's share to deforestation worldwide (see introduction section).

Through this quantitative assessment, we want to:

- Determine whether publicly available datasets developed by NGOs can be used to quantitatively assess the exposure of our corporate holdings to potential deforestation and conversion of natural ecosystems and whether they provide satisfactory coverage. In particular, we want to further assess the data gap and push companies to disclose more.

- Identify companies' production and sourcing of FERCs in countries and regions that have experienced or are at risk of experiencing recent deforestation and conversion of natural ecosystems, with the objective to further engage with these companies.

- Identify the FERCs produced or consumed by companies we hold that are driving most of the deforestation and conversion of natural ecosystems. While according to literature, cattle, palm oil and soy are the top three contributors[20] to deforestation and conversion of natural ecosystems in the world, we would like to know if our corporate holdings follow the same trends, and identify some less obvious FERCs that should also be on our radar.

- Create a precedent for the industry through the publication of the quantified potential exposure of our corporate holdings to deforestation and conversion of natural ecosystems. This should encourage an open discussion with investors on the usefulness of such analysis to inform their research and engagement.

- Identify companies that can make the largest contribution to halting deforestation and conversion of natural ecosystems, and use the results in our internal decision-making tools and engagement.

19 We researched whether we could derive estimates for beef and derived products, chicken, cocoa and derived products, coffee and derived products, corn, cotton, palm oil and derived products, pork, rubber, soy, sugarcane, timber and derived products. Our final assessment focuses on beef and derived products, cocoa and derived products, coffee and derived products, palm oil and derived products, rubber and soy. Please see figure 2 for details.

20 WWF, 2022. Seeing the forest for the trees - a practical guide for financial institutions to take action against deforestation and conversion risks

HOW OUR WORK RELATES TO EMERGING VOLUNTARY AND MANDATORY FRAMEWORKS

Several regulations, disclosure frameworks and technical guidance documents have been published recently that relate to land and biodiversity. Our work since 2020 relates to a number of the metrics required and recommended by these frameworks and builds on best practices as detailed in the GHG Protocol Land sector and Removals (draft) guidance and the Science-based target for Land guidance.

In particular, a number of metrics disclosed in this research paper can be used to meet

- TNFD[21] recommendations for financial institutions, in particular the Recommended Disclosure B in the Metrics and Targets pillar, which aims at disclosing the metrics used by the organisation to assess and manage dependencies and impacts on nature.

- EU SFDR PAI[22], in particular voluntary PAI 10[23], 11[24], and 15[25] as we have not reported these three indicators in our 2023 PAI statement.

- Article 29 of the French Law on Energy and Climate. Since 2022, asset managers are required to report their alignment strategy with long-term biodiversity targets under this French law. In our Article 29 entity level report, we published our potential biodiversity footprint and found that land use change is the main environmental pressure, contributing about 80% of the weighted biodiversity intensity of our corporate AUM.

This study also helps us conduct materiality screening to prepare for EU legislation on deforestation-free products and uses some of the same data sources as the European Commission for its materiality assessment.

21 Taskforce on Nature-related Financial Disclosures
22 European Union Sustainable Finance Disclosure Regulation, Principal adverse impact
23 Share of investments in investee companies the activities of which cause land degradation, desertification or soil sealing
24 Shares of investments in investee companies without sustainable land/agriculture practices or policies
25 Share of investments in companies without a policy to address deforestation

GENERAL APPROACH

We seek to understand the exposure of our corporate holdings to the risk of sourcing FERCs from an area recently deforested. Our assessment relies on desk-based estimates rather than field measures, hence the wording 'potential deforestation and conversion of natural ecosystems' (Appendix I & II).

We do not seek to estimate our financed deforestation footprint based on our ownership share in each company. When providing data at the aggregate level in this research paper, we use two lenses:

- Sum of our AUM invested in corporates which we know to be exposed to potential deforestation and conversion of natural ecosystems based on publicly available datasets developed by NGOs

- Sum of the quantity in tonnes of the FERCs produced/consumed by these corporates, and the associated number of hectares potentially deforested and/or converted.

Indeed, our objective is not to quantify the potential impact linked to deforestation of our specific financial flows and portfolios. We aim to identify the companies we hold that potentially drive the largest deforestation and conversion of natural ecosystems. In addition, we do not attempt to assess the financial risk associated with our holdings' contribution to potential deforestation and conversion of natural ecosystems – this would necessitate additional analysis. Our assessment can be seen, however, as an indication of systemic risk.

We use a constrained perimeter for this study. Namely, we focus on our corporate AUM, referring to the proportion of our assets under management accounted for by investment instruments issued by companies, as opposed to those issued by sovereigns, sub-sovereigns or agencies. In addition, we focus on four GICS sectors: *consumer staples, consumer discretionary, materials and energy.* These are covered by our deforestation target defined in our Global Sustainability Strategy and/or are often highlighted as the sectors consuming or producing the highest share of FERCs[26].

We devise our own approach to quantify, in hectares, the extent to which our corporate holdings in these 'relevant sectors' drive potential deforestation and conversion of natural ecosystems, based on four steps (figure 5).

26 We exclude the financial sector because of a lack of data in certain datasets and potential double counting issues. For an assessment of our financial sector AUM exposure to deforestation, see our biodiversity roadmap.

Figure 5: Description of the four steps to quantify the extent to which our corporate holdings drive potential deforestation and conversion of natural ecosystems

	Research step	Data sources	FERCs covered	Notes
STEP 1 ▶	Identify the companies we hold that are known to produce or source at least one FERC	Analyse the companies covered by CDP, Trase, Forest 500 and Forest IQ	1. Beef and derived products 2. Chicken 3. Cocoa and derived products 4. Coffee and derived products 5. Corn 6. Cotton 7. Palm oil and derived products 8. Pork 9. Rubber 10. Soy 11. Sugarcane 12. Timber and derived products	CDP, Trase, Forest 500 and Forest IQ are publicly available datasets that provide information on FERCs with large coverages
STEP 2 ▶	Determine the quantity of FERC(s) produced and/or consumed, as disclosed by the companies in our universe	CDP Forest Disclosure	1. Beef and derived products 2. Cocoa and derived products 3. Coffee and derived products 4. Palm oil and derived products 5. Rubber 6. Soy 7. Timber and derived products	Further examination of the datasets revealed that only CDP Forest Disclosure provided data on production and consumption quantities of FERCs in a format that can be easily used without further treatment[28]. Thus, the number of commodities we are able to assess decreased to the seven shown.
STEP 3 ▶	Estimate the potential deforestation and conversion of natural ecosystems in hectares linked to FERC production and/or consumption of the companies we hold	Multiply the quantities identified in STEP 2 with deforestation coefficients derived from Trase.earth and Dr Pendrill research	As above, excluding timber and derived products	We were not able to derive deforestation coefficients for timber and derived products of sufficient quality (please refer to Appendix I for details)
STEP 4 ▶	Overlay step 3 results with a high-level review of the policies and processes put in place by the companies for which we were able to derive a quantitative potential deforestation (ha) contribution estimate	Use Forest 500, CDP and Forest IQ data on commitments and traceability	As above, excluding timber and derived products	These three datasets include a large range of indicators on policies and processes.

27 With contribution from Julie Raynaud, independent consultant, Julie Raynaud | LinkedIn
28 We will explore integrating other data sources in the future, such as FOREST 500, Forest IQ and Trase.

Publicly available datasets developed by NGOs allowed us to estimate the potential deforestation and conversion of natural ecosystems in hectares of the companies we hold for six FERCs: beef and derived products, cocoa and derived products, coffee and derived products, palm oil and derived products, rubber, soy.
Unfortunately, we could not estimate the potential deforestation and conversion of natural ecosystems linked to timber (and derived products) production and/or consumption due to data quality issues of the deforestation coefficients. Even though we did not manage to quantify the potential deforestation and conversion of natural ecosystems in hectares of companies producing or consuming timber and derived products, we are already engaging with companies in these sectors where we found that they do not have strong deforestation policies and commitments.

Why did we devise our own approach, instead of using deforestation figures as reported by corporates themselves?

Several options exist to quantify, in hectares, the extent to which our corporate holdings drive potential deforestation and conversion of natural ecosystems. The first, and easiest option, consists of using deforestation figures reported by corporates, for example, via CDP Forests.

The issue is that it is often unclear how these figures are estimated by these corporates and whether their approach is comparable. Indeed, until recently, no standards on deforestation and land use conversion existed. With the recent publication of the GHG Protocol Land sector and Removals (draft) guidance and the Science-based target for Land guidance, this is likely to change.

To tackle this, we devise a standardised approach to quantify, in hectares, the extent to which our corporate holdings drive potential deforestation and conversion of natural ecosystems. Useful available data at the corporate level includes:

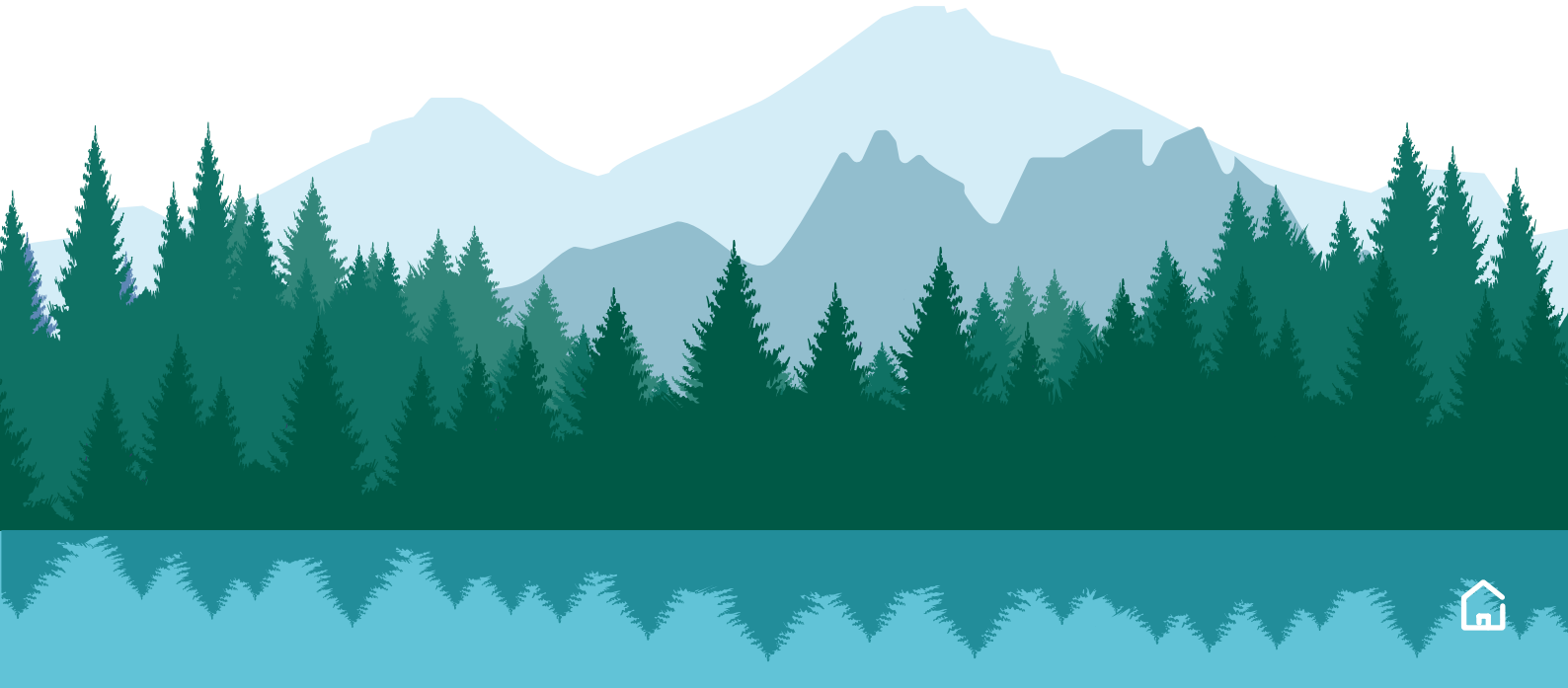
- Disclosed production and consumption data for each FERC, in tonnes, globally and where available at national and subnational levels

- Deforestation risk coefficient estimates, in hectares per tonnes produced/consumed, globally and where available at national and subnational levels, from available datasets and the literature[29].

Appendix I describes how we derived these coefficients and Appendix II how to interpret them.

29 Pendrill et al, 2022. Disentangling the numbers behind agriculture-driven tropical deforestation and trase.earth

Company A potential exposure to deforestation and conversion of natural ecosystems, in hectares	=	Quantity of FERC produced or consumed, by country and/or subnational where available, in tonnes	x	FERC-specific deforestation risk coefficient, country and/or subnational where available, in tonnes/hectare
BNPP AM corporate holdings production and consumption of FERCs, in tonnes	=	SUM of the production and consumption of FERCs of all the corporates in which we are invested and for which we have useable data, without taking into account ownership		
BNPP AM corporate holdings exposure to potential deforestation and conversion of natural ecosystems, in hectares	=	SUM of the potential deforestation and conversion of natural ecosystems of all the corporates in which we are invested and for which we have useable data, without taking into account our ownership share		



STEP 1: IDENTIFYING THE COMPANIES WE HOLD THAT ARE KNOWN TO BE EXPOSED TO AT LEAST ONE FERC

A. Methodology and coverage

We first identify the companies in which we invest that are known to produce or source at least one FERC. We do so by analysing companies covered by CDP, Trase, Forest 500 and Forest IQ.

Together, these four datasets cover **twelve FERCs and their derived products**: beef and derived products, chicken, cocoa and derived products, coffee and derived products, corn, cotton, palm oil and derived products, pork, rubber, soy, sugarcane, timber and derived products, as described in Appendix III. Of these, cocoa, palm oil, timber products, soy, cattle products and their derivatives are included in the new EU legislation on deforestation-free products. These datasets vary in their coverage of the FERCs, geographies, and actors of the agricultural supply chain. **We retained a wide scope at this stage of the research, reviewing each FERC and company even if covered by only one of the four datasets**.

We focus on four GICS sectors representing 24% of our total AUM. We selected ***consumer staples, consumer discretionary, materials, and energy***. These are covered by our deforestation target defined in our Global Sustainability Strategy and/or are often highlighted as the sectors consuming or producing the highest share of FERCs[30]. For example, the energy sector is exposed to palm oil and the materials sector to timber products.

Assessing the overlap between these datasets and our corporate holdings enables us to identify the companies in which we invest that are known to produce or source at least one of the FERCs in scope, given the selection methodology followed by the organisations responsible for these datasets. However, we recognise that other companies in which we invest which are not covered by these four data providers may also produce or source one or more of these commodities.

To produce aggregate figures of all of our corporate holdings, we aggregated our AUM in the companies knowingly exposed to at least one of the FERCs in scope.

B. Findings

273 companies in the four sectors are covered by, and report to, at least one of the above datasets, meaning that they are likely to produce or consume at least one FERC. **These companies represent 37% of our corporate AUM in the four sectors we are focusing on in this research paper (Appendix IV)**.

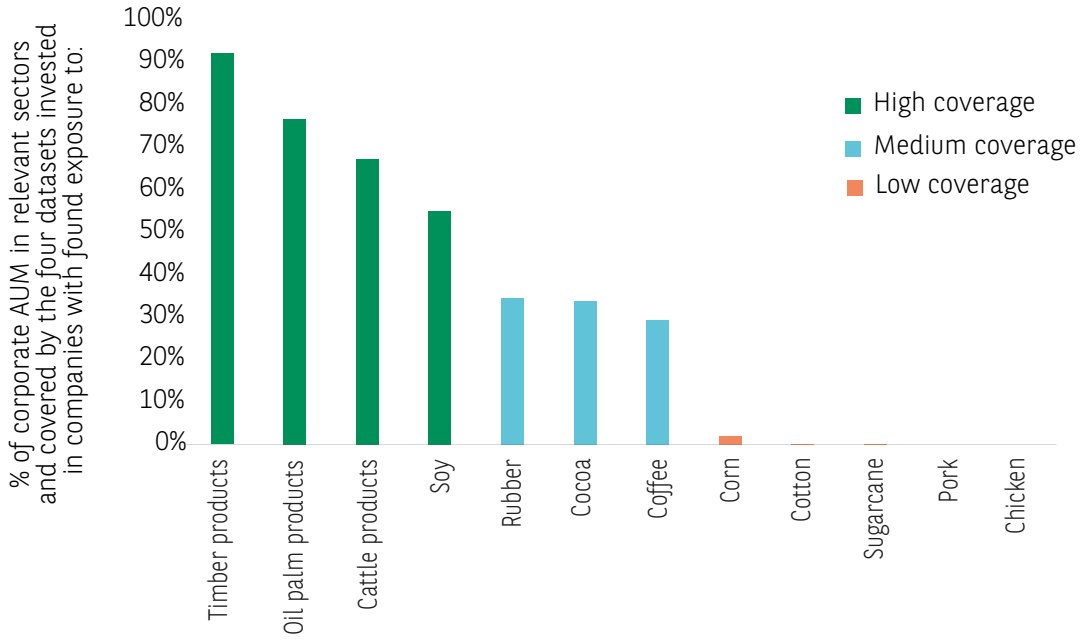
Importantly, this means that we do not know the extent to which the other 63% of our corporate AUM in relevant sectors is invested in companies that produce or source one or more of the twelve FERCs, although we expect the figure to be relatively low given that the four datasets we use (CDP, Forest IQ, Forest 500 and Trase) aim to cover the most important consumers and producers of FERCs.

Breaking down the data further: over 90% of our corporate AUM invested in these 273 companies were found to be exposed to timber and its derived products; over 70% to palm oil and its derived products; over 60% to cattle and its derived products; over 50% to soy; and about 30% to rubber, cocoa and coffee (Figure 6). This split can be explained by the fact that we invest in many downstream companies that buy multiple FERCs, in particular paper products for packaging. We found little exposure to cotton, sugarcane, pork and chicken.

30 We exclude the financial sector because of a lack of data in certain datasets and potential double counting issues. For an assessment of our financial sector AUM exposure to deforestation, see our biodiversity roadmap.

These findings are to be interpreted with care as they depend on the coverage of the datasets we use. For example, corn, cotton, sugarcane, pork and chicken are only covered by Trase, which focuses on traders rather than consumers. This means that our exposure to these FERCs is substantially underestimated. For example, we invest in many apparel and footwear companies that likely source large quantities of cotton, but this has not surfaced in our analysis because of the narrow focus of Trase on traders.

Figure 6: Percentage of our corporate holdings invested in companies with direct exposure to the twelve FERCs considered as part of this research paper within the relevant sectors. Orange: highly underestimated as the FERC is part of the scope of 1 out of 4 datasets used; Light green: potentially underestimated (2 out of 4 datasets); Dark green: covered by at least 3 out of 4 datasets.



This first step helps us to understand our exposure to companies sourcing and/or producing FERCs. **However, FERCs contribute differently to deforestation and conversion of natural ecosystems, with large variation at the country, subnational, municipality and field levels. Therefore, we need to go further than assessing data on production and sourcing exposure alone to understand the extent to which our corporate holdings drive deforestation and conversion of natural ecosystems.**

The second step to reach such a result consists in determining the quantity of FERC produced and/or consumed.

We know from our literature review that cattle expansion is currently the most important deforestation driver, contributing to around half of tropical agricultural deforestation, mostly in South America. Palm oil and soy account for at least a fifth of agricultural deforestation in both South America and southeast Asia. Finally, rubber, cocoa, rice, maize and cassava contribute to the remaining tropical agricultural deforestation[31].

31 Pendrill et al, 2022. Disentangling the numbers behind agriculture-driven tropical deforestation

STEP 2: IDENTIFYING THE QUANTITY OF FERC PRODUCED AND/OR CONSUMED

A. Methodology and coverage

We retrieve and consolidate disclosed data on FERC production and consumption quantities. To do so, we use CDP Forest disclosures as further examination of the datasets revealed that only CDP Forest Disclosure provided data on production and consumption quantities of FERCs in a format that can easily be used without further treatment. We will investigate in the future whether data from other datasets can be incorporated to expand coverage.

We also retrieve information, where disclosed, on sourcing and production locations. In the case that some companies provide only partial geographic disclosure, we allocate a percentage of quantities of FERCs to a specific country based on FAOstat. Details on how quantity data on FERCs produced or consumed have been gathered are available in Appendix I & VII.

Since CDP Forest covers a subset of seven FERCs and their derived products, the number of commodities we are able to include in step 2 decreases to these seven:

1. Beef and derived products
2. Cocoa and derived products
3. Coffee and derived products
4. Palm oil and derived products
5. Rubber
6. Soy
7. Timber and derived products

Companies that are likely to produce or consume the covered FERCs are invited to reply to CDP Forest every year, but this does not necessarily mean that they do. These data are self-reported by companies, and it is unclear whether all the data is audited. In 2022, we participated in the annual CDP Non-Disclosure Campaign designed to encourage companies with big impacts on climate, forests and water to improve their disclosure using the long-established and widely used CDP questionnaires. In relation to the engagement in which we were directly involved, we had an encouraging 19% success rate in terms of companies actually disclosing to CDP Forest as of 2022.

On average, nearly 40% of our corporate AUM in the four sectors found to be exposed to the FERCs on any of the four datasets report quantitative data to CDP on production and/or consumption[32]. Most of these companies report data for their entire operations. Data availability is higher on palm oil, and scarcer on cocoa and coffee (Appendix V).

32 Please note we could obtain quantitative data on FERC production and/or consumption for 152 companies representing 29% of corporate AUM in the 4 relevant GICS sectors, and that the scope of our corporate AUM does not include residual exposures in some funds delegated by BNPP AM or managed by BNPP AM affiliate entities.

On average, nearly 25% of our corporate AUM in these sectors found to be exposed to one or more FERCs on any of the four datasets report quantitative data to CDP on production and/or consumption in at least one country considered at risk by CDP. Again, there is more data available for palm oil and less for rubber.

In addition, 27% of our corporate AUM in these sectors report subnational exposure on palm oil in Indonesia (province), 22% on soy in Paraguay (department), Argentina (province) and/or Brazil (region), and 8% on cocoa in Ivory Coast (department) and cattle products in Brazil (region).

B. FERCs consumption and production quantities

When taking into account quantities based on disclosure, the companies we hold are exposed mostly to timber products and palm oil production, as well as companies consuming timber products, soy, palm oil and cattle products. Cocoa, rubber and coffee are the commodities to which they are the least exposed[33] (figure 7).

Most companies we hold are exposed to FERCs through their supply chains, except for palm oil, where we invest in three producers (due to our palm oil policy which has led to exclusion of many such producers) for which we could obtain production data; and timber products for which we could obtain production data for 20 companies that produce timber and related products that we invest in.

The 28 companies we hold for which we could retrieve data on cattle product consumption collectively sourced less than 10% of the global beef production in 2020. We estimate that 10% of the consumed cattle product quantities of our corporate holdings is likely to come from Brazil based on companies' disclosure and FAOstat, and less than 1% from Paraguay, which is a high-risk geography.

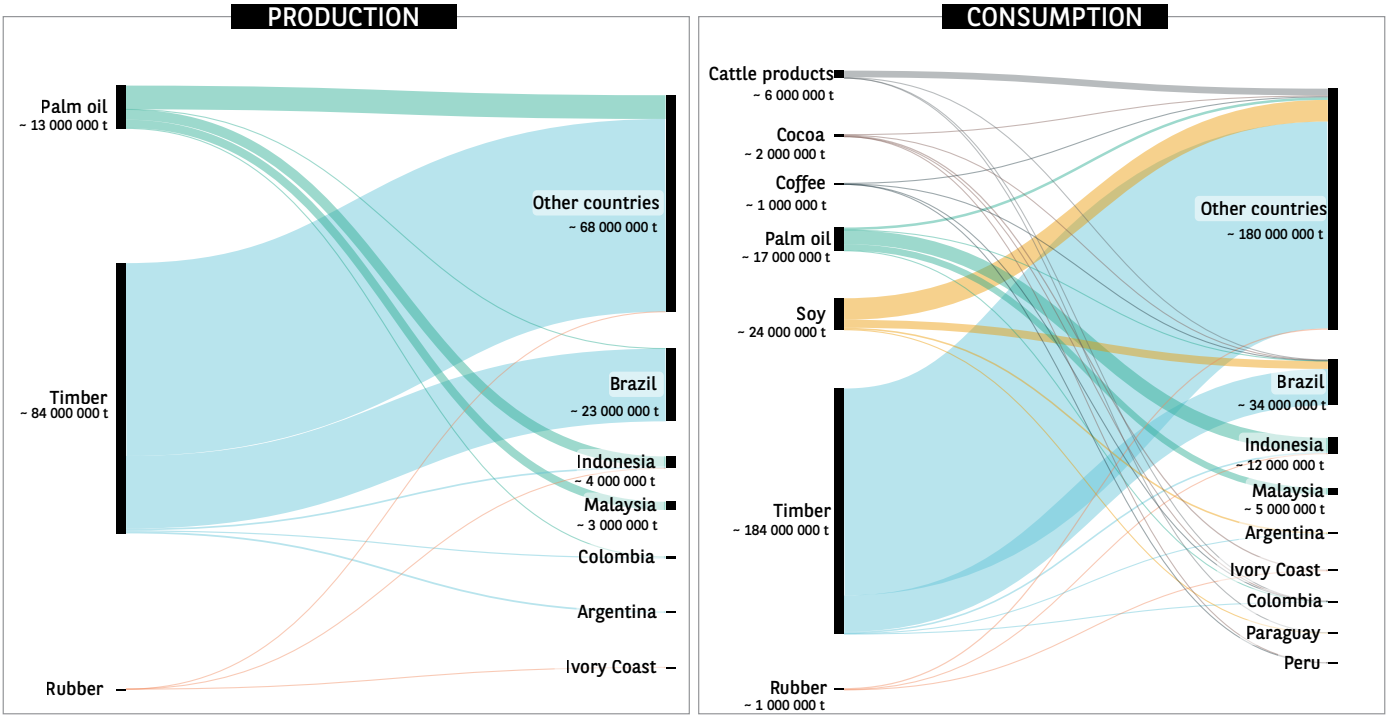
In addition, our agriculture policy has led us to reduce our exposure to beef producers.

The 10 companies for which we could retrieve data on cocoa consumption sourced about 30% of the global production in 2020. About half comes from Ivory Coast, based mostly on company disclosure.

The 85 companies for which we could retrieve data on palm oil consumption and production together represented about 40% of global production in 2020. About 60% of our corporate holdings palm oil consumption and production came from Indonesia (based on company disclosure and FAOstat data.)

33 Please note this scope does not include residual exposures in some funds delegated by BNPP AM or managed by BNPP AM affiliate entities.

Figure 7: Disclosed FERCs production quantities (left) and consumption quantities (right) in tonnes and geographical split (disclosed or estimated)



STEP3 : ESTIMATE THE POTENTIAL DEFORESTATION AND CONVERSION OF NATURAL ECOSYSTEMS LINKED TO FERC PRODUCTION AND/OR CONSUMPTION

We estimate the potential deforestation and conversion of natural ecosystems linked to the production and/or consumption of FERCs driven by the companies we hold (Figure 5). We multiply the quantities identified in STEP 2 with deforestation coefficients derived from Trase.earth and the work of Dr Pendrill, a recognized expert at Chalmers University of Technology. Please refer to Appendix I & II for details on the methodology used to estimate potential contribution to deforestation and the interpretation of deforestation results.

Since we could not derive deforestation and conversion of natural ecosystems coefficients for timber and derived products of sufficient quality, the number of commodities we can include in STEP 3 decreases to these six:

1. Beef and derived products
2. Cocoa and derived products
3. Coffee and derived products
4. Palm oil and derived products
5. Rubber
6. Soy

Using our proprietary methodology of estimation of deforestation and conversion of natural ecosystems, we found that the largest share of potential deforestation and conversion of natural ecosystems accounted for by our corporate holdings' production and consumption of FERCs is in Indonesia, Malaysia, Ivory Coast and Colombia (figures 8 & 9).

Palm oil is the FERC that contributes the most, by far, to the potential deforestation and conversion of natural ecosystems of our corporate holdings, followed by cocoa and cattle-related products. Palm oil and cattle products have been on investors' radar for some time, but these results suggest that cocoa should be a priority too. Cattle products do not contribute much due to our agriculture policy (explained above). As a result, many companies in which we invest source only by-products (fat or leather) which are attributed a lower potential deforestation and conversion of natural ecosystems impact than beef products.

Figure 8: Estimated amount of deforestation and conversion of natural ecosystems by companies in relevant sectors in our corporate holdings disclosing at least partial quantitative data on production and consumption (in hectares). Please note timber products are not included in this assessment due to methodology limitations (please refer to Appendix I – general approach for details)

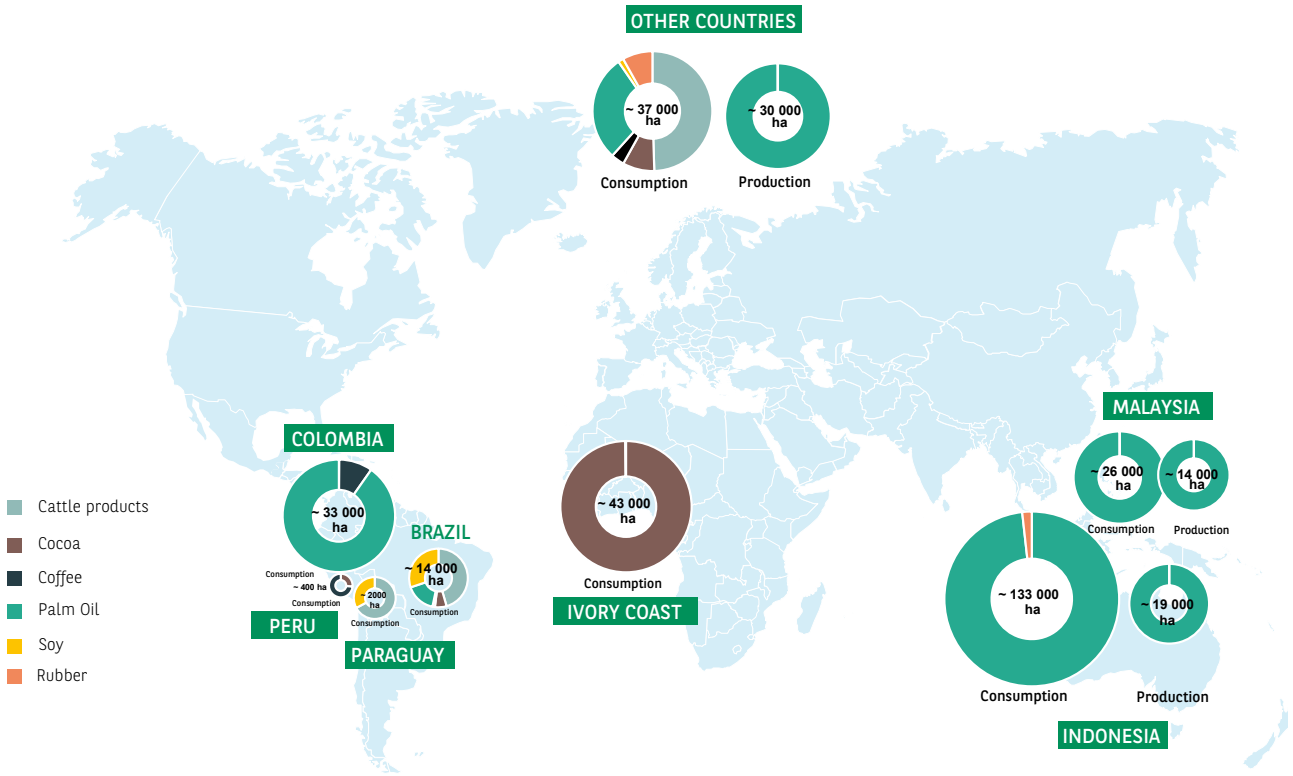
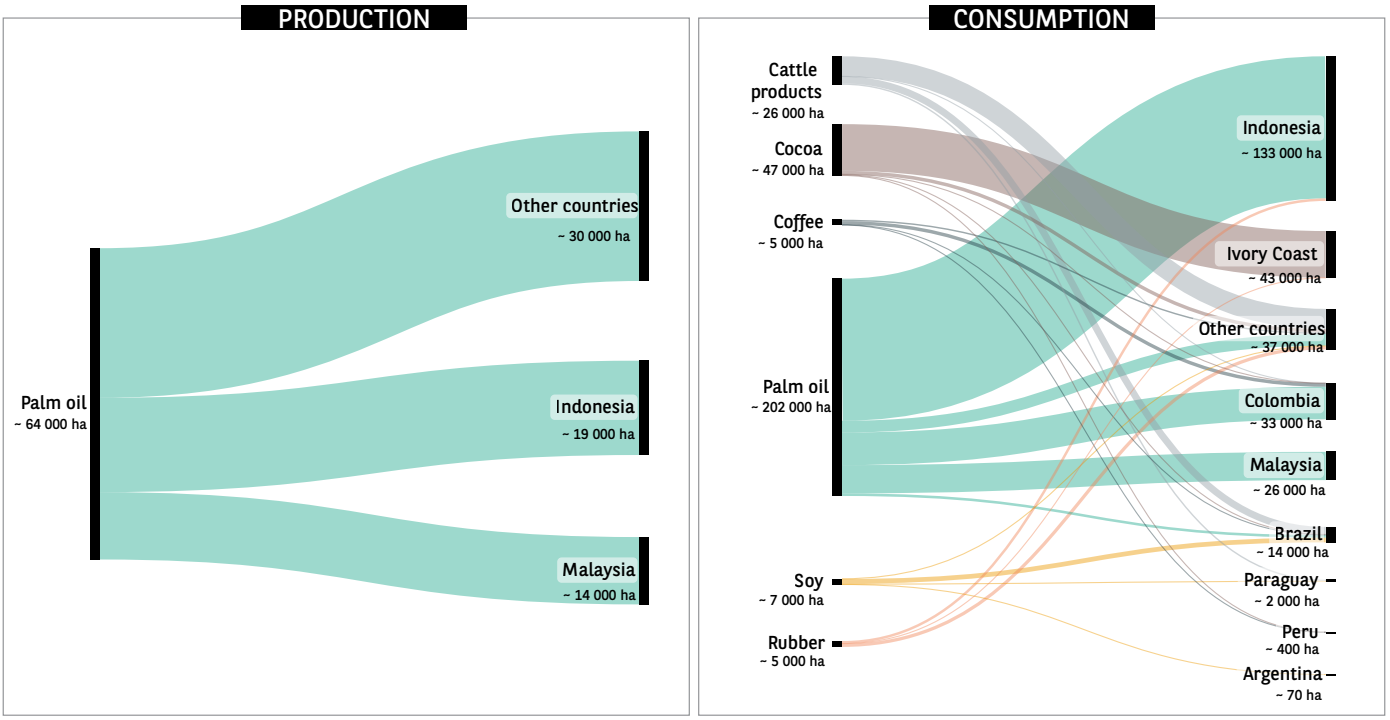
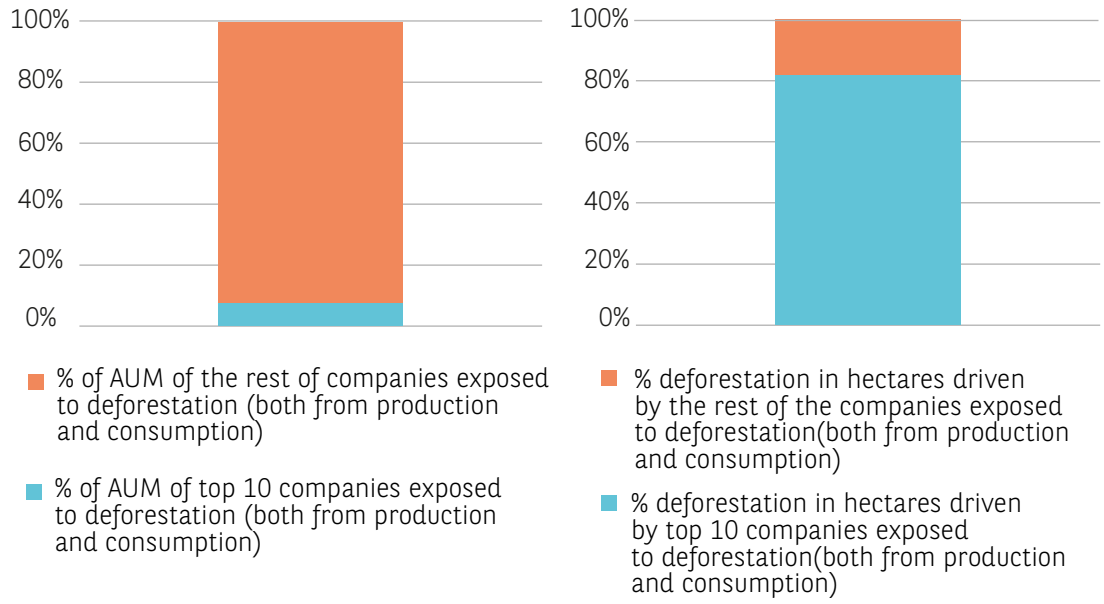


Figure 9: Estimated amount of deforestation and conversion of natural ecosystems by companies in relevant sectors in our corporate holdings production (left) and consumption (right) in hectares, and geographical split



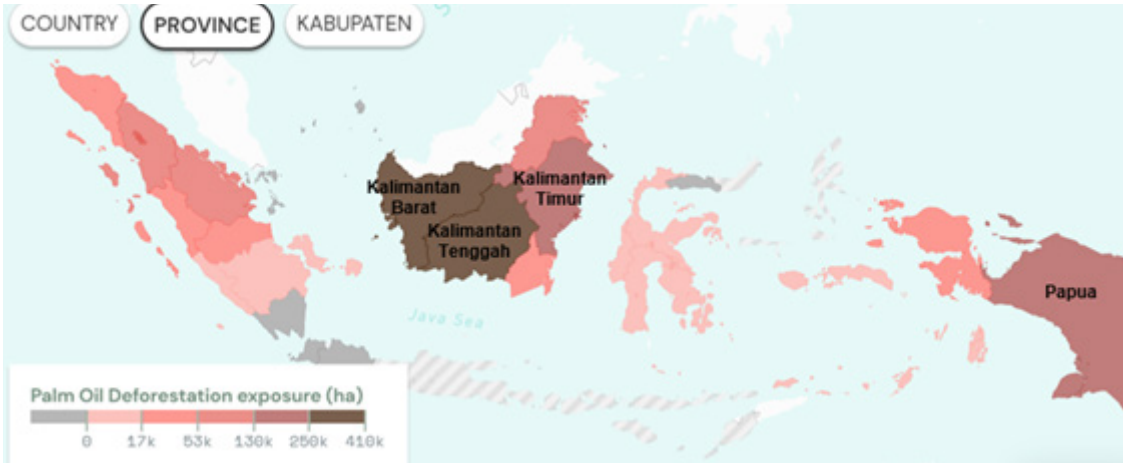
The potential deforestation and conversion of natural ecosystems driven by our corporate holdings FERC production and/or consumption is concentrated among a few companies, based on the data available. We find that the top-10 contributing companies represent 8% of our corporate AUM and 82% of the total potential deforestation to which companies in our universe are linked (figure 10).

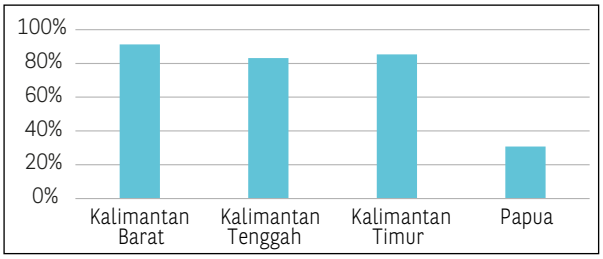
Figure 10: Top-10 companies in AUM (left) and hectares (right) exposed to deforestation (both from production and consumption).



We can drill down to understand the sub-national impacts of companies. For example, we find that most companies disclosing province level exposure for their palm oil sourcing and production source from provinces identified as most at risk in Trase.earth (Figure 11).

Figure 11: Sub-national exposure to deforestation risk – palm oil in Indonesia (above: Trase.earth data publicly available, below: BNPP AM exposure based on CDP Forest disclosure)





% of corporate AUM exposed to FERCs as per all datasets, in relevant sectors, with subnational exposure disclosure, exposed to region of production

STEP 4: OVERLAYING COMPANIES' IMPACTS WITH A HIGH-LEVEL REVIEW OF THEIR POLICIES AND PROCESSES

The above results indicate the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' FERC consumption and/or production, without considering the measures and policies that these companies may have already put in place to stem or end such nature loss.

We continue our assessment by combining our estimates of potential deforestation and conversion of natural ecosystems with policy-based indicators, as found in Forest 500, CDP, SPOTT and Forest IQ, and in line with the assessment in our Sustainable by Nature publication in 2021. As in step 3, we focused on six FERCs (beef and derived products, cocoa and derived products, coffee and derived products, palm oil and derived products, rubber, soy).

We look at two aspects:

1 - 'Deforestation-free' claims made by companies

2 - No deforestation commitments.

A. Assessing deforestation-free claims of companies

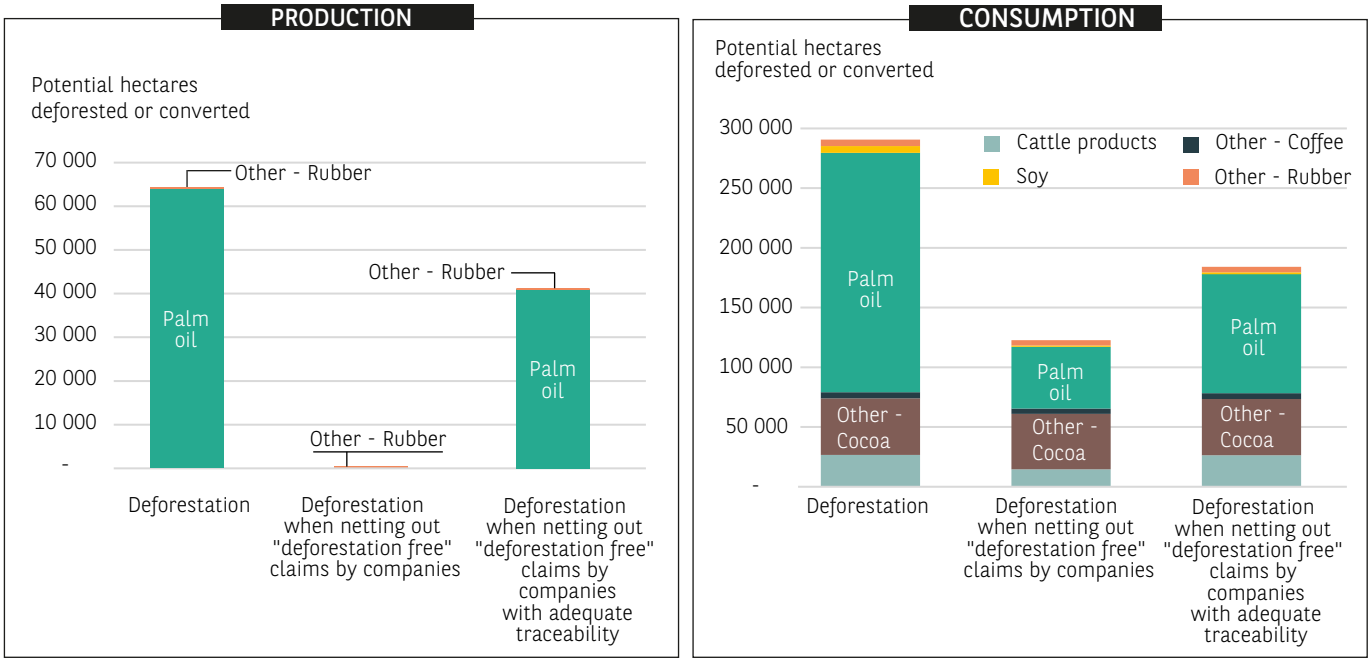
A growing number of companies that produce or source FERCs claim their supply chains are deforestation-free.

We investigate the actual share of the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' consumption and/or production of FERCs that is:

- Already deforestation-free based simply on the company's assertion that this is the case
- Already deforestation-free based on company's assertion and our assessment that a strong traceability system is in place[34].

34 See Appendix VIII for more details.

Figure 12a and 12b: Land deforested or natural ecosystems converted (in hectares) due to the consumption and production of FERCs by the companies in our universe, taking into account any deforestation-free claims by companies (second bar) and taking into account deforestation-free claims only from companies with strong traceability systems (third bar)



A large share of the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' consumption and/or production of FERCs is declared 'deforestation-free' by the companies reporting to CDP.

Figure 12a shows that most of the potential deforestation and conversion of natural ecosystems linked to FERCs producers in scope – effectively 100% - are covered by deforestation-free claims (second column). Figure 12b shows that for companies that consume the six commodities covered, around 60% of potential deforestation and conversion of natural ecosystems is covered by deforestation-free claims. These figures vary substantially by FERC, with over 70% of soy and palm oil consumption said to be deforestation-free compared to less than 5% for cocoa (second column).

Yet, this is not the end of the story. Indeed, additional research is needed to determine whether we, as an investor:

• Agree with the definition of 'deforestation-free' used by companies

• Can trust their deforestation-free claims.

For example, a preliminary assessment shows that:

- **Only about 37%** of the potential deforestation and conversion of natural ecosystems is declared 'deforestation-free' by **producer** companies that have 'strong' traceability systems (third column in figure 12a).
- **Only about 36%** of the potential deforestation and conversion of natural ecosystems is declared 'deforestation-free' by **consumer** companies that have 'strong' traceability systems (third column in figure 12b).

This raises questions over the credibility of these claims.

Additional research and engagement are needed with the most exposed companies to deforestation and conversion of natural ecosystems that:

- Do not claim 'deforestation-free' consumption or production
- Declare a large proportion of commodities 'deforestation-free', but do not have strong traceability systems in place based on our preliminary research
- Declare a large proportion of commodities 'deforestation-free' and have traceability systems in place, based on our preliminary research, to understand if it is truly adequate when digging deeper into their practices.

B. Assessing the impact of commitments

As a last step, we investigate what the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' consumption and/or production of FERCs would be in 2030 if all companies that have made a strong commitment 'walked the talk' and deliver on those commitments.

To do so, we :

1. Hold constant the production/consumption of relevant FERCs for companies that do not have a strong 'No deforestation' or 'No land conversion commitment' (or have no commitment);

2. Suppose that companies with a strong[35] commitment will respect it by the stated time horizon;

and

3. Assume that companies that state that they have already achieved their targets did so in 2023.

35 By strong commitment, we mean full coverage. See Appendix VIII for details

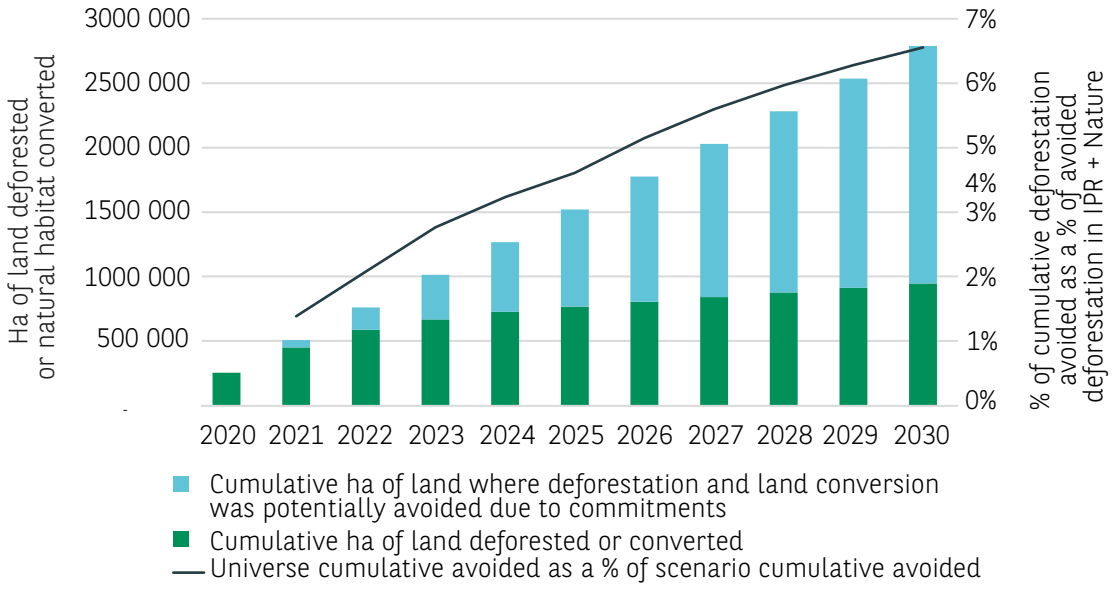
We then compare the projected rate of decrease of our corporate holdings potential deforestation and conversion of natural ecosystems to the required rate as embedded in the **Inevitable Policy Response (IPR) Forecast Policy Scenario (FPS) + Nature scenario** (see Box 2 for details).

- We find that if companies we hold with a strong 'No deforestation' or conversion' commitment walk the talk, nearly 1.8m hectares of deforestation or conversion of natural ecosystems will have been avoided by 2030 versus business-as-usual (representing a decrease of over 80% between 2020 and 2030). The largest contribution to this change, by far, is palm oil.

- The IPR FPS + Nature scenario estimates that between 2010 and 2020, global net deforestation was 4.7 million hectares per year, based on FAOStat data. It also estimates that between 2020 and 2030, on average 3.3 million hectares will need to be protected from deforestation each year. If we believe that the corporates we hold will deliver on their commitments, the deforestation avoided by these companies will contribute a growing share of avoided deforestation as required under the IPR FPS + Nature scenario of up to 6% in 2030, i.e., 1.8 million divided by about 33 million hectares, as illustrated in Figure 13. In addition, the cumulative deforestation of companies we hold should fall at a faster pace than what is required under the IPR FPS + Nature scenario to reach global climate and biodiversity goals.

These results are to be interpreted with care because corporates disclosing FERCs data are potentially more advanced, and more likely to have a commitment, than others. In addition, the assessment above, including the comparison with the IPR FPS + Nature scenario, is based on a range of strong assumptions and takes at face value corporate commitments.

Figure 13: Scenario analysis – What if corporates walk the talk on their sourcing commitments?



PROJECTING THE POTENTIAL DEFORESTATION AND CONVERSION OF NATURAL ECOSYSTEMS DRIVEN BY OUR CORPORATE HOLDINGS' CONSUMPTION AND/OR PRODUCTION OF FERCS

As outlined above, we have used the data to undertake a scenario analysis, as mentioned by the TNFD Guidance. Our objective was to investigate whether we can project the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' consumption and/or production of FERCs to 2030 and compare it to a scenario that captures what is needed to achieve global climate and biodiversity goals.

We used corporate commitment data to project the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' FERC consumption and/or production to 2030, using only commitments that have an appropriate coverage, relate to deforestation or conversion, and which are accompanied by the implementation of a traceability system. For companies that have no commitment (or a commitment that is not strong enough by our criteria, see Appendix V), we hold their potential deforestation constant. These hypotheses would need to be further refined in the future.

There are few publicly available model pathway scenarios for achieving both climate and biodiversity goals. According to the UN PRI, the "IPR FPS + Nature is the first integrated nature and climate scenario for use by investors. [...] It represents a 'beta version' scenario of what might happen when nature-related policy is incorporated into a climate-related scenario. [...] The IPR FPS + Nature incorporates key additional policy levers that support the nature transition – land protection, land restoration and nature markets." BNPP AM is one of IPR project's strategic partners.

Levers include government efforts to protect and restore land, the emergence of voluntary nature markets and a range of other policy measures at the nexus of land use, climate and nature (carbon pricing, bioenergy, diets, deforestation, sustainable agriculture and food waste).

Among the key outcomes for the environment of the IPR FPS + Nature scenario are the following:

- Planned policy action by governments would halt and reverse global biodiversity loss, potentially achieving 2000 levels of biodiversity intactness by 2045.

- Global forest land could increase by 273 million ha by 2050, with net deforestation ending by 2030, achieving levels of forest cover equivalent to levels in the early 1990s and reflecting a strong enforcement of legislation protecting forests in countries with high levels of deforestation.

Net zero is a key focus of organisations, governments and businesses worldwide. It is becoming clear that achieving net zero only through the reduction of CO_2 emissions by large corporates is unlikely to suffice. Unavoidable emissions will remain despite best efforts given the existing technological constraints. Therefore, significant investment in reforestation, afforestation and nature-based solutions will be critical to achieving net zero. With our new sustainable forestry partner IWC, we aim to offer clients an enhanced range of sustainable solutions that complement our private markets capabilities and contribute to reducing the net zero financing gap and enabling a just transition for nature.

EXPLORATORY OUTCOMES

The objective of this research paper is to determine whether publicly available data developed by NGOs can be used to quantitatively assess the extent to which our corporate holdings are driving potential deforestation and conversion of natural ecosystems.

We have shown in our key findings that it is possible for a large asset manager to do so based on publicly available data with higher-than-expected coverage. We made our methodology open-source to help other investors on their own journey towards deforestation-free portfolios. This investigation to quantify the potential deforestation and conversion of natural ecosystems driven by our corporate holdings' consumption and/or production of FERCs is another step on our biodiversity journey which we embarked on several years ago.

Our analysis does not take the final step of assessing the proportion of deforestation and conversion of natural ecosystems that we are exposed to, i.e., by multiplying the final figures by our holdings in each company to generate a 'financed deforestation' figure. It presents the total exposure of all investors in these companies. As such, we urge investors to use this type of analysis to inform their research and engagement, especially those joining the Nature Action 100 (NA100) initiative.

A. Closing the data gap

We acknowledge there are gaps and weaknesses, but these serve only to reinforce calls we and others have made for some time. There are gaps in company and sector coverage of the four organisations whose data we have used; we hope funders and regulators will come forwards soon to help close these gaps and thereby furnish investors (and other stakeholders) with the critical data we need to underpin our research and engagement. The data we have used from CDP Forest Disclosure is (for the most part) not audited; to have greater confidence in this data, we urge companies to subject this type of traceability data to third-party validation. We have not assessed all soft commodities nor all GICS sectors, but focused on those known to be the largest users of FERCs. To improve the scope and data quality of this analysis, the following avenues could be explored:

- Extending the potential deforestation estimate to timber products (including pulp and paper) as we could not go further than step two, i.e., identifying the quantity of timber produced and/or consumed in this analysis
- Exploring additional data sources such as the percentage of certified commodities. In particular, the ACOP (Annual Communication of Progress) reports submitted by RSPO members gauge their progress towards 100% RSPO certified sustainable palm oil
- Pushing companies to disclose quantitative information related to their sourcing and production of FERCs, through CDP Forest questionnaire, for example
- Devising a solid estimation approach for corporates that do not disclose any quantitative data on FERC sourcing and production
- Exploring whether a similar analysis could be done for deforestation driven by non-agricultural commodities, e.g., mining or in other GICS sectors.

B. Engaging with the laggards

Nevertheless, this study enables us to focus our research and engagement on the systematically most important contributors to potential deforestation and conversion of natural ecosystems, and create engagement and action lists. Several angles could be explored:

- **Inadequate disclosure**: Companies in relevant sectors that report only partial quantitative data and/or no quantitative data. We found that 97 companies out of 273 do not disclose any quantitative data related to their production or consumption of FERCs.

- **Inadequate policy commitments or traceability systems**[36]: Companies in our portfolios that potentially drive the largest share of deforestation and conversion of natural ecosystems and that do not have strong NDPE policies or traceability systems.

- I**nadequate claims**: Companies that claim deforestation-free production and consumption, but have not put in place strong traceability systems. We found that 35 companies out of 66 claim deforestation-free production and consumption, but do not have strong traceability systems in place.

Out of these companies, 32 are on the target list of Nature Action 100, a global investor engagement initiative which we helped launch. To address systemic risk in our portfolios, we believe collaboration with other investors is key.

In addition, it would be interesting to engage with companies with strong NDPE policies and traceability systems that potentially drive the largest share of deforestation and conversion of natural ecosystems to ensure that they 'walk the talk.'

Finally, an exploratory assessment of the projected potential deforestation impacts driven by our corporate holdings in 2030 finds that if all companies that have made a strong commitment deliver it, our corporate holdings (for which we have data) are likely to be on the right track in terms of curbing and halting deforestation and conversion of natural ecosystems. Engagement with companies and public authorities remains our priority to ensure that these companies walk the talk. Worryingly, we remain 'blind' with respect to a large number of our corporate holdings that do not report any data.

C. Educating portfolio managers and clients

This exploratory work has resulted in a systematic corporate investment screening tool that allows us to sense-check and continue the implementation of our biodiversity roadmap. In particular, we now have a better picture of the geographies (i.e., countries or sometimes even more precise areas such as a Brazilian region or an Indonesian province) from which the companies in which we invest are sourcing or producing FERCs.

We plan to apply this methodology to specific funds and client portfolios, taking into account our ownership of these corporates and comparing it to their benchmarks, and then using this information to engage with and educate clients on deforestation-related risks in their portfolios. The database that we have built allows us to provide tailor-made analysis for clients based on their specific portfolios.

We intend to use this research as a lens to identify potential investment opportunities in companies that are managing their FERC impacts and risks appropriately.

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36 It should be noted that these companies have been identified from among our holdings that disclose adequate data to allow us to make these assessments. Our holdings that lack adequate disclosure may include companies with a greater share of potential deforestation.

D. Leveraging the six pillars of our approach to sustainability to address deforestation challenges

Through the six pillars of our approach to sustainability, we will continue to seek to reduce the environmental impact of our investments, with a focus on forests.

- Over the past years, we have been working to quantify our dependencies and impact on biodiversity and forests. This study is an additional step to quantitatively assess the exposure of our corporate holdings to potential deforestation and conversion of natural ecosystems through corporate production and consumption of FERCs. Ideally, we would update this analysis regularly to follow up on the evolution of our investments. Ultimately, we aim to include these datasets systematically into investment decisions through our ESG scoring. In particular, through this analysis, we can provide portfolio managers with a better picture by FERCs of companies either lagging or leading efforts to halt deforestation and conversion of natural ecosystems.

- We engage with the highest-impact industries with a core focus on deforestation and water issues. We have joined the Investor Policy Dialogue on Deforestation (IPDD) initiative to target our engagement on deforestation with public agencies and industry associations in Indonesia, Brazil and consumer countries. We have been playing a leading role in developing and launching the collaborative investor initiative Nature Action 100 which aims to engage companies that are the systemically most important in reversing nature loss by 2030.

- Our palm oil, wood pulp and agriculture sector policies include criteria related to deforestation. In particular, BNP Paribas will require full traceability of beef and soy (direct and indirect) channels by 2025 in the Brazilian Amazon and Cerrado. We intend to review the potential to extend the scope of the BNPP AM target for relevant companies in our portfolios to comply with NDPE commitments for agricultural commodities (palm oil, soy, paper, timber, and beef products) to cocoa, coffee and rubber products.

- We are participating in private and public partnerships and collaboration initiatives to give more visibility to nature and learn how to better account for it. We helped launch the Task Force on Nature-related Financial Disclosures (TNFD), a corporate reporting framework to address nature-related risks.

- We are providing clients with a range of solutions targeted at solving biodiversity challenges. The BNP Paribas Ecosystem Restoration fund invests in companies that are engaged in improving aquatic, terrestrial and urban ecosystems services through their products, services or processes. Examples include sustainable forestry or alternative proteins. In addition, we took a majority stake in International Woodland Company. IWC will enhance our offering in sustainable timberland investments through our Private Assets unit.

APPENDIX I

General approach of our in-house methodology to estimate potential contribution to deforestation

Our corporate holdings' potential exposure to deforestation and conversion of natural ecosystems is estimated following the formula below:

Company A potential contribution to deforestation and conversion of natural ecosystems, in hectares	=	Quantity of FERC produced or consumed, by country and/or subnational where available, in tonnes	x	FERC-specific deforestation risk coefficient, country and/or subnational where available, in tonnes/hectare

In addition to deforestation and conversion of natural ecosystems analysis at national level, we also look at subnational exposure for some FERCs in some regions such as soy in Brazil (region), Argentina (province) and Paraguay (department), palm oil in Indonesia (province), cattle products in Brazil (region) and Paraguay (department), and cocoa in Ivory Coast (department).

GATHERING QUANTITY DATA ON FERCS PRODUCED OR CONSUMED

We use disclosed production and consumption data at FERC-level, and in certain cases national and sub-national levels. This data is available in CDP Forest, Forest 500, Forest IQ and Trase. These data are usually self-reported by companies, and it is unclear whether any of this data was audited. We prioritize CDP Forest as we find them the easiest to use without further treatment and will investigate how to integrate Forest 500, Forest IQ, and Trase quantitative data in the future.

One difficulty is the difference in coverage and partial overlap between CDP data, which is based on corporate voluntary disclosure, and Trase.earth data, which is based on supply chain data (trade datasets). In addition, CDP focuses on production and consumption, while Trase.earth investigates imports and exports[37]. We therefore use CDP data given its wider coverage, in terms of geography and number of companies in our universe, as well as its focus on production and consumption.

37 The overlap between imports and consumption on the one hand, and exports and production on the other hand, is not necessarily perfect, therefore we cannot make this assumption.

We also gather export and import data from Trase.earth where available, but keep it separate from CDP data, and do not disclose the results in this report. Only 17 companies in our universe are covered by Trase.earth given our main exposure to downstream companies, and most of these companies are covered in CDP Forest.

Our calculation procedure is as follows:

- We include only quantitative disclosures when reported in units that can be converted to tonnage using coefficients from the literature. When it is not, we exclude the disclosure.
- We quantify total exposure using full and partial disclosures[38].
- We quantify country-specific exposure as reported by the company, where available, and allocate the rest to 'Unknown countries'[39].
- We allocate our exposure to 'Unknown countries' to geographies with deforestation risk using FAOStat 2020 data.
- Where disclosed, we gather exposure data at subnational levels for soy in Brazil (region), Argentina (province) and Paraguay (department), palm oil in Indonesia (province), cattle products in Brazil (region) and Paraguay (department), and cocoa in Ivory Coast (department).
- We quantify the volumes of FERCs produced or consumed at subnational levels using average volume data from Trase.earth.

DERIVING DEFORESTATION AND CONVERSION OF NATURAL ECOSYSTEMS COEFFICIENTS

The GHG Protocol Land sector and Removals (draft) guidance and the Science-based target for Land guidance provide information on how to assess a company's contribution to land use change. The Protocols distinguish between measured land use change, at land management unit level ('direct land use change'), applicable in cases with high traceability, and estimated land use change ('statistical land use change').

While not mentioned in these guidance documents, it is clear that only the statistical land use change approach can be used by investors for a large universe to estimate portfolio-level deforestation exposure. This statistical land use change estimation could be, as a second step, completed by direct land use change data gathered though engagement with investees that use the 'direct land use change approach'.

38 As declared by the reporting company. Full disclosure refers to disclosure over the full perimeter of the company (geography and activities).
39 A number of companies also report for countries/ regions not considered at risk by CDP, we include this in our analysis.

Deforestation and conversion of natural ecosystems data at FERC-level is available in specialized publications, ad-hoc tools and life-cycle analysis datasets, based on a variety of methodologies. We evaluated publicly available sources[40] based on 1. FERC and country coverage 2. Frequency of updates 3. Recognised source, and 4. Whether it follows best practice as set out in the GHG Protocol and SBTN Land Guidance.

We find that Trase FERC deforestation exposure coefficients meet most, if not all, of our selection criteria. They are updated annually, derived by recognized institutions and used in peer- reviewed articles, cover a number of country-FERC with high deforestation risk, are publicly available and are derived using geospatial analysis on deforestation and crop expansion.

Yet, they cover only a small number of FERCs/countries. In order to increase the coverage of the data, we decided to combine Trase data with data derived by Dr Pendrill, as the two datasets have already been combined in prior work. Because Trase data relies on geospatial analysis, we prioritised it over Dr Pendrill's data and used the latter to 'fill the gaps', in line with recommendations and prior studies[41].

The differences between these two methods precludes any direct comparison[42]. In addition, it is essential to understand how these coefficients were derived and how to interpret the results. Appendix VI details the methodology used by Trase and Dr Pendrill and Appendix II provides a deeper analysis of the interpretation of the results.

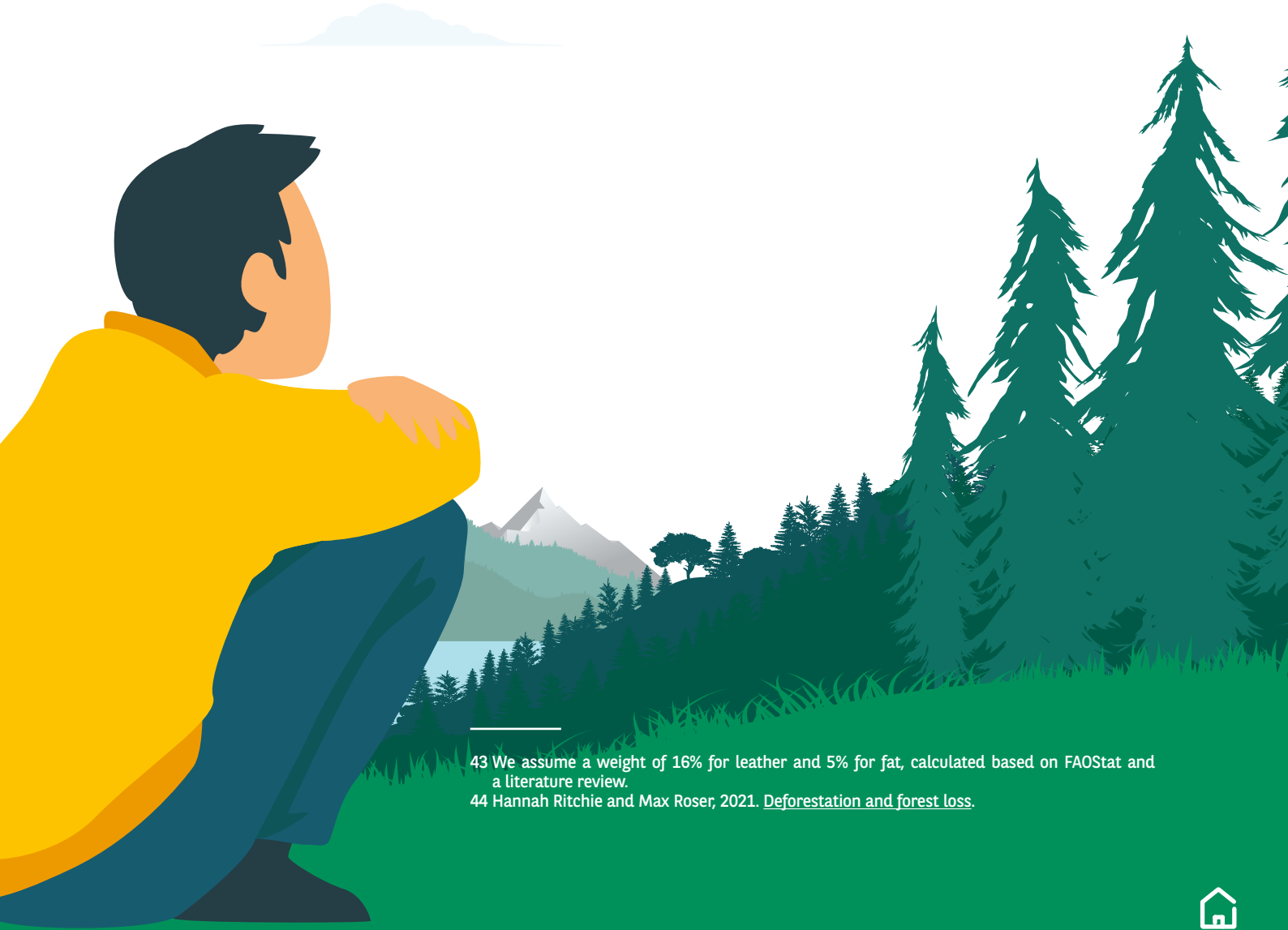
These coefficients represent averages and are uncertain. We found it difficult in some cases to understand how they were estimated by Trase and Dr Pendrill, in particular in relation to relative exposures, and we therefore had to make a number of assumptions:

Our calculation procedure is as follows:

- We derive country and FERC-specific deforestation coefficients using the approach described in Appendix II. Where available, we also use sub-national level coefficients.
- We apply these coefficients to disclosed production and consumption quantities (see above). When sub-national or country level data is not available, we use volume-weighted averages.
- We use the same coefficients for consumers and producers rather than trying to assign a relative impact to each as we believe that both types of actors are equally responsible. When adding consumption and production data, this may lead to double counting. This is why we have kept the figures separate throughout our assessment.

40 GHG Protocol, SBTN and from our own research
41 Trase, 2022. Assessing tropical deforestation in Germany's agricultural commodity supply chains
42 Trase, 2022. Approaches to assessing commodity-driven deforestation

- When production and consumption quantities relate to a derived product (e.g., roasted coffee beans or beef extracts), we apply a conversion coefficient to take into account losses in the transformation process. For example, we estimate that to produce 1kg of roasted beans coffee, 1.25kg of green coffee is necessary.
- When the quantities relate to a by-product (beef fat or leather), we apply an allocation coefficient – meaning that the deforestation footprint is only a fraction of that of beef[43]. We derive these allocation coefficients based on the relative weight of each by-product.
- We do not include timber products in our deforestation exposure assessment. That is because we believe we would have to make so many assumptions that the usefulness of the results would be substantially reduced. For example, we were not able to retrieve data on the share of timber products from plantations vs. natural forests in production/consumption disclosure, nor data on the share of recycled products vs certified products. In general, key challenges linked to timber relates predominantly to forest degradation rather than deforestation[44].



43 We assume a weight of 16% for leather and 5% for fat, calculated based on FAOStat and a literature review.
44 Hannah Ritchie and Max Roser, 2021. Deforestation and forest loss.

APPENDIX II

Interpreting deforestation results

Several challenges arise when looking for, using and interpreting deforestation and conversion of natural ecosystems coefficients at FERC level.

We wish to align as closely as possible to the deforestation definition of the Accountability Framework initiative[45] but we are limited by the definitions and assumptions embedded within the deforestation coefficients we used from our literature review.

WHAT DEFINITION OF DEFORESTATION AND CONVERSION OF NATURAL ECOSYSTEMS IS USED?

The definition and methods to measure deforestation and land use change varies across the different studies and datasets. According to Dr Pendrill, "There is no single way to distinguish between forests and non-forests, nor between deforestation and forest degradation, so different studies and monitoring systems rely on different definitions." **Trase coefficients, used for the most impactful FERCs and geographies, cover the primary loss of native vegetation, regardless of vegetation type (i.e., it encompasses forest, savannahs and grasslands), but Dr Pendrill uses only forest loss. Plantations are counted within the scope**.

Both datasets look at 'recent' deforestation, i.e., land that was deforested 15 to 5 years ago, depending on the FERC (5 years for soy and cattle products; 10 years for palm oil and 15 years for cocoa products in Trase; 5 years for all FERCs in Dr Pendrill's work).

HOW IS DEFORESTATION AT COUNTRY-LEVEL ATTRIBUTED TO AGRICULTURE AND FERCS? WHAT ARE THE KEY ASSUMPTIONS?

The attribution of deforestation and conversion of natural ecosystems to agriculture is fraught with difficulties.

The first challenge is the attribution of deforestation to the different drivers and co-drivers, such as urbanization in agricultural deforestation frontiers. **Both Trase and Dr Pendrill attribute deforestation to the primary driver, in that case agriculture**.

The second challenge is the attribution of the share of agriculture-driven deforestation that does not result in agriculture production, because of land speculation for example. **In Trase, deforestation that does not lead to agricultural production is not attributed to specific FERCs, and therefore not captured in the coefficients. In Dr Pendrill's work, it is**.

45 The Accountability Framework initiative (AFi) is a collective effort of diverse organisations dedicated to protecting forests, natural ecosystems, and human rights by making ethical production and trade the new normal. BNP Paribas is a member of the Private Sector Advisory Group that provides inputs to AFi.

The third challenge is the allocation to deforestation to the succession of FERCs produced on the same piece of deforested land years after the deforestation event. One single FERC is hardly responsible for deforestation in most cases. For example, soy expansion usually follows on cattle expansion in South America[46]. **Both Trase and Dr Pendrill allocate the deforestation to the FERC produced following the deforestation event but use different allocation procedures[47]. To harmonize both datasets, we annualize the results – meaning that the deforestation in year T is spread evenly to the FERC produced thereafter, over 5 to 15 years, depending on the FERC**.

The last challenge is allocating indirect deforestation, when a FERC is produced on land which is not deforested but its land occupation led to the deforestation in another location, for the production of another FERC. **In Trase, this is not taken into account. Dr Pendrill takes this into account and allocates it to the former – however, in the final estimate, it is not possible to disentangle whether crop expansion directly led to deforestation or whether it happened on other land uses, leading indirectly to deforestation**.

46 Song, XP., Hansen, M.C., Potapov, P. et al, 2021. Massive soybean expansion in South America since 2000 and implications for conservation.

47 In Trase, the deforestation event is fully allocated to all subsequent production (after a lag period to account for land clearance and agricultural establishment) over 5 to 10 years (unamortized results). In Dr Pendrill, the deforestation event is spread equally to all subsequent production (after a lag period to account for land clearance and agricultural establishment) over 5 years (amortized results).

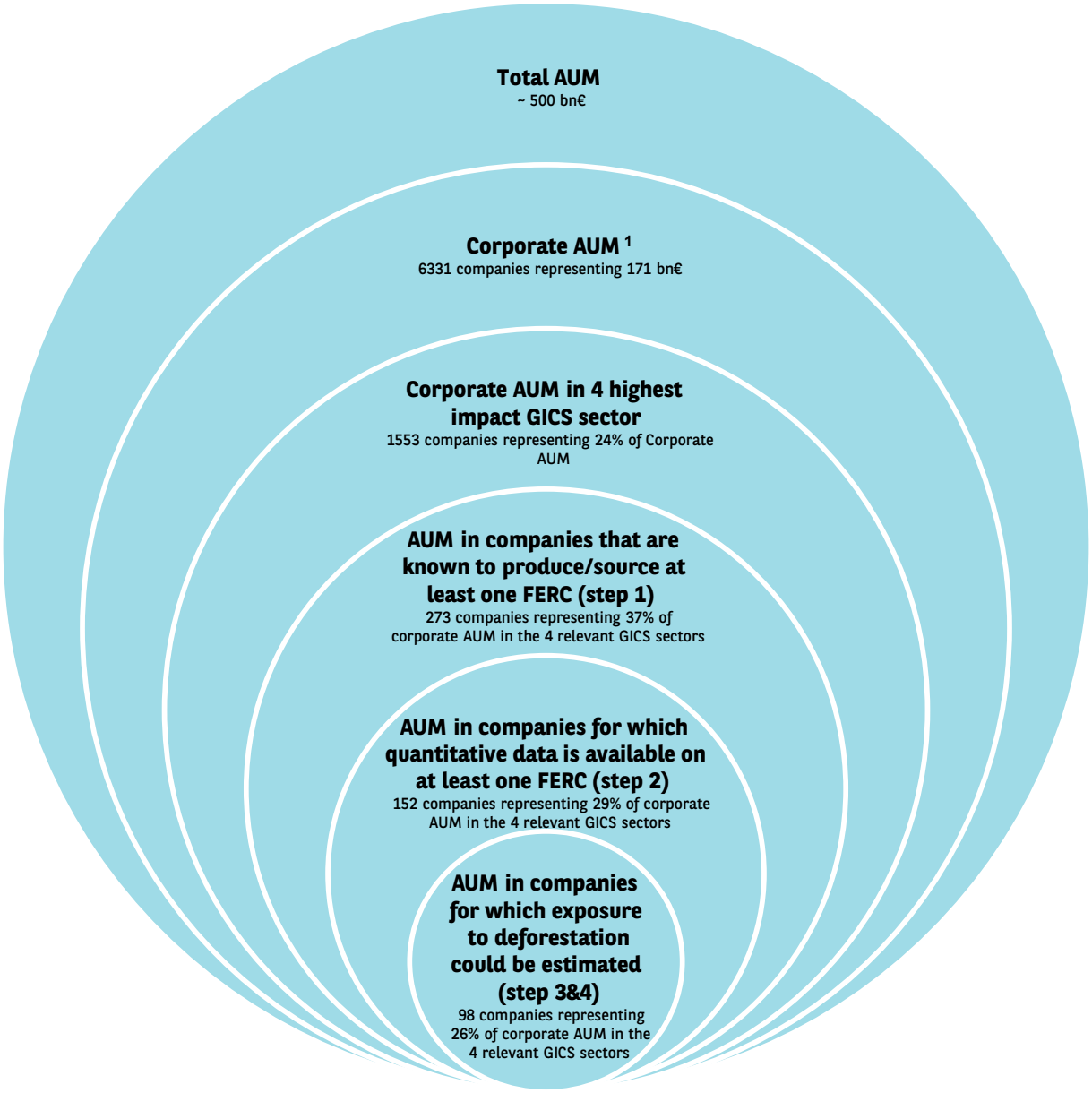
APPENDIX III

FERCs coverage in the selected datasets, and the EU Regulation (alphabetical order)

FERCS	CDP	TRASE	FOREST 500	FOREST IQ	WITHIN EU REGULATION SCOPE
Beef and derived products	Yes, including leather	Yes, excluding leather	Yes, including leather	Yes, including leather	Yes, including leather
Chicken	No	Soy exposure in chicken feed	No	No	No
Cocoa and derived products	Yes	Yes	No	No	Yes
Coffee and derived products	Yes	Yes	No	No	Yes
Corn	No	Yes	No	No	No
Cotton	No	Yes	No	No	No
Palm oil and derived products	Yes	Yes	Yes	Yes	Yes
Pork	No	Soy exposure in pork feed	No	No	No
Rubber	Yes	No	No	Yes	Yes
Soy	Yes	Yes	Yes	Yes	Yes
Sugarcane	No	Yes	No	No	No
Timber and derived products	Yes	Wood pulp only	Yes	Yes	Yes

APPENDIX IV

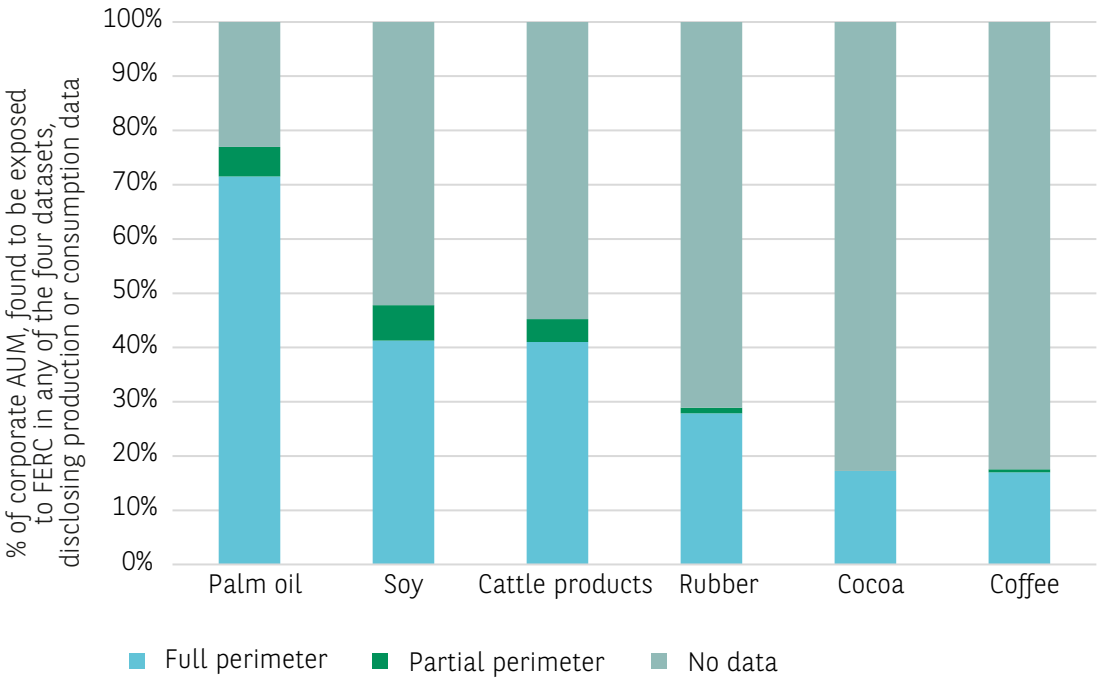
Percentage of AUM covered at each step of our proprietary methodology to quantify the extent to which our corporate holdings drive potential deforestation and conversion of natural ecosystems



1 Please note this scope does not include residual exposures in some funds delegated by BNPP AM or managed by BNPP AM affiliate entities.

APPENDIX V

Availability of full, useable, quantitative consumption and/or production data



APPENDIX VI

Description of Trase and Dr Pendrill's methodologies to derive FERC and country-specific deforestation coefficient

	TRASE	DR PENDRILL
METHODOLOGY		
Brief description	Trase's FERC deforestation indicator captures how much of a defined area (obtained via satellite imagery) used to produce a particular FERC overlap with areas that have been recently deforested. The parameter used to decide which years of deforestation are included in the analysis is termed the 'allocation period.' This accounts for the period of time over which deforestation is likely to have been caused by the target FERC.	Dr Pendrill uses geospatial analysis from GFC to determine the extent of deforestation at country-level. It then allocates deforestation to specific land use drivers (such as pasture and crop expansion), and at FERC level by using a statistical land balance model based on FAOStat data, also taking into account an allocation period (See Trase short description).
Definition of deforestation	Trase defines deforestation as the primary loss of native vegetation, regardless of vegetation type (i.e., it encompasses forest, savannahs and grasslands).	Tree cover loss (includes short term disturbances)
Deforestation data source	Geospatial analysis (multiple & local sources depending on FERC/location)	Geospatial analysis (GFC remote sensing)
Attribution of deforestation to agriculture	This step is not necessary as Trase approach is fully geospatial.	Statistical model using FAOStat attributes forest loss to expanding cropland, pasture or plantations based
FERC specific attribution	Spatial analysis (overlay)	Expanding crop land is further attributed to specific FERCs based on a statistical model using FAO Stat.
COVERAGE		
Commo/country[48]	**Brazil**: Soy, beef, chicken, pork **Argentina**: Soy **Ivory Coast**: Cocoa **Indonesia**: Palm oil, wood pulp **Paraguay**: Beef, soy **Subnational-level data on**: Brazil beef; Argentina soy; Ivory Coast Cocoa, Paraguay beef and Indonesia palm oil.	All in FAOStat
Granularity of deforestation exposure coefficients	Municipality; subnational; biome; country	Country
Latest year available	2017/2020 depending on FERC/country	2018

48 Pork and chicken is based on soy consumption

APPENDIX VII

Details of disclosed FERCs consumption and production quantities and geographical split (disclosed or estimated)

		Quantity (tonnes) of companies in relevant sectors in our corporate AUM		% of quantity with geographic disclosure vs % of quantity that was allocated to a specific country based on FAO Stat (cf. methodology in Appendix I)			
				% of production quantity...		% of consumption quantity...	
		Production	Consumption	With country-level disclosure	Where country-level exposure was estimated	With country-level disclosure	Where country-level exposure was estimated
Brazil	Cattle products	-	565 407	0%	0%	23%	77%
Colombia	Cattle products	-	36 708	0%	0%	11%	89%
Paraguay	Cattle products	-	24 721	0%	0%	9%	91%
Other countries	Cattle products	-	4 999 734	NR	NR	NR	NR
Brazil	Cocoa	-	159 465	0%	0%	98%	2%
Colomb a	Cocoa	-	653	0%	0%	0%	100%
Ivory Coast	Cocoa	-	940 352	0%	0%	98%	2%
Peru	Cocoa	-	1 636	0%	0%	0%	100%
Other countries	Cocoa	-	752 119				
Brazil	Coffee	-	327 139	0%	0%	96%	4%
Colombia	Coffee	-	81 405	0%	0%	96%	4%
Peru	Coffee	-	11 393	0%	0%	88%	12%
Other countries	Coffee	-	744 958				
Brazil	Palm oil	-	48 316	0%	0%	38%	62%
Colombia	Palm oil	-	284 684	0%	0%	72%	28%
Indonesia	Palm oil	3 175 277	10 414 159	100%	0%	78%	22%
Malaysia	Palm oil	2 576 063	4 842 987	100%	0%	80%	20%
Other countries	Palm oil	7 423 073	1 908 310				
Brazil	Soy	-	5 935 366	0%	0%	91%	9%
Argentina	Soy	-	1 185 668	0%	0%	82%	18%
Bolivia	Soy	-	12 719	0%	0%	2%	98%
Paraguay	Soy	-	548 710	0%	0%	91%	9%
Other countries	Soy	-	16 094 126				
Brazil	Timber products	22 711 941	27 216 259	100%	0%	99%	1%
Argentina	Timber products	565 195	95 597	100%	0%	78%	22%
Colombia	Timber products	378 197	586 619	100%	0%	98%	2%
Indonesia	Timber products	535 672	1 195 671	99%	1%	87%	13%
Other countries	Timber products	60 221 560	154 459 792				
Ivory Coast	Rubber	2	64 822	0%	100%	1%	99%
Indonesia	Rubber	8	360 942	0%	100%	42%	58%
Other countries	Rubber	28	917 585				

APPENDIX VIII

Criteria used to decide whether a corporate commitment or traceability-system is "strong"

	TYPE & COVERAGE OF COMMITMENT	TRACEABILITY
Forest 500	Zero gross conversion/deforestation commitment - company-wide	Have a commitment to develop and implement supply chain traceability systems, company-wide, within the next two years or already achieved
CDP	No conversion of natural ecosystems; zero gross deforestation/ no deforestation - company-wide	Have a commitment to develop and implement supply chain traceability systems, company-wide, within the next two years or already achieved
Forest IQ (incl. SPOTT)	No deforestation (zero-gross de-forestation OR conversion) or no conversion (zero gross conversion) - company-wide	NA

VIEWPOINT

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