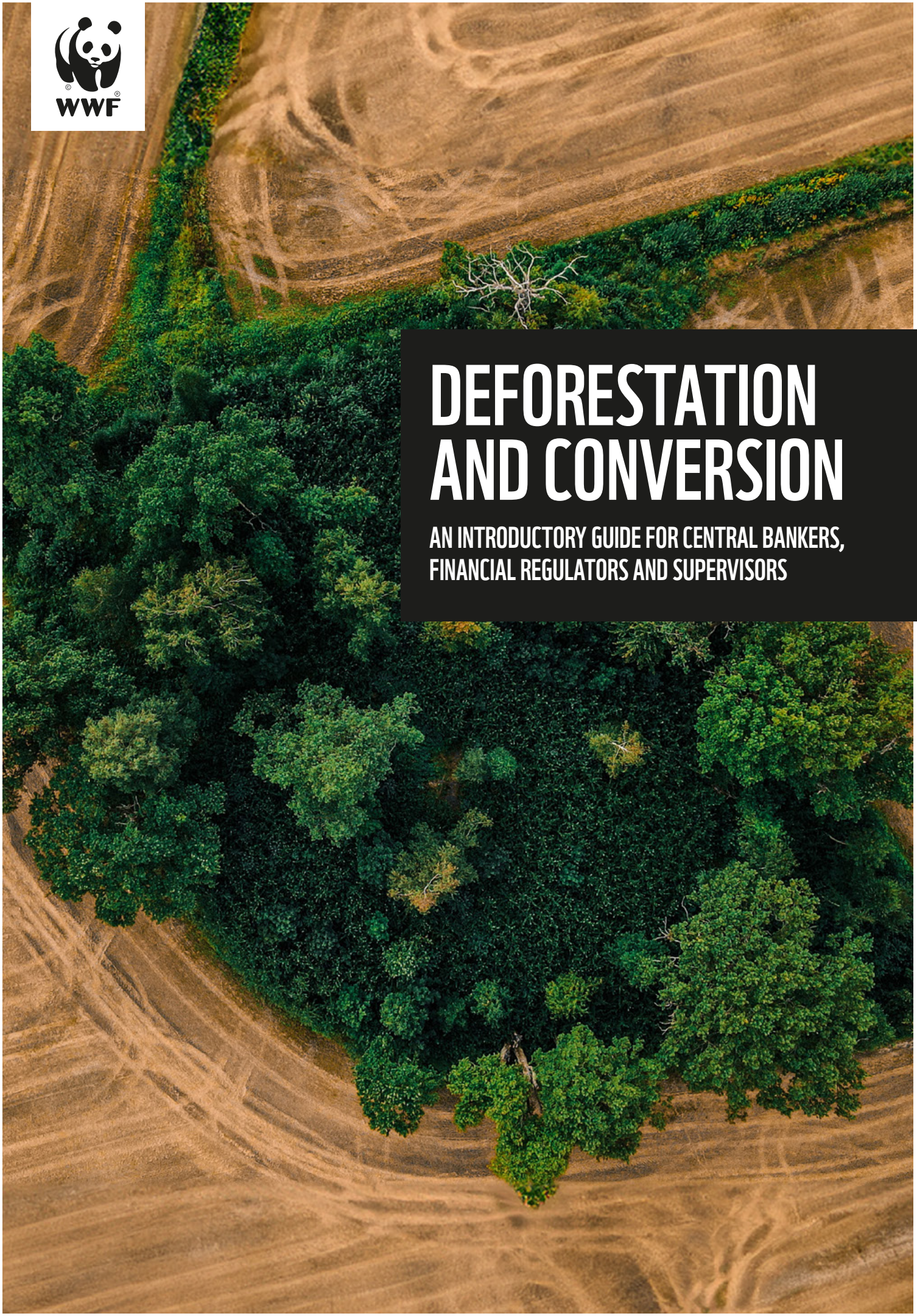

DEFORESTATION AND CONVERSION

AN INTRODUCTORY GUIDE FOR CENTRAL BANKERS, FINANCIAL REGULATORS AND SUPERVISORS

Authors:
- Maria Fernanda Contreras
- Maud Abdelli
- Pablo Pacheco
- Carolin Carella
- Pina Saphira

Advisory Group:
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- Section 2 (deforestation and conversion risk financial and system stability) and section 5 (an approach to metrics for deforestation and conversion financial risk management)
  - Dafermos, Y., Nikolaidi, M., Colesanti Senni, C., von Jagow, A. 2024. Macrofinancial causes and risks of deforestation, land conversion and water stress: analysing the role of central banks and financial supervisors through a stock-flow double materiality lens, SOAS University of London; University of Greenwich; University of Zurich; Vienna University of Economics and Business.
- Section 2. Deforestation and conversion red flags in the European Central Bank's collateral basket.
  - Research by WAV Recherchekollektiv.
- Section 3. Halting Deforestation through Finance: Regulatory Mapping of the Central Bank of Brazil
  - Stussi, M., Souza, P., and Contreras, M.F. 2024. Halting Deforestation through Finance: Regulatory Mapping of the Central Bank of Brazil. Rio de Janeiro: Climate Policy Initiative.

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A GFRI series for central banks and financial regulators and supervisors
WWF's Greening Financial Regulation Initiative (GFRI) is preparing a series of online publications aimed at central bankers and financial supervisors and regulators (hereafter, CBFS). The series aims to demonstrate how they can contribute to halting the crises in climate and nature, and prevent the aggregation of related financial risks, by helping to address the drivers of nature loss and climate change. Further guidance is to be published in 2025 to address freshwater-related challenges and ocean and marine ecosystem overexploitation, pollution and ecosystem change.

WWF Switzerland: The mission of WWF is to stop the global destruction of the environment and shape a future in which people and nature can live together in harmony. In order to fulfil this mission, WWF is dedicated to preserving global biodiversity. WWF also fights to reduce the use of natural resources to a sustainable level. In order to meet its objectives, WWF works at four levels: in the field, with companies, in the political arena and with the population. WWF regularly performs company ratings and thus assesses the sustainability performance of companies in important sectors.

Field of soy bean growing. Cerrado, Brazil. © Peter Caton / WWF-UK

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EXECUTIVE SUMMARY

Climate change and nature loss represent threats to the macroeconomy and the financial system. In addressing these threats, especially as they relate to long-term financial and price stability, central banks and financial regulators and supervisors (CBFS) have an important role to play.

CBFS have begun to take action on climate but are mostly neglecting the threats that broader environmental issues – including deforestation and the conversion of non-forest ecosystems – pose to financial system stability.

This report, part of a series of guidance for CBFS from WWF's Greening Financial Regulation Initiative, makes the case for action by CBFS on deforestation and conversion, and directs them towards tools that can help them take that action.

In its first section, the report sets out the importance of forests and other threatened terrestrial ecosystems to life on Earth in general, and humanity in particular. It also sets out the direct and indirect economic drivers of deforestation, including agricultural expansion, the role of finance in enabling that expansion, and how those drivers are transmitted along supply chains and through trade.

Efforts are underway to address these drivers, through international agreements, corporate deforestation commitments, and by environmental corporate disclosure frameworks. However, notwithstanding these efforts, few commitments have been met, disclosures tend to be voluntary, and there is little consensus on metrics.

The second section then presents reasons why CBFS need to play their role in addressing the crisis in deforestation and conversion. These are that:

DEFORESTATION AND CONVERSION RISK FINANCIAL AND SYSTEM STABILITY

Through the provision of capital, the financial system supports activities that directly drive deforestation and conversion, such as agriculture and mining, as well as sectors with an indirect impact on deforestation. Meanwhile, the financial system is highly dependent, through its lending and investments, on the ecosystem services provided by forests and non-forest natural ecosystems.

The physical and transition risks involved have the potential to pose systemic threats. By working to mitigate these adverse environmental impacts, CBFS will mitigate future financial risks linked to climate change and nature loss.

CENTRAL BANKS ARE INDIRECTLY CONTRIBUTING TO DEFORESTATION AND CONVERSION THROUGH THEIR MONETARY POLICY PORTFOLIOS

Deforestation and conversion can be embedded in central banks' collateral baskets and asset purchase portfolios. Holding as collateral securities issued by companies that drive deforestation and conversion means that CBFS are contributing to the associated impacts and risks.

The report includes a case study looking at the exposure of the European Central Bank's collateral basket to deforestation and conversion risk-commodities, and the measures it could take to reduce these exposures.

The third section describes the actions taken by some CBFS and financial institutions:

SOME CENTRAL BANKS AND FINANCIAL REGULATORS ARE ALREADY TAKING ACTION

A handful of central banks – including Bank Negara Malaysia, De Nederlandsche Bank and the Monetary Authority of Singapore – are beginning to take action on deforestation. Banco Central do Brasil has played a crucial role in encouraging sustainable practices within the Brazilian financial sector, including through measures that link the availability of credit to agricultural enterprises to their adherence to environmental regulations around deforestation.

Forest fire and deforestation to clear land for planting soybeans. Amazon Rainforest, Vilhenal. © Andre Dib / WWF-Brazil

ACTION TAKEN BY FINANCIAL INSTITUTIONS IS INCIPIENT AND REGULATORY SUPPORT IS REQUIRED

Similarly, some financial institutions are beginning to take action, but these efforts are generally nascent and inadequate. This raises the potential for cascading and compounding nature- and climate-related risks.

On the positive side, extensive, detailed guidance is available to support financial institutions in identifying, assessing and eliminating deforestation and conversion risks from their portfolios. There is much that CBFS can do to help the financial institutions that they oversee begin to address these risks.

The report describes 15 tools used by financial institutions to eliminate deforestation and conversion from their lending and investment portfolios. These tools can also be used by central banks to eliminate deforestation and conversion risks from their monetary policy portfolios. The report also considers metrics that CBFS can adopt or develop on deforestation and conversion that they can apply to financial system supervision as well as to their monetary policies.

RECOMMENDATIONS FOR CBFS

Finally, the report offers a number of recommendations for CBFS to address deforestation and conversion of non-forest ecosystems. In the short-term, they need to:

- Undertake research to understand and manage the risks associated with deforestation and conversion, including systemic risks.
- Issue clear supervisory expectations for financial institutions to integrate deforestation- and conversion-related risks in risk management processes, including in their strategies and risk appetite.
- Establish expectations that financial institutions estimate the environmental materiality of deforestation and conversion risks within their portfolios, and manage them accordingly.
- Issue supervisory expectations that disclosure requirements and due diligence include deforestation-related risks.
- Apply strict regulations and penalties for financial institutions that underestimate and insufficiently manage deforestation- and conversion-related risks.
- Assess the contribution of their own portfolios to deforestation and conversion and the associated financial risks.

Over the medium term, CBFS should:

- Establish expectations for financial institutions to develop deforestation- and conversion-free policies, with clear objectives and time-bound targets, covering all their financial activities and all deforestation-risk commodities.
- Account for deforestation- and conversion-associated risks within tools used by CBFS, such as their refinancing operations and reserves tiering.
- Account for deforestation and conversion within tools such as capital requirements and credit guidance, and within their monetary policy portfolios.

CONTEXT

"Central banks and supervisors have clear reason to be concerned and involved as economies and financial sectors are not isolated from these existential challenges. The degradation of nature, and actions aimed at preserving and restoring it, can have material macroeconomic, macroprudential, and microprudential consequences."
(NGFS, 2023)

It is widely recognised that climate change and nature loss represent threats to the macroeconomy and the financial system. In response to these threats, central banks and financial regulators and supervisors (CBFS), as guardians of long-term financial and price stability, should collaborate with policymakers and do their part.

However, there are disconnects between the actions of CBFS and the severity of the crises we face, as is reflected in the 2024 edition of WWF's Sustainable Financial Regulations and Central Bank Activities (SUSREG) Assessment, which evaluates how CBFS integrate climate, environmental and social risks in their practices. One of the most important of these is that the primary focus remains on climate, leaving behind broader environmental and social issues (WWF, 2023a). CBFS have been working to formulate regulations and actions within their monetary policy processes to address climate change-related risks, and they are beginning to explore how to address nature loss-related risks, but few CBFS have adopted an integrated approach (WWF, 2023a).

CBFS need to aim their interventions at the source of the problem: the drivers of nature loss and climate change. These drivers, and their interactions, are the source of the physical and transition risks that pose challenges to financial stability. It is therefore fundamental that CBFS make interventions that modulate the financial resources flowing to the activities associated with such drivers.

CBFS need to act urgently to integrate deforestation and conversion of non-forest ecosystems considerations, as these are the source of risks related to climate change and nature loss. Land-use change is one of the most important drivers of nature loss and climate change. Almost half (48%) of land-use change involves deforestation and conversion of non-forest ecosystems (hereafter conversion) (Winkler et al. 2021).

Around 23% of global human-caused greenhouse gas (GHG) emissions originate from agriculture, forestry and other land uses (IPCC, 2019). Moreover, the conversion of forests and other natural ecosystems is an important driver of biodiversity loss (IPBES 2019); the abundance of monitored forest-dwelling populations of vertebrates declined an average of 79% between 1970 and 2018 (WWF, 2022).

The financial system allocates resources to sectors that contribute and are highly exposed to deforestation and conversion, increasing financial risks associated with climate change and nature loss. This is the case where finance supports the expansion of commodity production driving tropical deforestation, particularly of beef, palm oil, rubber, cacao, soy, and pulp and paper.[1] According to Global Canopy, as of October 2022, 150 financial institutions provided US$6.1 trillion to 350 companies exposed to deforestation-risk commodities (Thomson et al., 2024).

Not only is the financial system fuelling deforestation and conversion, but its stability is in jeopardy due to the same risks that it contributes to creating and aggregating. As deforestation and conversion are sources of physical and transition risks – including those associated with climate change – financing the economic activities that create such deforestation and conversion contributes to the exposure of the financial system itself.

In this sense, it is not only of concern for CBFS that they address deforestation and conversion, but it is also in their interests if they are to fulfil their mandate to ensure financial and price stability.

1. This Guide emphasises the role of agricultural commodity-related deforestation and conversion, but this does not mean that the role of other sectors, such as construction and mining, should be overlooked.

ABOUT THIS GUIDE

This guidance sets out the necessary concepts, arguments and information to understand the role of deforestation and conversion in contributing to nature loss- and climate-related risks, and why this is within the scope of work of CBFS. In addition, it provides general guidance on how to identify regulations and policies that CBFS are already using to intervene to account for such risks.

In the **first section**, this report provides a synthesis of information on forests and other natural ecosystems that contributes to understanding why their loss is a source of financial risk. It also explains the important role of commodity production as the major driver of deforestation and conversion, and related human rights controversies.

In the **second section**, the guidance points out the four main reasons why CBFS need to address deforestation and conversion to fulfil their mandates. It provides a case study on how central banks are exposed to deforestation risks within their portfolios, specifically the case of the collateral basket of the European Central Bank (ECB).

The **third section** showcases approaches that financial institutions are taking to address deforestation and conversion, as well as the guidance and tools they are using, and provides a case study on the regulatory action that the Banco Central do Brasil (BCB, Central Bank of Brazil) has put in place through its rural credit policy, with a focus on deforestation and conversion.

The **fourth section** provides an analysis of useful tools that CBFS can apply to address the issue, as well as metric considerations. The **fifth section** sets out an approach that CBFS can take in selecting and/or creating deforestation and conversion metrics that can be applied both in their supervisory activities as well as in their monetary policies.

Finally, **section six** sets out recommendations.

This guidance is part of a wider project implemented by the GFRI on providing guidance to CBFS on deforestation and conversion.

The main focus of this guide is on deforestation in the tropics and subtropics and its main drivers, with limited references to deforestation in other regions and conversion of other valuable ecosystems. This does not mean that these issues are not important, but the chosen emphasis is a response to increasing global attention to tropical and subtropical forests, which account for two-thirds of global deforestation (Pacheco et al., 2021). However, most aspects considered in this guide, including its recommendations, can be applied to other forests and non-forest ecosystems. Subsequent phases of the project will focus on these, as well as issues around fragmentation.

Addressing deforestation and conversion requires multiple and complementary solutions, involving a range of stakeholders. In this report, we address the financial flows allocated to the global supply chains of commodities related to deforestation and conversion, and the crucial role that CBFS have to lead the necessary changes in the financial system, as crucial complementary and contributing measures.

In implementing the recommendations made in this guidance, CBFS will need to adapt the advice to their own contexts. Further phases of the project will focus on developing particular elements of this topic, such as tipping points, links with other drivers of nature loss and climate change, complementary public policies (environmental, fiscal, etc.) and case studies for the application of operational recommendations in specific jurisdictions.

This guidance does not attempt to create a separate line of work for CBFS to that developed for climate change and, more recently, for nature loss. Instead, it suggests, building on relevant existing climate and nature frameworks, a solution that works from a driver perspective, which can contribute more effectively to the most pressing issues stemming from both crises.

ACRONYMS

BCB	Banco Central do Brasil, or Central Bank of Brazil	**ECB**	European Central Bank
CBFS	Central banks and financial regulators and supervisors	**GFRI**	WWF's Greening the Financial Regulation Initiative
CPI	Climate Policy Initiative	**GHG**	Greenhouse gas emissions
DCF	Deforestation and conversion free	**SUSREG**	Sustainable Financial Regulations and Central Bank Activities Assessment

01: IN A NUTSHELL: FOREST AND NON-FOREST NATURAL ECOSYSTEMS, DRIVERS AND RESPONSES

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SECTION 01: IN A NUTSHELL: FOREST AND NON-FOREST NATURAL ECOSYSTEMS, DRIVERS AND RESPONSES

Sustaining life on Earth as we know it would not be possible without forests. The high dependence humans have on these ecosystems for our social, cultural and economic fulfilment is palpable and undeniable. Other terrestrial ecosystems, such as grasslands, deserts and tundras, as well as marine and freshwater ecosystems, including wetlands, are also fundamental to sustaining life on Earth. Most of these ecosystems have less representation and protection than forests in international commitments and are highly threatened by conversion. This section sets out the importance of forest and non-forest ecosystems, the main drivers that jeopardise them, as well as responses to halt their loss.

Seven-colored tanager (Tangara fastuosa) – vulnerable species. Serra do Urubu, Brazil. © WWF / Humberto Tan

FORESTS IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW?

Forests cover 31% of the world's land surface (FAO, 2022).

Forests and biodiversity: Forests are home to 80% of terrestrial biodiversity (WWF, 2023e).

Forests and humans: It is estimated that around 1.6 billion people live close to forests and woodlands (WWF, 2023e). Forests provide more than 86 million jobs. Three-quarters of leading food crops (and 35% of global food production) benefit from animal pollination (Ritchie, 2021d), while 1 billion people depend to some extent on foods from organisms that rely on forest ecosystems for their habitat (mammals, insects, plant products, mushrooms, fish) (FAO, 2020).

Forests and climate change: Forests are the second largest storehouse of carbon after oceans. Protecting existing forests would provide 14% of the additional global warming mitigation needed by 2030 to meet the 1.5°C target (FAO, 2022).

Forests, water and soil: Forests play an important role in the water cycle, transporting water vapor as rainfall to other regions (a phenomenon known as "flying rivers") and, by filtering pollutants, in the quality of water. In addition, they produce the topsoil that is needed to grow plants and crops and help prevent landslides (WWF, NA). Watersheds with more forest cover have higher groundwater recharge, lower stormwater runoff and lower levels of sediment and nutrients (Brett et al. 2005; Matteo et al. 2006 cited in Qin et al. 2016).

DEFORESTATION IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW?

Deforestation and main drivers: Over the course of the 20th century, the world lost 488 million hectares of tree cover, equivalent to 12% of the total (WRI, 2024b). An assessment of global forest loss between 2001 and 2015 finds that 27% of deforestation was due to the expansion of commodity production, 26% to forestry, 24% to shifting agriculture and 23% to wildfires (Pacheco et al., 2021). Most deforestation takes place in the tropics and subtropics: from 2000 to 2018, two-thirds of total global forest cover loss took place in these regions (Pacheco et al., 2021).

Deforestation and biodiversity loss: The abundance of monitored forest dwelling populations declined an average of 79% between 1970 and 2018 (WWF, 2022).

Deforestation causes climate change: Agriculture and associated forest land-use change are responsible of 25% of global GHG emissions (WWF, 2023e).

Deforestation decreases the quality and quantity of freshwater: The world's major watersheds lost an average of 6% of their tree cover from 2000 to 2014; only 31% of the world's watersheds are still covered by forests (WRI, 2017; Qin et al. 2016).

Deforestation decreases the quality and fertility of the soil: removing forest cover affects soil and its chemical and physical properties, changing the quality and quantity of the ecosystem services they provide, such as soil fertility and nutrient cycling, which are important for agriculture (Crasswell, et al., 2001; Kassa et al., 2007; Rocha et al., 2023).

NON-FOREST ECOSYSTEMS IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW? GRASSLANDS

Grasslands: Natural grasslands account for up to 49% of the Earth's terrestrial area (GRaSS, 2024). Examples of grasslands ecosystems include the Eurasian and Patagonian steppes, North American prairies, the Pampa and Chaco plains in South America, and the Serengeti in East Africa.

Grasslands and biodiversity: Grasslands account for around 30% of Key Biodiversity Areas globally (Key Biodiversity Areas Data, 2023, referenced in GRaSS, 2024).

Grasslands and humans: They are home to around 792 million people (White et al. 2000, referenced in Gibson et al. 2019) and directly support the livelihoods of around 800 pastoralist groups (GRaSS, 2024).

Grasslands and climate change: They store almost the same amount of carbon as forests, at around 30% of total terrestrial carbon (mostly underground), which makes it less vulnerable to droughts and fires than forests (Overbeck et al., 2015; Dasgupta, 2021 and Kerlin, 2018, referenced in WWF, 2022b).

Grasslands, water and soil: Grassland plants have deep and dense roots, which filter rainwater, while allowing it to penetrate deeply (GRaSS, 2024). Their root systems support resilience against droughts and floods, and prevent compaction and erosion, lowering the possibility of sediment discharge and promoting soil stability and fertility (GRaSS, 2024).

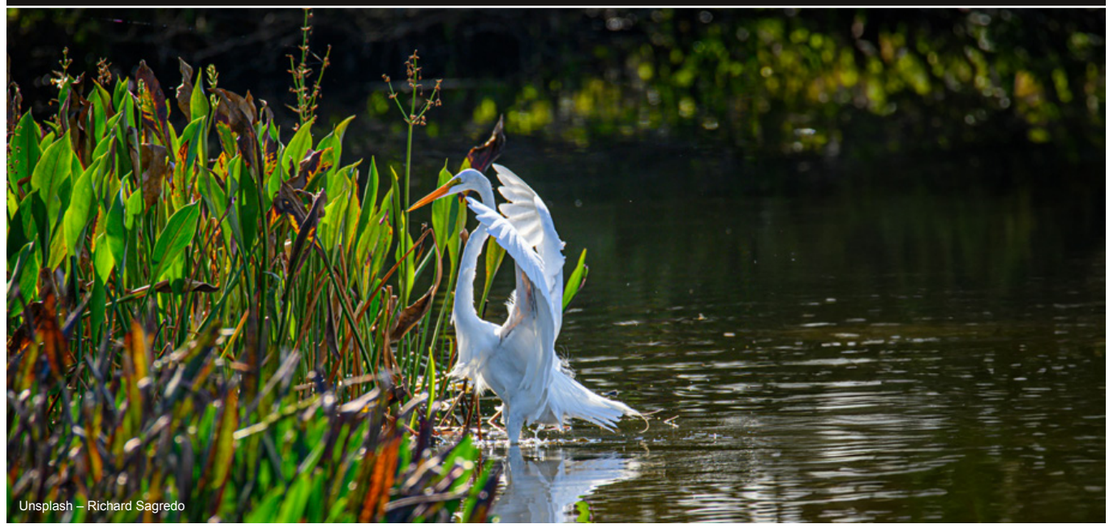
CONVERSION OF NON-FOREST ECOSYSTEMS IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW? GRASSLANDS CONVERSION

Grassland conversion and main drivers: Half or all major grasslands has been lost. The main drivers of this loss are agricultural conversion for commodity production, alteration of grazing regimes and afforestation (GRaSS, 2024). Only 8% of grassland is protected. As referenced by Bengtsson et al. (2019), more than 20% of the grasslands in southern Africa has been cultivated while 60% has been irreversibly transformed to other land uses; 90% of the semi-natural grasslands in northern Europe has been lost; 80% of North American grasslands has been converted to cropland; 43 million hectares of Eurasian steppe have been converted and 60-80% of grasslands in South America is degraded.

Grassland conversion and biodiversity loss: Since 1970, bird populations in grasslands have declined more than those in other terrestrial biomes (NABCI, 2022 referenced in GRaSS, 2024).

Grasslands conversion and climate change: Avoiding the conversion of grasslands would contribute to climate change mitigation by preventing up to 3.35 to 4.25 gigatons of carbon dioxide equivalent by 2050 (Grassland protection, 2020 referenced in GRaSS, 2024).

Grasslands conversion, water and soil: Grasslands conversion also jeopardises water provision. When converted for agriculture and livestock, water infiltration to the soil reduces by approximately 50% (Sirimarco et al., 2017).



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NON-FOREST ECOSYSTEMS IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW?
WETLANDS

Wetlands and humans: Wetlands provide livelihoods for one billion people (RAMSAR, 2020).

Wetlands and biodiversity: Even though they only cover 7% of the planet, wetlands are host to, or provide breeding grounds for, 40% of the world's flora and fauna (RAMSAR, 2020; WI, 2022). Their buffer areas are home to 25-30% of the world's biodiversity (RAMSAR, 2009).

Wetlands and humans: Wetlands provide a myriad of ecosystem services. For example, they can improve water quality as they remove pollutants from surface waters by trapping sediments and removing nutrients and chemicals.

Wetlands and climate change: Wetlands act as carbon sinks. Peatlands (inland wetlands) only cover 3% of the Earth's surface but store around 30% of all land-based carbon, helping to mitigate climate change (UNEP, 2022). Mangroves and coastal wetlands annually sequester carbon 10 times faster than mature tropical forests (NOAA, NA). By acting as a sponge, wetlands can protect infrastructure, and also provide protection from climate change impacts such as floods and storm surges (RAMSAR, 2017).

Wetlands, soil and water: Wetlands' vegetation is effective in removing excess nutrients from water, such as those from agricultural and lawn fertilisers (Vermont, NAa). Ninety percent of the sediments present in runoff and streamflow may be removed if water passes through wetlands (Vermont, NAb). Vegetation in wetlands along the shores of lakes and rivers protects against erosion caused by waves, especially during floods and storms.

NON-FOREST ECOSYSTEMS IN A NUTSHELL: WHAT DO CBFS NEED TO KNOW?
WETLANDS CONVERSION

The main drivers of wetlands conversion: Wetlands are disappearing three times faster than forests, which makes them the most threatened ecosystem. Since 1970, 35% of wetlands have been lost (RAMSAR, 2020). The main drivers of wetland conversion are drainage and infilling for agriculture, livestock farming and forestry, as well as the construction of dams (RAMSAR, NAa).

Wetlands conversion and biodiversity loss: Wetlands loss has affected 81% of inland wetland species and 36% of coastal and marine species (WI, 2022).

Wetlands conversion and climate change: Drainage and infilling of wetlands also contributes to GHG emissions. For example, wetland drainage is responsible for around 4% of anthropogenic GHG emissions (Joosten et al., 2016 referenced in Günther et al., 2020).

Wetlands conversion, water and soil: Wetlands conversion can result in a number of impacts on water and soil quality. These include: erosion and increased sediment; an oversupply of nutrients, which can lead to rapid growth of plants and algae, and the production of toxins that affect wildlife and humans; rising of water tables; and increased soil salinity (hindering vegetation growth).

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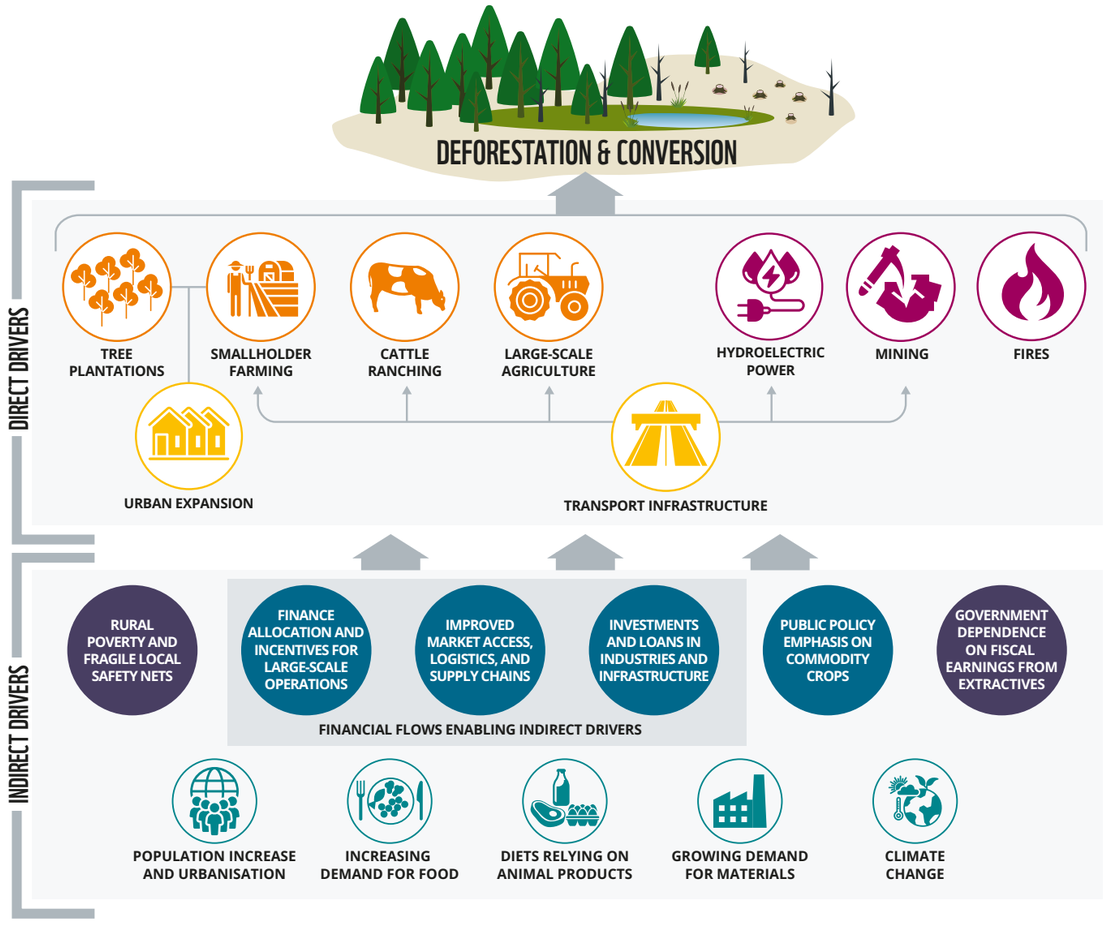
DEFORESTATION FRONTS AND MAIN DRIVERS

Deforestation in the tropics and the sub-tropics accounted for at least two-thirds of global forest cover loss between 2000 and 2019, underscoring the importance of addressing forest loss in these regions (Pacheco et al., 2021; Curtis et al., 2018). WWF's Deforestation Fronts study (Pacheco et al., 2021) identifies 24 fronts in the tropics and sub-tropics, with a significant concentration of deforestation hotspots, where forest fragmentation[2] also occurs, and where remaining forests are under threat. This analysis does not include boreal forests, where fires and forestry are the main drivers of forest loss (WRI, 2024b).

Drivers of deforestation can generally be classified as either direct or indirect. The former concerns the effective change in land use from forests and the latter encompass overarching factors (e.g. international demand). In the tropics and sub-tropics, the main direct drivers of deforestation are agriculture and forestry (large scale, smallholder farming and plantations). Between 2011 and 2015, the expansion of agriculture in these regions was associated with 90% of deforestation. Other direct drivers within the 24 deforestation fronts include extractive activities (logging, fuelwood and mining), infrastructure and urbanisation (which includes transport and hydroelectric power as well as urban expansion) and wildfires (Pacheco et al., 2021; Curtis et al., 2018) (See Figure 1).

2. Forest fragmentation refers to the breaking of large, contiguous forested areas into smaller forest patches, due to, for example, construction of roads, agriculture, etc. Fragmentation disrupts forest processes and makes them less resilient.

FIGURE 1: DIRECT AND INDIRECT DRIVERS OF DEFORESTATION



Source: Pacheco et al., 2021

While agricultural expansion is the most significant direct driver of deforestation, the specific activities and actors impacting forests differ across fronts. For example, cattle ranching is the main driver in the Amazon, pulp and paper and oil palm plantations in Indonesia, and subsistence agriculture in the Congo (Pacheco et al., 2021).

Overall, pasture expansion for beef production is the most important direct driver of deforestation across the tropics, leading to 50% of clearings. Other commodities, such as soy and palm oil, rubber, cocoa, coffee, rice, maize and cassava, contribute to deforestation to a lesser degree (Pendrill et al. 2022; Henders et al, 2015; Pendrill et al. 2019b; Weisse et al. 2021).

Indirect drivers of deforestation include (Pacheco et al., 2021):

- demographic factors, such as population increases and the resulting growth in demand for products that cause forest loss;
- increasing consumption levels and associated dietary shifts, especially increased meat and dairy consumption;
- technological changes in production factors and practices;
- political drivers, such as policies and regulations, as well as land contestation and encroachment of public, community and Indigenous Peoples' lands; and the persistence of informal, illegal economic activity; and
- economic factors, including financial flows to the sectors that are responsible for the main economic activities driving deforestation and conversion.

THE RELEVANCE OF IMPORTED AND EXPORTED DEFORESTATION AND CONVERSION

It is estimated that between 25% and 35% of commodity-driven deforestation is linked to international demand, depending on the models used (Pendrill, et al., 2019a). A high proportion of this demand is for soy, palm oil, rubber, coffee and cocoa, which are traded in export markets, while beef and cereals are typically consumed domestically (Pendrill, et al., 2022). Of the traded commodities, 40% end up in high-income countries (Ritchie, 2021b). International demand is linked to 30-35% of commodity-driven deforestation in Latin America, 35-40% in Asia and 5-10% in Africa (Pendrill et al, 2022).

The global forest footprint associated with the trade of timber, soy, coffee, cocoa, rubber, palm oil and beef in 2020 was equivalent to a land area the size of Belgium (Vaughan, 2022 with data of Global Forest Watch). China, the European Union and India are the largest importers of commodities that cause tropical deforestation, responsible for 24%, 16% and 9%, respectively, of tropical deforestation associated with international trade (WWF, 2021).


Oil palm plantation, Sabah Softwoods, Borneo. © Chris J Ratcliffe / WWF-UK

BOX 1: RISKY BUSINESS, RISKY FINANCE – EUROPE IN THE SPOTLIGHT

European countries are significant consumers of deforestation-risk commodities ('importing deforestation and conversion') and are home to large financial institutions that are investing in, underwriting and lending to companies that are driving commodity-linked deforestation.

- Swiss companies trade 53% of the coffee, 35% of the cacao and 56% of the palm oil traded globally. Swiss banks Credit Suisse and UBS provided almost US$8 billion in credit and underwriting to firms trading deforestation-risk commodities between 2014 and 2020. Switzerland was the 4th, 6th and 7th largest provider of investment, bonds and equity underwriting, respectively, to palm oil buyers (WWF, 2023d).
- The UK financial sector invested almost £8.7 billion between 2013 and 2021, mainly in revolving credit, underwriting and corporate loans, to 167 producers, traders, processors and buyers of deforestation-risk commodities. The highest financial exposure is to palm oil, beef and soy (Midgley et al., 2021).
- German financial institutions provided US$899 million in loans and underwriting to companies exposed to deforestation risk between 2016 and 2021. Four financial institutions – Deutsche Bank, Commerzbank, DZ Bank and KfW – provided 90% of this. In May 2022, German financial institutions had investments of approximately US$423 million in bonds and shares exposed to deforestation risk-commodities. The main commodities associated with these financial flows are beef, palm oil, pulp and paper, rubber, soy and timber (Yousefi et al., 2022).

Truck transporting wood logs from illegal deforestation, Apuí - Amazonas - Brazil. © Andre Dib / WWF-Brazil

DEFORESTATION-RELATED CRIMES AND HUMAN RIGHTS

Besides their environmental impacts, deforestation and conversion have important implications for human rights, including threats to customary land rights, and are often the source of controversies over environmental protection, especially when it comes to Indigenous Peoples and Local Communities.

- *Illegal deforestation:* in a study by Lawson (2014) (referenced in Public Eye, ND), it was found that 49% of deforestation due to industrial agriculture was illegal. Of this, 50% was linked to export markets. Brazil and Indonesia alone account for 75% of total global illegal deforestation.
- *Land grabbing and property rights:* acquisition of land for large-scale production is another concerning issue. According to GRAIN (2016, referenced in Public Eye, ND), approximately 500 cases of land grabbing[3] were documented globally between 2006 and 2016, involving 30 million hectares of land.
- *Agricultural products most associated with deforestation are also highly associated with human rights violations:* Between 2012 and 2022, almost 2,000 people were killed while trying to protect the environment (Global Witness, 2022). One third of fatal attacks between 2015 and 2019 were directed at Indigenous People (Global Witness 2020, referenced in Client Earth and Global Witness, 2021).

Crimes and human rights violations associated with agriculture-related deforestation and conversion expose stakeholders throughout commodity supply chains, including producers, processors, distributers, retailers and financiers. Despite this, action to counteract them remains limited.

Forest 500 is an initiative that analyses the 350 companies and 150 financial institutions that have the greatest exposure to tropical deforestation risk through their production and sourcing of beef, leather, soy, palm oil, timber, pulp and paper. In its 2023 report, it assessed companies on (among other things) their commitments on seven human rights indicators: labour rights; smallholder inclusion; gender equality; remediation of abuses and deforestation; free prior and informed consent; customary rights to land; resources and territory; and violence and threats again forest, land and human rights defenders (Thomson et al., 2023). It found that 33% of the 350 companies did not have a single publicly available human rights policy for any of the commodities. The lack of such policies is a source of risk for companies along the supply chain.[4]

3. Land grabbing is taking control, legally or illegally, of larger than locally-typical amounts of land for speculation, extraction, resource control or commodification at the expense of peasant farmers, agroecology, land stewardship, food sovereignty and human rights (Baker-Smith et al., 2016).
4. See the Taskforce for Nature-Related Financial Disclosures (TNFD)'s Guidance on engagement with Indigenous Peoples, Local Communities and affected key stakeholders (TNFD, 2023a).

RESPONSES AND INITIATIVES TO HALT DEFORESTATION AND CONVERSION

In general, responses to deforestation have historically evolved from public policy and regulation to private governance and market-based initiatives (Pacheco et al., 2021), and from area-based and sector-specific responses (Figure 2). However, responses and approaches to deforestation in the tropics and subtropics are context specific and are formulated and implemented in response to specific drivers. The different types of responses reflect the multiple dimensions of deforestation, which are linked, for example, to the governance of supply chains, tenure rights, sustainable management and responsible finance (Pacheco et al., 2021).

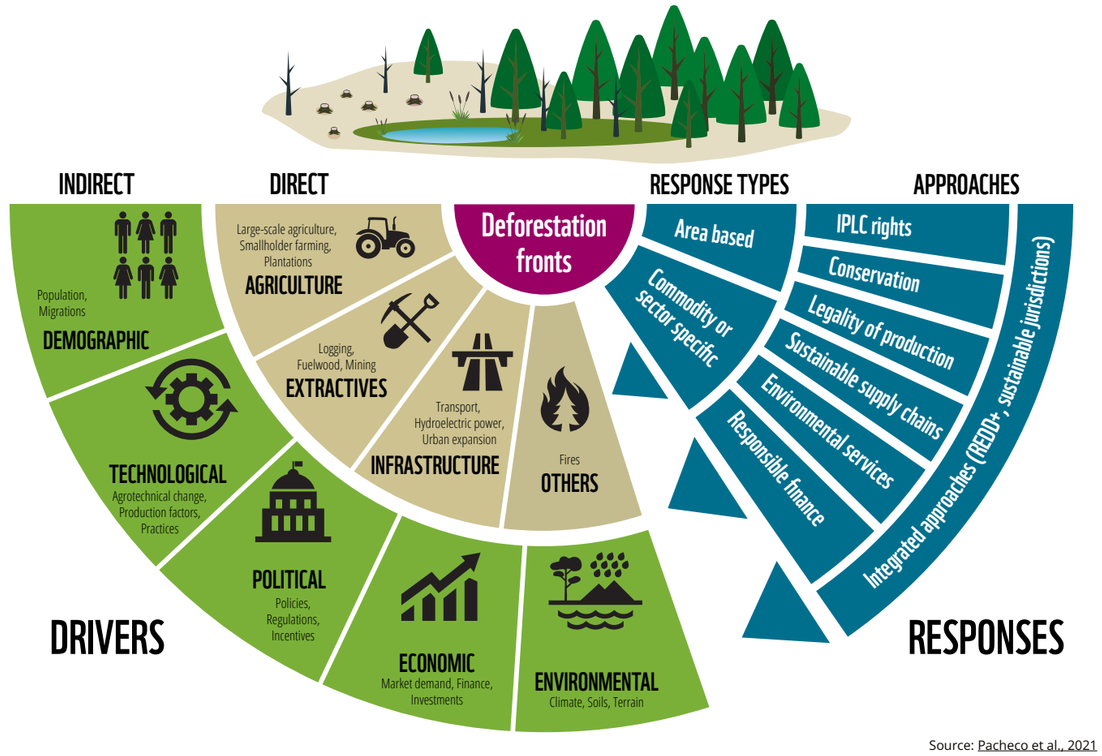
It is therefore clear that addressing deforestation and conversion requires multiple and complementary solutions, from different stakeholders. Reduction in consumer demand for deforestation-risk commodities, the development of businesses that profit from standing forests, and governmental actions to make deforestation illegal, strengthen territorial governance, clarify tenure rights and modify incentive systems, among others, are necessary to halt deforestation and conversion (Energy Transitions, 2023). In this report, we address the flows of finance to the global supply chains of commodities related to deforestation and conversion, and the crucial role that CBFS have to lead the necessary changes in the financial system, as crucial complementary and contributing measures.

INTERNATIONAL EFFORTS TO HALT DEFORESTATION AND CONVERSION

Numerous initiatives and commitments from the public and private sectors have emerged to support global processes to halt deforestation. These currently work in complementary ways. Voluntary commitments to zero deforestation have emerged, and they have permeated sustainability standards and collective public-private agreements. They have also been adopted as regulatory frameworks, such as the case of the EU Deforestation Regulation (EUDR).

Some of the main initiatives are described below, drawing on elements from Lambin et al. (2018) and WWF (2023e).

FIGURE 2: DRIVERS OF AND RESPONSES TO DEFORESTATION IN THE 'DEFORESTATION FRONTS'



Source: Pacheco et al., 2021

TABLE 1: MAIN INTERNATIONAL INITIATIVES AND COMMITMENTS TO TACKLE DEFORESTATION AND CONVERSION.

Initiative	Example	Description
Governmental initiatives	**New York Declaration on Forests**	Adopted in 2014 to halt forest loss and call for restoration of 350 million hectares of degraded landscapes and forestlands by 2030. Endorsed by 200 governments, multinational companies, indigenous peoples and civil society organisations. Consolidates various initiatives and objectives and counts over 200 endorsers. Annually assessed by the Forest Declaration Assessment, led by civil society efforts.
	Amsterdam Declaration Partnership	Launched in the context of the Paris Climate Agreement and built on the commitments of the New York Declaration on Forests, with the ambition of deforestation-free, sustainable commodities. Includes the Amsterdam Declaration on Deforestation, and the Amsterdam Palm Oil Declaration. Signatory countries are based in Europe and include Belgium, Denmark, France, Germany, Italy, Luxembourg, Norway, Spain, The Netherlands and the UK.
	Glasgow Leaders' Declaration on Forests and Land Use (newly named Forest Declaration Platform)	Commitment by 145 countries, covering approximately 90% of global forests, aligned with the New York Declaration on Forests to end deforestation by 2030. The Forest Declaration Platform assesses global forest commitments through the independent Forest Declaration Assessment.
	Forest and Climate Leaders' Partnership	Launched at COP27, an effort by almost 30 countries focused on expanding and maintaining high-level political leadership on forests, land-use and climate. It works on the implementation of solutions that reduce forest loss, increase restoration and support sustainable development, ensuring accountability of pledges. The unifying goal is aligned with the New York Declaration of Forests and the Glasgow Leaders' Declaration on Forests and Land Use, to halt and reverse forest loss and land degradation by 2030.
	Libreville Plan	Agreement of more than 20 countries representing great forest basins (the Amazon, Congo and Borneo-Mekong in Southeast Asia), to protect tropical forests. It aims to seek solutions in order to fulfil the commitment of protecting 30% of natural areas by 2030.
NGO's initiatives	**Accountability Framework initiative**	Consists of more than 25 environmental and human rights NGOs from around the world. It promotes the application of a framework to drive progress towards ethical supply chains and stronger accountability to end commodity-driven deforestation, conversion and human right abuses.
	Forests Forward by WWF	Corporate programme to engage companies, help them reduce their forest footprint, and support them in implementing other on-the-ground actions, such as best practice around nature-based solutions and forest restoration. Through this programme, WWF works with companies on near- and long-term strategies and collaborations with benefits for the companies and local communities.
Companies' initiatives	**Consumer Goods Forum Forest Positive Coalition of Action**	CEO-led initiative of consumer goods and retailer companies to remove deforestation, conversion and degradation from key commodity supply chains. It includes 21 of the world's largest consumer goods retailers and manufacturers, with a collective market value of more than US$1.8 trillion. Its goal was to achieve zero-net deforestation by 2020, with the implication that the goal is now extended to 2030.
	Zero deforestation voluntary commitments	For example, by Wilmar, APP, Unilever, etc., to advance towards deforestation-free supply chains.
Financial institutions initiatives	**Glasgow Financial Alliance for Net Zero (GFANZ), specifically the statement on Deforestation Financing**	The GFANZ is a coalition of eight independent net-zero financial alliances, committed to support the transition to net zero by 2050. It has more than 675 member firms in over 50 countries. Through the statement on deforestation financing, members strive to eliminate commodity-driven deforestation from their investment and lending portfolios.
	Finance Sector Deforestation Action	Initiative launched at COP26, in which 35 financial institutions with more than US$8 trillion in assets under management work towards the elimination of agricultural commodity-driven deforestation risks from cattle, soy, palm oil, pulp and paper in their investment and lending portfolios by 2025.
Sectoral certifications and standards	**Certification standards**	For example, the Rainforest Alliance Certification, particularly the Rainforest Alliance Sustainable Agriculture Standard, which "does not allow the certification of farms on which destruction or conversion of natural ecosystems occurred later than January 1, 2014".
	Certification standards by commodity	For example, the Roundtable on Sustainable Palm Oil (RSPO), Round Table on Responsible Soy Association (RTRS), Global Roundtable for Sustainable Beef (GRSBeef), and the Forest Stewardship Council (FSC) for timber certification.
Global frameworks	**UN Sustainable Development Goals**	Target 15.2: "By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally."
	UN Framework Convention on Climate Change	In the global stocktake of the COP 28, halting and reversing deforestation and forest degradation by 2030 is recognised as a crucial solution to achieve the Paris Agreement temperature goals, as it would eliminate about 14% of global emissions and enhance the capacity of forests to store carbon (UNFCCC, 2023).
	UN Forum on Forests	Commission of the UN Economic and Social Council, aiming to promote "management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end".
	CBD Global Biodiversity Framework	Target 1: loss of ecosystems of high ecological integrity close to zero by 2030. Halting and reversing land degradation and loss of areas of high biodiversity importance by 2030.
Regulatory frameworks	**European Union Deforestation Regulation (EUDR)**	Aimed at halting the placing or exporting of products on or from the EU market that are linked to deforestation or forest degradation, with a cut-off date for land conversion of 31 December 2020. The law applies to companies from the end of 2024.
	UK Forest Risk Commodities Regulation	In 2021, the UK government introduced new legislation in the Schedule 17 of the Environment Act that prohibits regulated businesses from using illegally produced deforestation risk commodities (raw and derived products) and requires a due diligence system with annual reporting. Secondary legislation on commodities in scope is to be developed.
	US Forest Act (still under revision)	The bill would ban the import of products made wholly or in part of commodities produced on land under illegal deforestation or after the date of the enactment of the Forest Act of 2023. Targeted commodities include palm oil, soybeans, cocoa, cattle and rubber. For products containing any of these commodities, supply chain traceability monitoring must be certified.
Target setting initiatives	**SBTi FLAG**	The Science Based Targets initiative (SBTi) defines and promotes guidance and best practices for emissions reductions and net-zero targets. SBTi Forest, Land and Agriculture (SBTi FLAG) offers the necessary science and guidance for companies in land-intensive sectors to reduce their GHG emissions. One of the key requirements of SBTi FLAG is to set and adopt zero deforestation targets no later than 2025, and in line with the AFi.

BOX 2: DEFORESTATION AND CONVERSION FREE (DCF)

Crucial to many global initiatives and commitments to halt forest loss and conversion is the concept of 'deforestation and conversion free' (DCF). DCF is used in the context of supply chain management and market governance requiring "that materials did not originate from production units where conversion from forests or other natural ecosystems occurred after a specified cut-off date" (CDP, 2023a). The Accountability Framework initiative (AFi) defines it as commodity production, sourcing or financial investments that do not cause or contribute to deforestation and conversion of natural ecosystems (AFi, 2024).

DCF commitments aim to constraint market demand for products associated with deforestation and conversion and shift away investments from goods production leading to deforestation and conversion. Voluntary DCF commitments are increasingly being complemented by laws and regulations (e.g., the European Union Regulation on Deforestation-free products), which create regulatory barriers to prevent products associated with deforestation from entering markets. In simple terms "if there is no market for goods produced on deforested lands, there is no incentive to clear them," says Emily Morbeg (WWF, 2023b).

Two important components to any DCF goal are the cutoff date and target dates:

- The cutoff date refers to the latest date after which a country, company or financial institution can source from or finance production on lands that have been converted for agricultural purposes. To avoid perverse incentives, the cutoff date should never be undefined or set in the future.
- The target date refers to the date on which the country, company or financial institution making the commitment must become completely deforestation and conversion-free (for a more detailed description, see WWF, 2023b).

Implementing traceability systems to the farm or production unit level is the most effective way to demonstrate compliance with a DCF commitment (CDP, 2023a).

Commitments, regulations and policies aimed at achieving DCF are not adequate if they do not safeguard the rights of workers or protect the tenure rights of Indigenous Peoples and Local Communities exposed directly or indirectly to the expansion of commercial agriculture (Thomson et al., 2023). Furthermore, providing the financial and technical means to support smallholders engaging in more environmentally stringent supply chains and avoiding potential exclusion risks should be an inherent part of DCF commitments, regulations and policies to build more sustainable and inclusive value chains (Dodson et al., 2019).

Guidance is available for companies on how to eliminate deforestation and conversion from their supply chains. This includes guidance from the Accountability Framework Initiative and complementary tools such as the WWF Deforestation and Conversion Free Implementation Toolkit.

Even though most initiatives have explicitly embraced goals of halting deforestation (and, in some cases, conversion), an analysis by the Forest Declaration Assessment (2023) finds that the world is not on track to eliminate deforestation by 2030. It notes that deforestation targets were not fulfilled in any tropical region by 2022, with tropical Latin America and the Caribbean being farthest off track. This shows that voluntary commitments cannot achieve the change at scale and pace we need to see in the financial system to address deforestation and conversion. Those voluntary commitments therefore need to be supplemented by clear incentives, regulations and supervisory expectations, including from CBFS. Those should be enforced and, in cases of non-compliance, lead to corrective actions.

Meeting zero-deforestation targets is critical, since many of the targets set by the various commitments, conventions and related initiatives cannot be met unless deforestation and conversion are halted, particularly those related to climate change and biodiversity. However, deforestation-free policies don't achieve climate and biodiversity targets on their own: it is fundamental to expand them to cover conversion of other non-forest ecosystems.

BOX 3: EXTENDING ZERO DEFORESTATION TO NON-FOREST ECOSYSTEM POLICIES, AND TAKING A REGIONAL PERSPECTIVE

Zero-deforestation policies that encourage the decrease in forest clearing for commodity production can have 'leakage' effects in other ecosystems. This refers to the "displacement of land use activities from a region subject to conservation policy enforcement to another region without or with lower levels of enforcement" (Miranda et al., 2019).

For example, one study has found that around half of the deforestation in the Brazilian Amazon avoided by a zero-deforestation supply chain policy in Brazil's soy sector was simply displaced to non-Amazon areas within Brazil, including the Cerrado savannahs and the Pampa grasslands (Villoria et al., 2022; Trase, 2023). While deforestation in the Brazilian Amazon dropped 50% in 2023 in comparison to the previous year, the loss of native vegetation in the Cerrado increased 44% compared to 2022 (WWF, 2024a).

Moreover, these pressures can expand to other countries. In the context of soy production, this could create pressures in Bolivia, for example, where the regulatory frameworks are much more favourable to soy production and penalties for illegal deforestation are negligible compared with those in neighbouring countries (Czaplicki-Cabezas, 2023). Indeed, deforestation rates in Bolivia have increased 259% over the last eight years (Czaplicki-Cabezas, 2023). For this reason, policymakers and regulators must coordinate their actions and take regional perspectives into account.

Such leakage effects can increase with regulatory frameworks that focus only on deforestation, and do not consider other non-forest ecosystems. EU regulation on deforestation-free products only considers forests within its scope. The EU will undertake a first review of the regulation by September 2024, to consider the inclusion of "other wooded lands" and, in 2025, to consider the inclusion of grasslands and wetlands. However, so far, the regulation is constrained in its target.

Natural Cerrado vegetation surrounded by soy crops. Cerrado, Brazil. © Peter Caton / WWF-UK

HOW DEFORESTATION AND CONVERSION HAVE BEEN INTEGRATED IN CLIMATE AND NATURE DISCLOSURES

Global corporate sustainability disclosures have evolved rapidly and provide a framework for companies to report information on their links to climate change and nature. Currently, there is only one specific corporate sustainability disclosure questionnaire focused on deforestation for corporates, but other disclosure frameworks on nature- and climate-related risks are useful for providing information on the identification, evaluation, assessment, mitigation and disclosure of deforestation and conversion risks. Moreover, some of them provide some specific disclosure metrics. However, there are no agreed standards and metrics allowing for comparison between different organisations. A brief table with the most relevant disclosures and target-setting frameworks for climate and nature, which are also useful for deforestation and conversion reporting, is included below.

In addition, initiatives such as the Accountability Framework Initiative also provide useful general guidelines on disclosures for companies regarding deforestation- and conversion-free supply chains.

None of these disclosure frameworks specifically target the financial sector. Nevertheless, some of them include overall considerations to be taken into account by financial institutions. Currently, Global Canopy has published case studies on nature-related financial disclosures for financial institutions, using the TNFD framework, including Indusind Bank (The Biodiversity Consultancy et al., 2023), JPG Asset Management (Fronterra et al., 2023a) and Grupo SURA (Fronterra et al., 2023b).

TABLE 2: DEFORESTATION WITHIN CLIMATE- AND NATURE-RELATED DISCLOSURE FRAMEWORKS

Disclosures	Description	Example of reference to deforestation and conversion
Task Force for Climate-related Financial Disclosures	**Created by the Financial Stability Board, it aims to provide a framework for public companies and other organisations to report on climate-related risks and opportunities.**	TCFD supplemental guidance considers the disclosure of emissions associated with the agricultural, food and forest sectors as a result of direct (Scope 1) emissions through land-use change and practices (including deforestation) but also as a result of supply and distribution chains (Scope 3).
Taskforce for Nature-related Financial Disclosures	**An initiative to provide a framework for public companies and organisations to assess and disclose nature-related dependencies, impacts, risks and opportunities.**	The TNFD framework considers the disclosure of land-, freshwater- and ocean-use change, including deforestation, and of the quantity of high-risk natural commodities. The TNFD's assessment guidance, LEAP (Locating, Evaluating, Assessing and Planning), can be useful for companies and financial institutions to understand their exposure to deforestation and conversion risks. The disclosure metrics suggested by the TNFD include cross-sector metrics on land-use change.
CDP Forests	**As one of its areas of focus, CDP provides a standardised reporting system to measure and manage organisations' forest-related dependencies, impacts, risks and opportunities.**	Through a questionnaire, companies report on the specifics of their exposures to deforestation-risk commodities (paper, pulp, timber, palm oil, cattle, soy, rubber, cocoa and coffee) throughout their supply chains, and associated risks and opportunities.

BOX 4: INSIGHTS INTO COMPANY DISCLOSURES: CDP FORESTS

According to CDP's Global Forests Report (2023b), most of the 1,000 companies disclosing information on deforestation recognise the associated risks. Approximately 65% of reporting companies identify deforestation-associated risks, with nearly 30% calculating their potential impact. However, these remain largely unaddressed, as only 10% of the companies say they monitor their deforestation and conversion footprint throughout their supply chain.

Landscape of the mangroves,Gulf of Carpentaria, Australia. © The Ocean Agency / WWF / C. Bailhache

KEY MESSAGES FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

- Current global deforestation rates remain high, and forest loss exceeds gains in forest cover.
- Most forest loss takes place in the tropics and subtropics, mainly driven by the expansion of agricultural commodity production, principally of beef and leather, soy, palm oil, cocoa, coffee, pulp and paper, rubber and timber plantations.
- The loss of other non-forest natural ecosystems is equally important, due to their implications for climate change and biodiversity loss. However, protection of these other ecosystems is still underrepresented in international commitments.
- Deforestation and conversion directly impact biodiversity loss, the mitigation of and adaptation to climate change, water quantity and quality and soil quality. They represent an increasing risk to the ecosystem services needed to maintain wellbeing and economic activity, including agriculture and food production.
- Around 25-35% of commodity-driven deforestation is linked to international demand for commodities, making importing countries co-responsible for deforestation and conversion undertaken in producing countries.
- Moreover, international finance is flowing from producing and importing countries to the production of deforestation-risk commodities. These financial flows indirectly drive agricultural commodity-related deforestation and associated human rights controversies and crimes.
- Even though numerous international, regional and sectoral initiatives and commitments have emerged to halt deforestation and conversion, goals and commitments from companies and financial institutions are still far from being either ambitious or achieved. In many cases, target dates for halting deforestation and conversion have been pushed back. Given that these commitments are still voluntary, there is a risk that these will not halt deforestation and conversion on the timescales needed to deliver global climate and biodiversity targets. The integration of deforestation and conversion-related policies by CBFS would have an important impact in ensuring the adoption and fulfilment of the necessary commitments to halt deforestation and conversion by companies and financial institutions and mitigate the associated future financial risks.
- The traceability, monitoring, reporting and verification tools for governments and companies to track compliance with deforestation-free commitments and regulations are multiplying, yet their uptake is still limited. More incentives are needed for a wider uptake by public agencies and private actors.
- Disclosures from companies and financial institutions regarding deforestation and conversion are still generally voluntary and progress is still incipient. Moreover, there is a lack of agreed standards and metrics, which does not allow for accurate comparisons. Even though disclosures are necessary for understanding the associated impacts and potential risks to companies, financial institutions and the financial system, they are not sufficient to ensure deforestation and conversion commitments and their fulfilment. That is why CBFS intervention is crucial: the integration of deforestation and conversion into financial regulation and policies, with implications for the preparedness of financial institutions in terms of data and disclosures, would in turn impact commitments and fulfilment on deforestation and conversion targets, helping to mitigate future financial risks.

02: WHY DEFORESTATION AND CONVERSION ARE CRITICAL FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

WWF sustainable plant mangroves, Madagascar. © Justin Jin / WWF France

SECTION 02: WHY DEFORESTATION AND CONVERSION ARE CRITICAL FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

Clearly, we face a crisis in deforestation and conversion. To address this crisis, it is important to understand the relevance and importance of these issues to the financial system. Within this, CBFS have a key role to play.

Freepik – EyeEm

DEFORESTATION AND CONVERSION RISK FINANCIAL AND SYSTEM STABILITY[5]

The more central banks and financial supervisors mitigate adverse environmental effects, the more they are mitigating future financial risks linked to climate change and nature loss.[6]

From an **environmental materiality perspective**, the financial system supports many activities that directly drive deforestation and conversion, such as agriculture and mining;[7] as well those in other sectors, such as food manufacturing and electricity generation, which have indirect impacts through their supply chains (as well as some direct impacts, such as from construction of infrastructure).

From a **financial materiality perspective**, the smooth function of the financial system is highly dependent on forests and non-forest natural ecosystems, biodiversity and freshwater. This is because companies in the agriculture, mining and other sectors that depend on land, water and biodiversity for their everyday activities might fail to meet financial commitments as a result of ecosystem loss and degradation (physical risk) and of changes in policies that address these issues, consumer preferences and reputation (transition risk).

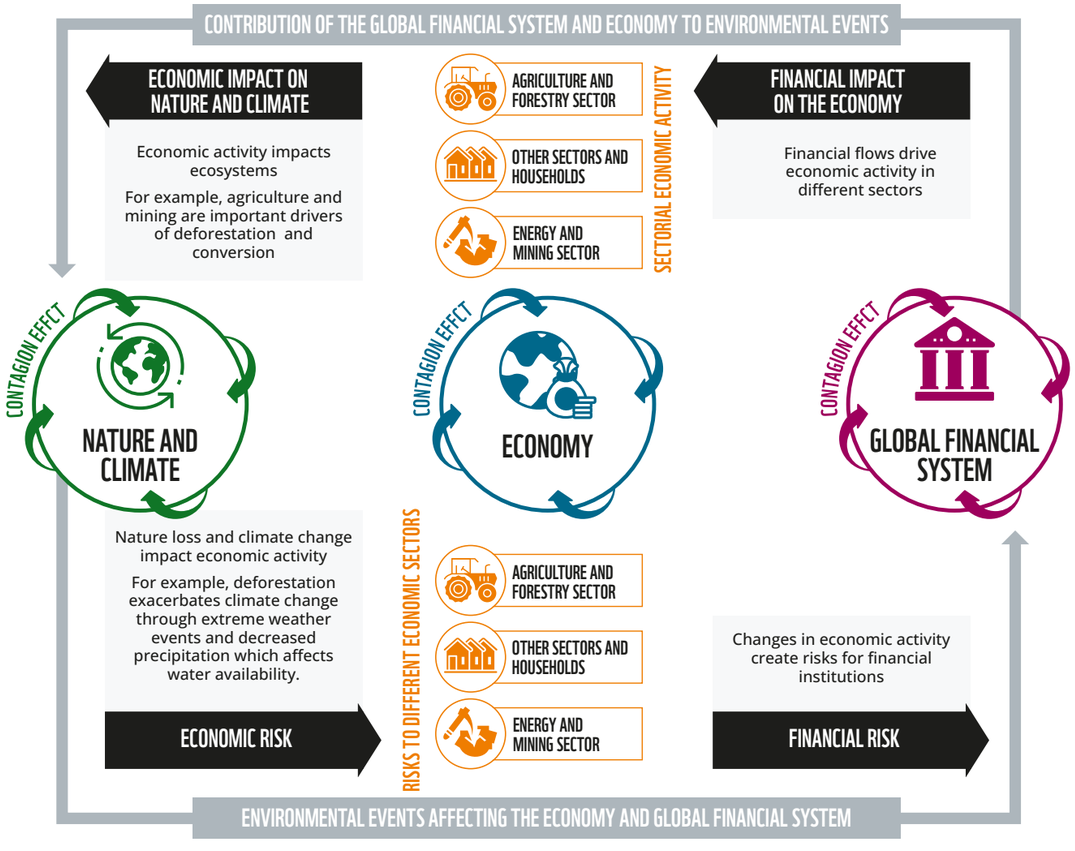
Importantly, this 'double materiality' should not be understood within a static context. Instead, a dynamic systems-based analysis is necessary, as environmental and financial materiality take time to materialise, and influence each other dynamically.

In the case of **environmental materiality, the effects of the financial system's support for unsustainable activities typically take time to materialise**. For example, the conversion of natural forests to other types of land use threatens biodiversity and the climate system once it has led to a substantial reduction of forest stocks. Additionally, although transition policies might create a financial burden for companies as they are implemented, they can reduce physical risks in the long run.

Financial materiality should be analysed in a dynamic manner as well. Physical risks can start causing financial crises once specific environmental thresholds have been paced, for instance, large decreases in the population of pollinators driven by deforestation and reduced natural ecosystems areas might take time until they generate substantial irreversible losses in crop yields. Additionally, as is well-known, financial crises are often caused by growing credit flows that lead to the accumulation of too much private debt. However, it might take time until a sufficiently high stock of debt has been accumulated and households and firms are unable to repay it, leading to macrofinancial instability.

5. This section is based on the work developed by Dafermos et al., 2024, which was commissioned by WWF for the purpose of this project.
6. See also the WWF (2022d) publication, Central banking and financial supervisors roadmap, which highlights how today's environmental impacts are tomorrow's financial risks.
7. For the impact of agriculture and mining on deforestation, see Pacheco et al. (2021).

FIGURE 3: DOUBLE MATERIALITY WITHIN NATURE-RELATED FINANCIAL RISKS FRAMEWORK



Source: Authors' depiction

ENVIRONMENTAL MATERIALITY: HOW THE FINANCIAL SYSTEM ENABLES AND DRIVES DEFORESTATION AND CONVERSION

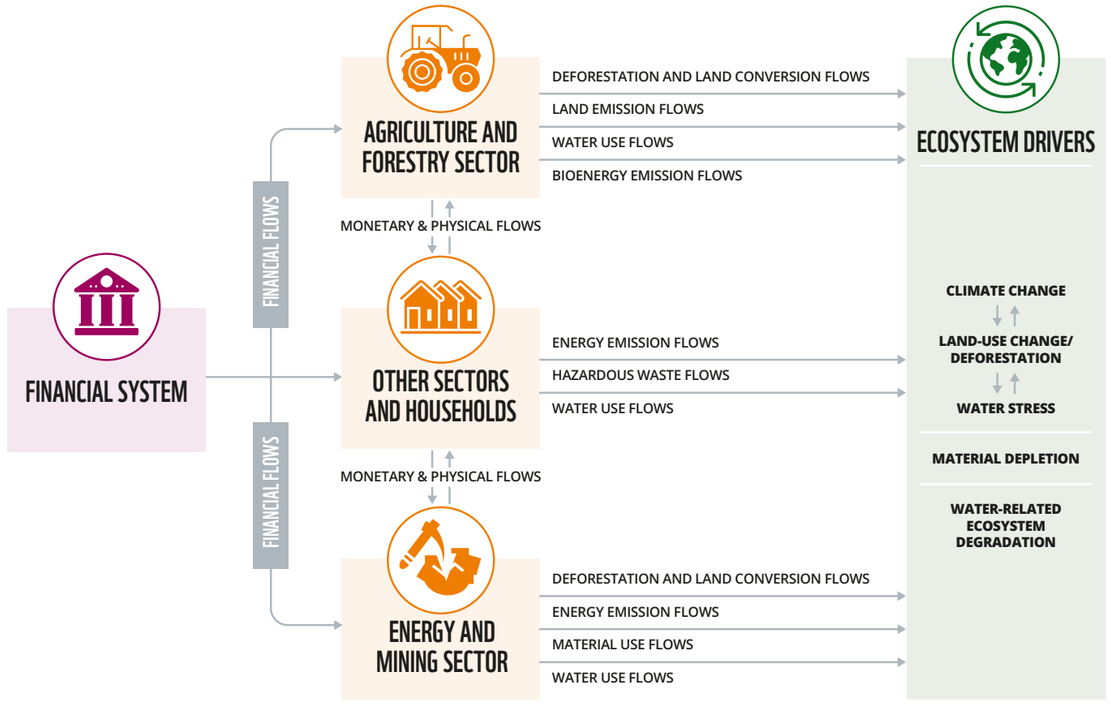
The following figure shows the main channels through which the financial system contributes to the sources of nature-related risks. To simplify this specific example, the agriculture, forestry, energy and mining sectors are emphasised as important sectors driving deforestation and conversion, with other sectors grouped apart. These sectors receive credit and investment from the financial system in the form of bank loans, bonds or stocks.

Scale effect of environmental materiality

Through the provision of credit, the financial system supports activities that lead to deforestation, the conversion of other non-forest natural ecosystems (such as natural grasslands and savannahs), unsustainable water use, water pollution, and the generation of GHG emissions and hazardous waste. As illustrated in Figure 4, with everything else given, and in a business-as-usual scenario, higher economic activity in the agriculture and forestry sectors lead to an increase in land conversion (Box 4). We call this the scale effect.

Financial flows to other sectors that require inputs from the agriculture, forestry, energy and mining sectors also matter from an environmental materiality perspective, as they drive the scale effect that leads to more land conversion (supply chain and consumption effects).[8]

FIGURE 4: THE ENVIRONMENTAL MATERIALITY OF THE FINANCIAL SYSTEM: EXAMPLES OF TRANSMISSION CHANNELS



Source: Authors' depiction. *Note:* The right-hand side depiction of the environmental pressures that follow from the materiality of the financial system (left-hand side) only lists examples that are directly related to the purposes of this paper. There are other environmental impacts, such as invasive species, hazardous waste from the energy and mining sector and bioenergy emission flows from the agricultural sector, that have not been included for simplicity.

8. If demand from sectors using inputs produced in the agriculture, forestry, energy and mining sectors increases, production in those sectors is expected to increase as well to meet this demand.


Cattle in Colibri Farm, Iñapari, Peru. © WWF-US / Yawar Motion Films

BOX 5: SCALE EFFECT OF ENVIRONMENTAL MATERIALITY: HOW FINANCE DRIVES AND ENABLES THE PRODUCTION OF COMMODITIES ASSOCIATED WITH DEFORESTATION AND CONVERSION

There are a number of initiatives that seek to identify, track and understand the role of financial flows in deforestation and conversion. Through their work, it has been possible to evidence the role that the financial sector has to incentivise and enable deforestation and conversion, by providing finance to companies with exposure to deforestation and conversion-risk commodities.

According to Global Canopy, as of October 2022, 150 financial institutions had provided US$6.1 trillion to 350 companies exposed to deforestation-risk commodities (Thomson et al., 2024).

For example, in the case of beef production, JBS S.A. and Marfrig Global Goods, the two largest beef processors, received US$26 billion from creditors (Feedback, 2024).

In the case of palm oil, nearly US$4.4 trillion was invested in palm oil buyers (comprising US$1.5 trillion in loans and underwriting from January 2016 to December 2021, and US$2.9 trillion in bonds and shares, as of April 2022) (WWF, 2023c).

Intensity effect of environmental materiality and its combination with the scale effect

For a given level of credit provided to companies, the environmental pressures associated with their activities can be higher or lower. We call this the intensity effect. If firms receive credit on favourable terms on the condition of meeting specific deforestation- and conversion-associated commitments and targets, the sector's overall environmental intensity can be reduced. For the majority of economic activities, harmful physical flows can be reduced if credit is provided on condition of sufficiently low intensity.

An example of the intensity effect is provided in section 3, specifically in the case study on the Brazilian Central Bank's Rural Credit Policy on deforestation. The policy, introduced in 2008, made the concession of subsidised rural credit conditional on borrowers meeting legal requirements relating to environmental regulation. This shows that credit conditions can have an impact on the environment, and that green financial policies can reduce the environmental materiality of finance.

FINANCIAL MATERIALITY: HOW RISKS ASSOCIATED WITH DEFORESTATION AND CONVERSION TRANSMIT TO THE ECONOMY AND THE FINANCIAL SYSTEM

PHYSICAL RISKS

Deforestation and conversion are sources of physical risk. Moreover, as discussed above, deforestation also reinforces other sources of risk, such as climate change (deforestation is a source of carbon emissions and reduces capacity for adaptation). These risks transmit into the economy and the financial sector (Source: NGFS 2022a; NGFS 2022b; NGFS, 2024).

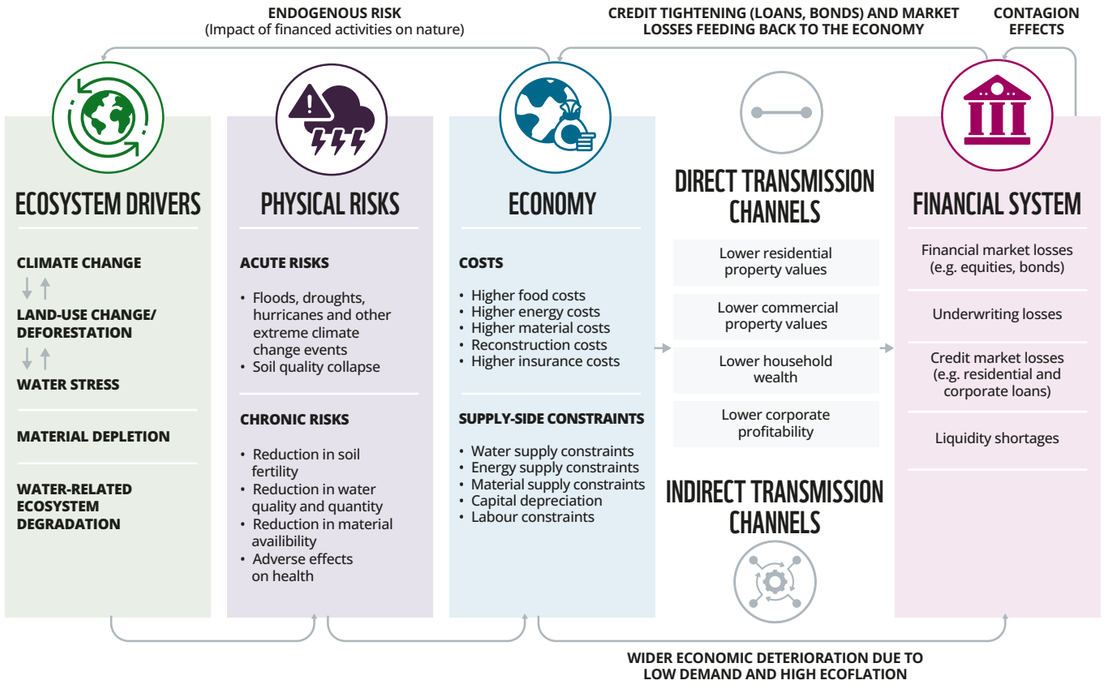
These physical risks transmit to the economy and the financial system directly through cost and supply:

Cost

Floods, droughts and soil quality collapse can **increase the costs of production of food and raw materials and reduce supply**. For example, dry weather in the southern states of Brazil, which are important producers of corn, helped push the price of this staple up 10% in early 2022. This, in turn, contributed to an 8.45% increase in the price of meat and a 10% rise in the benchmark consumer prices index (Figueiredo, 2022). Inflation such as this can affect corporate profitability, lowering the ability of firms to pay dividends, repay debt and cover interest payments. This can feed through to the prices of their bonds and stocks and/or in higher default rates, affecting the solvency of the banking sector.

Acute risks related to, for example, typhoons and hurricanes can destroy property owned by firms and households. **The resulting reduction in the value of these firms' and households' collateral can increase the credit risk of borrowers and the insolvency of banks**.

FIGURE 5: FINANCIAL MATERIALITY: EXAMPLES OF TRANSMISSION CHANNELS



Source: Authors' depiction, drawing on NGFS (2019)

Hurricane Maria as it was making landfall near Yabucoa, Puerto Rico. © NOAA

If damaged properties are uninsured, then the reconstruction burden falls on firms and households. If losses are insured, the burden falls on the insurance sector. As a response, insurers are likely to ask for higher premiums from households and firms. For example, the US has seen significant increases in the cost of housing and automobile insurance (up 11.3% and 20.6% respectively in 2023), partly due to climate change (Quiroz-Gutierrez, 2024). Either way, the rising costs of extreme weather reduces household wealth and corporate profitability.

Supply

Acute and chronic risks can also contribute to supply-side constraints. The effects of deforestation and conversion on soil fertility and rainfall patterns can reduce agricultural productivity. For example, as documented by WEF (Edmond et al., 2024), the exceptionally hot and dry summer of 2023 caused poor harvests, increasing the prices of commodities such as cocoa (cocoa bean yields fell in Ghana and Ivory Coast), olive oil (as a result of production disruption in southern Spain), rice (due to extreme weather in Italy, India and the US) and soybeans (as a result of droughts in the US and Argentina).This in turn can reduce the profitability and solvency of companies dependent on these commodities, in upstream (producers) and midstream sectors (traders or refineries), with knock-on effects for the banking sector.

Systemic dimensions of physical risks

Besides impacts on cost and supply, **physical risks associated with deforestation and conversion can also be indirectly transmitted**. If affected firms pass higher costs on in their prices, this can result in so-called 'ecoflation',[9] which is inflation related to environmental factors. Ecoflation can reduce demand and encourage firms to reduce investment due to broader uncertainty and lower returns on investment. This can reinforce the destabilising forces in the banking sector and financial markets.[10]

Importantly, the above direct and indirect effects on the financial system can have feedback effects on the economy, which can be reinforced by contagion effects between the different components of the financial system. For example, banks that have not directly provided loans to firms and households that are affected by environmental risks might be exposed to banks that have (e.g., through the interbank lending market).

9. This is in line with so-called 'climateflation'; see Schnabel (2022). Ecoflation is a broader term than climateflation.
10. NGFS (2023a) identifies compounding risks (risks transmitting between ecosystems), cascading risks (risks transmitting via value chains), and contagion risks (risks transmitting between financial institutions).

TRANSITION RISKS

Deforestation and conversion can lead to transition risks. These risks stem from policies implemented to address deforestation and conversion and can include, for example, regulations on the trade of products associated with deforestation-risk commodities, or moratoria on logging concessions or specific commodities. Transition risks are also related to market access (which can be affected by reputational impacts), stranded assets and the cost of capital (which can both be related to DCF and associated/complementary policies which constrain the use of deforested or converted land).

Transition risks can have **direct effects** that are transmitted, for example, through increased costs or reduced supply resulting from changes in regulation.

Cost

Transition risks can increase companies' costs either because they have to pay fines or because they need to change their business practices (i.e. liability risk).[11] For example, meat processing giant JBS has been attempting to strengthen its sourcing processes after the company was fined for sourcing from suppliers implicated in deforestation (BloombergNEF, 2023). JBS faced a suit of US$1 billion, which it settled with the Brazilian government by agreeing to a moratorium in sourcing livestock from land cleared after October 2009. In addition, the company was fined 24.7 million Brazilian reais by the Brazilian Institute of Environment and Renewable Resources (IBAMA) for purchasing cattle from illegally deforested areas in Pará between 2013 and 2016. The prosecutors claimed that the case was linked to human right controversies, as workers were being forced to live in degrading conditions and were subject to debt bondage (with payments for food deducted from their wages, etc.) (Gross et al., 2017). This caused major retailers such as Waitrose in the UK to pull JBS products off their shelves while they held an investigation (Gross et al., 2017). In addition, in 2020, Nordea Asset Management, investment arm of one of northern Europe's largest financial services groups, removed JBS from its list of eligible investments (Phillips, 2020).

As well as such transition costs, financial policies that might be introduced to protect the environment (such as higher capital requirements for finance that supports deforestation), can increase companies' cost of capital.

Supply

Deforestation and conversion regulations can impose constraints on the use of land. This means that, without improvements in productivity, some companies might be forced to reduce the amount of food, timber, energy, metals and other goods that they produce. Other sectors that rely on these intermediate goods might be affected as a result, reducing their own ability to satisfy demand.

If the financial system does not anticipate the measures necessary to transition, then deforestation and conversion transition risks can materialise and jeopardise the production and consumption of associated commodities. Additionally, importing countries could face higher commodity prices or supply constraints. Once again, this could have knock-on effects on the financial institutions providing capital to these companies and supply chains.

Systemic dimension of transition risks

As with physical risks, transition risks can have significant **indirect effects** as well, for example to what we call 'transitflation', i.e. inflation caused during the transition to a more environmentally sustainable economy.[12] If firms are able to pass some of the costs mentioned above on to their customers, then household incomes might be negatively affected. For example, policies limiting deforestation may lead to a lower supply of palm oil, coffee, cocoa and other commodities that are associated with deforestation, driving up their price and the costs facing food-processing industries. However, transinflation should be considered in the context of the costs that companies would face from the physical impacts of continued deforestation and conversion.

As in the case of physical risks, the effects described above can also have feedback implications due to credit tightening and financial market losses, which could be reinforced by the effects of financial contagion.

The financial system can play a significant role in supporting the implementation of measures necessary to transition to a deforestation- and conversion-free economy, and by exploring mechanisms and instruments that can support the transition by recognising the value of standing forests (Energy Transitions, 2023).

11. For the economic and financial costs of policies tackling deforestation in Indonesia, see OECD (2023) and for the potential financial effects of the EU deforestation rules, see Standard and Poor's (2023).
12. This is in line with so-called 'fossilflation'. See Schnabel, (2022). Transitflation is a broader term than fossilflation.


Coffee plantation. Unsplash – JSB Co.

BOX 6: THE EU REGULATION ON DEFORESTATION-FREE PRODUCTS AND ITS FINANCIAL MATERIALITY

The EU Regulation on Deforestation-free products (EUDR) forbids certain products that play a substantial part in deforestation from being placed on or exported from the EU market. The legislation includes products derived from seven commodities: cattle, cocoa, coffee, oil palm, soya, wood and rubber. This captures a wide range of products, such as furniture, soybean, meat, chocolate, pulp, leather, oil and palm kernel. Under the regulation, companies are not allowed to place products covered by the law on the European market or export them unless they are deforestation-free, produced in accordance with relevant national legislation and covered by a due diligence statement. Covers any land converted after a cut-off date of 31 December 2020.

As part of the due diligence statements required, companies need to provide the geographic coordinates of the plots of land where the commodities were produced. If companies are not in a position to obtain the necessary information from upstream suppliers, they should not place the relevant products on the market or export them. Failure to comply with the regulation can lead to fines, exclusion from public procurement processes and from access to public funding. It can also lead to the confiscation of the relevant products. Companies have been given a period of 18 months to comply with the regulation (of 24 months for SMEs).[13]

From a financial materiality perspective, the regulation has several important near-term implications. To comply, companies might need to cover costs associated with the re-design of their supply chains and the appropriate collection of regulation-related information. Costs will also increase for companies that fail to comply, since they will need to pay fines – they might also lose access to sources of revenues and funding. If companies pass higher costs on to consumers, this will create additional inflationary pressures.

In its publication Recommendations toward the development of scenarios for assessing nature-related economic and financial risks, the (NGFS, 2023b) undertook a first estimate of the financial effects of the EUDR on the Brazilian economy, hypothesising a 15% reduction in EU imports from its forestry, agriculture, livestock and mining sectors. It estimated that the EUDR would reduce these sectors' total output by €1.6 billion, with cultivation of crops and extraction of crude petroleum being the most affected upstream Brazilian sectors. This would impact those Latin American and EU sectors that provide inputs to the exposed sectors in Brazil: the fall in demand from Brazilian producers implies a reduction of output value of €25.9 million for Latin American suppliers, and €38.2 million for those in the EU. Finally, this would also affect sectors that import goods from Brazil: in the case of the EU, a total of €960 million of imports are exposed to the implementation of the policy.

Financial institutions should be specially prepared, as they will need to support their clients and investees in the required transition, playing a fundamental role in structuring mechanisms and instruments that allow financing under the new DCF framework and in seizing the opportunities of financing a nature-positive economy. Moreover, they should also pay special attention to the compliance to the EUDR of their clients and investees, as failing to do might imply penalties.

In the long term, the regulation will contribute to reducing climate- and nature-related risks and avoid their materialisation throughout the economy and the financial system. The financial and economic sectors need to plan a transition towards halting deforestation and conversion and building a more resilient economic and financial system.

13. For more information about the EU regulation on deforestation-free products, see European Commission, Regulation on deforestation-free products.

SYSTEMIC RISKS

As stated in previous chapters, forests and other ecosystems provide a range of ecosystem services crucial to the economy and to livelihoods. Deforestation and conversion disrupts these complex bundles of ecosystem services and the dynamic interactions among them. Deforestation, as one of the main drivers of biodiversity loss and GHG emissions, can trigger cascades of impacts, which can be reinforced through other drivers (e.g. climate change), and therefore create systemic risks.

The Amazon is widely studied as an example of the potential cascading and feedback effects of deforestation (Lenton et al., 2023, Araujo, et al., 2023; Bottino, et al., 2024; Flores et al., 2024; Wunderling, et al. 2022; Staal et al., 2020). These papers have pointed out the potential tipping point in the Amazon, known as 'Amazon dieback'. This is where deforestation affects local precipitation to the extent that the forest itself cannot be supported. This would lead to higher temperatures that could encourage 'savannisation', with increases in wildfires and soil erosion. At the same time, and reinforcing these effects, the disappearance of species habitat would decrease seed dispersal, reducing the possibility of forest regrowth. Meanwhile, lower river levels resulting from Amazon dieback would have important effects in other aspects, such as water flows, food security and health, and would influence other aspects, such as migration. All of these factors would be reinforced by the global effects of climate change.

As noted above, the risk of such deforestation and conversion, as related to agricultural and mining commodities, is embedded throughout value chains, exposing industries throughout the global economy.

Financing companies that endanger local ecosystem services through deforestation and conversion can also threaten the growth of other economic activities, resulting in trade-offs. For instance, consider a portfolio that includes an institution financing both companies linked to deforestation in a particular ecosystem and companies relying on water from the same area. Deforestation can degrade water quantity and quality through increased sedimentation in the short term, compromising its use for the latter group of companies. This creates inherent trade-offs within the same portfolio.

BOX 7: SYSTEMIC RISKS: TROPICAL DEFORESTATION AND CHANGES IN PRECIPITATION

Forests play a fundamental role in the water cycle, as their evapotranspiration is a driver of precipitation. In the case of the Amazon and the Congo basins, for example, evapotranspiration contributes 41% and up to 50%, respectively, to mean rainfall (Baker et al., 2022 referenced in Smith et al., 2023). This means that deforestation can have significant effects on patterns of precipitation. For example, it is estimated that business-as-usual deforestation (based on deforestation rates prior to 2004) would lead to an 8.1% (+/-1.4%) reduction in annual mean Amazon basin rainfall by 2050 (Spracklen et al., 2015). The relation between deforestation and the water cycle has also been widely discussed in the context of "flying rivers".

Smith et al., (2023) undertook a study on the impacts of tropical deforestation on precipitation across spatial scales. They found that the effect of deforestation on precipitation increases at larger scales: at 200 km (the largest scale explored) 1% of forest loss reduced precipitation by 0.15-0.35 mm per month. The same study estimates that deforestation in the Congo will reduce local precipitation by 8-10% by 2100.

Clearly, the effects on precipitation also have impacts on surface and ground freshwater recharge, as well as its provision for multiple uses, including domestic and agricultural uses. For example, a study investigating the relationship between deforestation and rainfall across the southern Brazilian Amazon found that there is a significant decrease in rainfall after a deforestation threshold is breached. In addition, under a weak governance scenario, this translates into productivity losses worth up to US$1 billion annually within agribusiness across the region, which is primarily associated with the production of beef and soy (Leite-Filho et al., 2021).

As well as the effects on productivity of reduced water availability, it is necessary to account for the aggregated changes in other crucial ecosystem services, and their effects on the economy. This should consider regional and national effects, especially when it comes to beef, as three-quarters of beef production is consumed domestically (SEI, 2023), and international effects when it comes to soy, which is Brazil's second-largest export (SEI, 2022).

Effects on the financial system could also be significant at the national level, as 74% of finance raised by beef and soy producers is from by domestic banks, while three foreign banks provide 10% of the finance for these two commodities (Chain Reaction, 2020). Furthermore, since 77% of soy is used for animal feed (Ritchie et al. 2021c), it is necessary to understand the effect of contagion on associated companies and, of course, the aggregated economic and financial effects. As noted above, droughts in Brazil during 2021 caused crop price inflation to feed through to increased meat prices and a 10% rise in the benchmark consumer price index (Figueiredo, 2022).

Other effects were felt in hydroelectricity generation, which accounted for 80% of Brazil's total electricity generation in 2021 (IEA, 2021). In that year, droughts caused a 6.78% average increase on electricity prices for consumers (Reuters, 2021). This does not take spillover effects to other sectors into account.

The relationships between ecosystems, ecosystem services and their complex dynamics and their links with the economy and the financial system are poorly understood. Waiting for the necessary research to be undertaken could prove costly and ineffective, and therefore anticipation and precautionary measures are without doubt the most cost-effective measures to be taken when it comes to managing deforestation- and conversion-related risks.

Drought in Amazonas. © Jacqueline Lisboa / WWF-Brazil

BOX 8: ALARMING GAP ON DEFORESTATION AND CONVERSION: NOT ACCOUNTING FOR CRIMES INTENSIFIES ENVIRONMENTAL IMPACTS AND FINANCIAL RISKS

A recent study by WWF and Themis (2024c) found that, as well as contributing to deforestation and conversion through loans and investment, financial institutions are also exposed to the issue through an array of crimes related to land conversion, including bribery and corruption, money laundering, tax evasion, fraud and trafficking in people, drugs, wildlife and other natural resources.

As part of this study, 644 financial services professionals across 17 countries were surveyed on how their companies addressed crimes related to deforestation and conversion. The survey found that almost half of the financial institutions sampled reported operating with or in high-risk sectors or areas associated with land conversion-related crimes, with 25% of respondent stating that no specific due diligence was undertaken. Alarmingly, between a fifth and a third of the respondents also indicated that their firms witnessed third parties attempting to hide financial crimes or unethical business practices linked to deforestation and conversion.

This finding is even more alarming for CBFS, when considering that, between 2013 and 2019, at least 69% of tropical forest conversion associated with agriculture took place in violation of national laws and regulations (Dummett et al, 2021).

The lack of due diligence by financial institutions regarding financial crimes associated with land conversion hinders an accurate accounting of its real environmental impacts. This means that physical financial risks associated with deforestation and conversion are likely to be underestimated and/or not accounted for.

It also creates significant legal and reputational risks. Litigation risks associated with financial crimes related to deforestation and conversion should not be underestimated: according to the International Criminal Police Organisation (INTERPOL), environmental crimes generate between US$110 and US$281 billion annually, a figure that is rising by 5 to 7% annually, making them the fourth largest category of criminal activity (Nellemann et al., 2018).

The report serves as an introduction to an Environmental Crimes Financial Toolkit, which aims to support financial institutions addressing deforestation and conversion from a financial and environmental crime perspective. The toolkit will be launched by the end of 2024.

Anti-poaching patrol, Gabon. © WWF / James Morgan

Farming in the Alta Floresta municipality, Amazon, Brazil. © Adriano Gambarini / WWF Living Amazon Initiative / WWF-Brazil

KEY MESSAGES FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

- The financial system contributes to deforestation and conversion through the allocation of financial resources to activities associated with deforestation and conversion.
- Lack of acknowledgement of the environmental materiality of deforestation and conversion to the financial sector risks greater exposure to associated physical and transition risks, potentially leading to systemic risks.
- Deforestation and conversion manifest through different acute and chronic risks, which can transmit directly and indirectly to the economy and the financial system as nature- and climate-related risks.
- Transition risks are already materialising. The less the financial system prepares to adapt to regulations and preferences that aim to halt deforestation and conversion, the greater these risks become, potentially leading to the instability of the system.
- Addressing these risks will enable the financing to allow companies to adapt their business models, preventing a disorderly transition, and supporting long-term financial stability. Regarding climate change, the risk of default is highest in a delayed transition scenario, which would require abrupt government action and rapid adjustment by companies.

Key recommendations

- CBFS need to better understand the extent to which the financial system contributes to deforestation and conversion, and the associated risks for the financial system as a whole. It is therefore necessary to ensure that the necessary research is properly resourced.
- Financial regulators and supervisors need to set expectations on financial institutions to undertake double materiality assessments that not only reflect their exposure to nature-related risks, but also their contribution to such risks. These should include lending and investment to activities associated with the production of deforestation-risk commodities.
- The design and application of microprudential, macroprudential and monetary tools should consider scale and intensity effects, so that differentiated risk approaches can be applied to higher deforestation- and conversion-exposed sectors. This should not only consider the sectors which directly drive deforestation and conversion, but also those which do so indirectly (along related supply chains). Microprudential supervision should take into consideration commitments on deforestation and conversion, as well as the associated transition plans of companies and financial institutions.
- Financial supervisors must put in place stringent financial regulations to ensure that financial institutions do not engage in crimes related to land conversion and monitor the implementation and compliance of such regulations. Moreover, central banks must ensure that they conduct strict due diligence to avoid exposure to any criminality related to land conversion through their monetary and non-monetary policy portfolios.

CENTRAL BANKS ARE CONTRIBUTING TO DEFORESTATION AND CONVERSION THROUGH THEIR MONETARY POLICY PORTFOLIOS

DEFORESTATION AND CONVERSION RED FLAGS IN THE EUROPEAN CENTRAL BANK'S COLLATERAL BASKET

Collateral frameworks are at the heart of central banks' liquidity operations. They outline the criteria and processes by which assets are accepted as collateral for a central bank's credit operations and set the rules for the repo market. These collateral rules and practices affect wider demand for financial assets (Dafermos, et al. 2022a). By defining some assets as eligible as guarantees for monetary policy operations, i.e. "eligible collateral", these become therefore more attractive for banks, increasing their liquidity and impacting their prices in the secondary markets. This is especially important considering that many of those assets are issued by entities driving biodiversity loss and climate change. If the market itself misprices the risks associated with environmental degradation in those assets, then the market neutrality principle may create a structure which impairs an adequate allocation of resources and contributes to the amplification of environmental related risks.

Existing collateral frameworks lack environmental considerations, which indirectly allows the financing of entities involved in carbon-intensive activities (carbon bias) (Dafermos, et al., 2022a) and those causing deforestation and forest conversion. This means that their inclusion in the collateral basket facilitates the financing of environmentally destructive activities.

To understand better how central banks are also indirectly contributing to deforestation and conversion and, therefore, are exposed to the associated transition risks (and potentially associated physical risks), an exercise was undertaken to provide examples on companies and financial institutions exposed to deforestation-risk commodities within the collateral basket. In this case, the collateral basket of the ECB was selected. The criteria for the selection considered that the EU is within the biggest importers of deforestation (WWF, 2021), and the data of the assets in the collateral basket is available via the bank itself. Furthermore, the screening exercise focused on Germany and the Netherlands, as Germany imports the highest mean deforestation in ha per year of the whole EU; meanwhile, the Netherlands tops the list in terms of m^2 per year per person, at 18 m^2 (WWF, 2021).

The ECB has been undertaking measures to understand and manage climate-related risks in the European financial system and support an orderly transition to preserve financial and price stability. Among these measures, there is the consideration of climate change in its corporate bond purchases, collateral framework, disclosure requirements and risk management (ECB, 2022). However, the ECB could go further including, among other measures, those related to deforestation and conversion and thus addressing the three areas of focus established in its Climate and Nature Plan 2024-2025 (ECB, 2024b).

As previously stated, the objective of the exercise was to 'red-flag' specific issuers and/or Ultimate Parent Companies (UPCs) within the basket that are exposed to deforestation and conversion-risk commodities. This was achieved by comparing the basket to different ratings that assess and rank companies and financial institutions exposed to these risks. It is therefore important to notice that the exercise was based on the information provided by these ratings. Such information itself is based in the data and information available by the companies and financial institutions on this matter. Specifics on the methodology and the information used by the rankings considered in this exercise, can be found in Annex 1.

After analysing the 259 collateral instruments associated with corporate entities and, where appropriate, the Ultimate Parent Companies (UPCs), a selection of specific case studies showcases some issuers with exposure to deforestation and conversion risk commodities. These selected cases do not intend to pick out companies and financial institutions with the highest scores, but to illustrate different examples of issuers and, where appropriate, the UPCs, that are exposed to deforestation risk commodities within the ECB collateral basket. The selection of these examples aims to showcase issuers with exposure to a diversity of deforestation and conversion-risk commodities, through different geographies and in different subsectors. It is important to note that the inclusion of some of the companies and financial institutions red-flagged in this analysis does not imply a lack of action on deforestation and conversion but does reflect their exposure because of their geographies and sectors of operation, as well as a need to improve the strength of their commitments or their implementation. In addition, it has been possible to identify these companies and financial institutions as they have the capacity to provide the necessary information and data.

TABLE 3: EXAMPLES OF ISSUERS/UPCS IN THE ECB COLLATERAL BASKET WHICH ARE EXPOSED TO DEFORESTATION AND CONVERSION RISKS

Company/Financial Institution/UPC	Impacts by location	Examples of exposure to deforestation and conversion risk
Adidas	**Sourcing of leather from Brazil**	Adidas's commodity score in the Forest 500 in 2022 was just 16 out of 90. The strength of its commitments and implementation were also assessed poorly (5 out of 17 and 7 out of 56, respectively) (Forest 500, NA).
Continental	**Sourcing of rubber in equatorial Africa**	In its 2023 assessment, SPOTT scored Continental with 4.5 out of 10 regarding deforestation and biodiversity, with an overall score of 51.5 out of 109 (SPOTT, NA). SPOTT found that Continental failed to monitor its supply chain operations for deforestation and conversion and its commitment on forest protection from illegal activities only covered certain forms of illegal activities.
Shell	**Sourcing of palm oil and soy products for biofuel production from Southeast Asia**	The Forest 500 ranking gave Shell a commodity score of 13 out of 90 in 2022: it highlighted that the company lacked robust policy on reporting and suppliers were not aligned with deforestation commitments (Forest 500, NA).
Group BPCE	**Financing of sectors with exposure to deforestation risk commodities in various geographies, including Brazil and Colombia**	According to Forest and Finance (Forest and Finance, NAa), BPCE extended US$1.3 billion of credit to sectors with exposure to deforestation risk between 2013 and 2022, while it invested US$55 million in those sectors up to 2022. It Invested US$478 million in mining between 2016 and 2022 and provided US$206 million as revolving credit facilities (Forest and Finance, NAb). In addition, Forest and Finance ranked BPCE policy scores on commodities at 0.2 out of 10 in 2022. Firms funded by BPCE included COFCO (sourcing soy from Brazil, with an overall score of 32% in the Forest 500 ranking in 2022) and Groupe Lactalis (which had an overall score of 13% in the Forest 500 ranking in 2022).
Banco Santander	**Financing of companies sourcing from Argentinian soy, Paraguayan beef and soy, Brazilian beef and soy, Indonesian palm oil**	Santander's average policy score regarding deforestation-risk commodities was 3.6 out of 10 in 2022, measured by Forest and Finance (Forest and Finance, NAa). It had business relations with JBS (with a score of 32% in the Forest 500 ranking in 2022) The Spanish banks also helped issue bonds for Brazil's other meat-producing companies, Marfrig and Minerva (scoring 39% and 29% respectively in the Forest 500 ranking in 2022).
Louis Dreyfus Company	**Sourcing of commodities exposed to deforestation risk commodities in South America and Southeast Asia**	In 2019, Chain Reaction Research (2019) identified Louis Dreyfus Company as direct and indirect buyer of three Southeast Asian entities in the company's supply chain responsible for deforestation. In the Food and Agriculture Benchmark of 2023, the company ranked 224th out of 350, scoring a mere 10.9 out of 100 (World Benchmarking Alliance, 2023).
Bayer	**Sourcing of palm oil and soy derivatives, principally from Brazil**	According to CDP Forests 2023 Questionnaire (CDP, 2023c), 3% of Bayer's revenue depends on palm oil and 4% on soy. The company scored 14.3 out of 24 in WWF's Palm Oil Buyers Scorecard (WWF, 2024c).
BASF	**Sourcing of palm kernel oil and its derivatives, mainly from Brazil**	BASF sources 50% of the 441,108 metric tonnes of palm oil it consumes through its own supply chain (WWF, 2024c). WWF's PBOS puts BASF at 58th place with a total score of 14.6 out of 24. Forest 500 ranking gave BASF an overall score of 38 out of 100 in 2022. Its policy scores on pulp, paper and soy are 10 out of 90.
Canadian Banks: Royal Bank of Canada, ScotiaBank, Toronto-Dominion Bank, Bank of Montreal, Canadian Imperial Bank of Commerce	**Financing of companies associated with deforestation-risk commodities: tar sands and beef**	The ECB accepts bonds from banks which are the most important financiers of the Canadian tar sands industry (Rainforest Action Network et al., 2023). This industry is responsible for clearing huge areas of Canadian boreal forests for oil sands extraction (WRI, 2014). All major Canadian banks with assets in the ECB collateral basket lack robust policies to mitigate tropical deforestation risks occurring through their financing activities (Forest and Finance, NAa). The companies financed, which are highly exposed to deforestation, include JBS (financed by Bank of Montreal and Bank of Canada), Marfrig, Bunge, Minerva Foods and Cargill.

From the total sample of 259 issuers/UPC:

- **43 (16%) were assessed by Forest 500.**
  - Of these, 93% had an overall score below 50 (out of 100).
  - Of these, 97% had a commodity score below 50 (out of 90).
- **52 (20%) had cases registered in the Environmental Justice Atlas.**

The total sum of cases of the 52 issuers were 303, with a minimum of 1 case per issuer/UPC to a maximum of 82 cases per issuer/UPC.

The tools used for this analysis aim to signalise potential red-flags on the exposure to deforestation-risk commodities and are just a first step to address deforestation and conversion within the collateral basket. **These can thus be used as a step to pinpoint those companies and financial institutions that both contribute to deforestation and conversion, but also have leverage to drive meaningful change**. For a complete analysis, this exercise should be followed by a careful examination of the specific instruments and the associated companies and financial institutions. More on the tools used for this exercise, additional tools and metrics, and their recommended uses for further analysis are described in Section 4 of this guidance.

Such an examination should include an estimation of the concentration risk caused by the potential financial exposure of the ECB to companies exposed to deforestation and conversion, and the contribution to these issues through the allocation of financial flows to relevant sectors. When examining the ECB's collateral basket, it is evident that the assets contained are diversified. However, by looking into the financial institutions and companies which might be backing businesses or initiatives linked to deforestation and conversion, the associated concentration risk could be amplified: this means that the collateral basket could make a high indirect contribution to deforestation and conversion, as well as face higher exposure due to the concentration of companies and financial institutions exposed to deforestation-risk commodities. In addition, if these financial institutions fund projects within the same ecosystem, the risk linked to deforestation and conversion becomes more concentrated. With this potential concentrated risk, any negative event in that ecosystem – such as environmental issues, regulatory shifts, or opposition from local people – could simultaneously impact all related projects, potentially causing financial setbacks for all associated institutions.

Moreover, financing companies that endanger local ecosystem services through deforestation and conversion can also threaten other economic activities, resulting in trade-offs. If a significant portion of the assets or securities in the ECB's collateral basket are tied to industries or sectors that promote deforestation, it makes the entire system more vulnerable to shocks specific to that sector. Furthermore, assets associated with high concentration risk might be harder to liquidate without incurring significant losses, especially if there is a widespread move away from deforestation-linked industries.

As previously stated, the ECB is one of the central banks that has started to take measures for the integration of climate considerations in its policies and portfolios, including the collateral basket. However, nature loss is still not integrated in ECB portfolios so far. **The integration of deforestation and conversion considerations, including in the collateral basket, would help mitigate financial risks linked to deforestation and conversion but also ensure that the collateral basket does not contribute to activities that are reinforcing climate change and nature loss.**

Many trees have been killed by the encroachment of seawater and rising sea levels. Raviravi,Vanua Levu, Fiji. © Tom Vierus / WWF-UK

Deforestation for agriculture and park's boundaries Virunga National Park DRC. © Martin Harvey / WWF

KEY MESSAGES FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

- Central banks might be contributing to deforestation and conversion through the assets in their collateral basket and other portfolios, such as asset purchase programmes. This exposes them to associated transition, physical and potential systemic risks.
- The exercise undertaken is meant to exemplify and signal how the collateral basket of a central bank can hold assets which are exposed to deforestation and conversion risk. These risks are still neither accounted for nor considered in the eligibility of assets within the collateral framework. Current information is already good enough to start taking action: should deforestation and conversion risks materialise without proper preparation, transmission to the economy and the financial system will be less orderly and predictable. This will jeopardise the achievement of the goals of CBFS.

Key recommendations

- Alignment of monetary and non-monetary policy portfolios to net-zero and a nature-positive pathway should include deforestation and conversion considerations.
- Central banks lead by example on analysing and mitigating deforestation and conversion risks in their collateral baskets. Based on the available tools and metrics (further described in the next section), and on the guidance approaches for financial institutions, first steps can already be taken. Pilot exercises can begin with their own portfolios, to be further applied to collateral baskets.
- The fact that there is an overall lack of aligned and disclosed information on deforestation and conversion also reflects the importance of the role of CBFS and their collaboration with other stakeholders to encourage its collection, monitoring and disclosure. An example of this collaborative effort is the one undertaken by the ECB with the national central banks of the EU members (ECB, 2024a) to developing statistical indicators – harmonised at the euro area level – for climate-related analysis. Another example is Banco Central do Brasil's implementation of its of the Rural Credit Policy, in which collaboration with multiple governmental bodies has been fundamental for data collection, verification and analysis, and the overall execution of the policy (see section 3 of this document). In this sense, CBFS need to signal financial institutions and companies to prepare for a changing data-landscape, considering the information requested in disclosures that already take into account deforestation and conversion (TNFD and ESRS 4, for example), and regulatory frameworks (such as the EUDR).

03: EMERGING ACTIONS BY CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS, AND FINANCIAL INSTITUTIONS

The black-bellied whistling duck, Amazon Tapajos River. © WWF-Brazil / Adriano Gambarini

SECTION 03: EMERGING ACTIONS BY CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS, AND FINANCIAL INSTITUTIONS

A handful of central banks are beginning to take action on deforestation. This section discusses emerging practices among central banks and details the case of the Banco Central do Brasil, which has played a fundamental role in promoting sustainability in the financial system and has implemented regulatory action through its Rural Credit Policy.

It also provides an overview of the actions taken by financial institutions to identify and assess deforestation and conversion risk, as well as their commitments and pledges to halt deforestation and conversion. This is accompanied by a brief description of the guidance available to support such actions. It also considers the gaps and challenges faced by financial institutions in this effort.

SOME CENTRAL BANKS ARE ALREADY TAKING ACTION

WWF's Greening the Financial Regulation initiative, through its SUSREG Tracker (Sustainable, Financial Regulations and Central Banks Activities Assessment; WWF, 2023a), collects emerging good practices regarding sustainability within financial regulation and supervision and monetary policy. Practices relevant for the topic of deforestation and conversion include the following:

- The due diligence questions in Bank Negara Malaysia's Climate Change Principle-Based Taxonomy, under guiding principle 3 'no significant harm to the environment'. These include questions such as whether clients are looking to achieve deforestation- and conversion-free supply chains across relevant high-risk commodities. Moreover, Bank Negara Malaysia has launched its Value-Based Impact Assessment Framework, which represents a framework for Islamic Financial Institutions. While it is voluntary, it helps financial institutions adopt ESG considerations in the provision of financial services. Within the framework, the central bank has published sectoral guidelines, including one for palm oil (VBIAF, 2021)).
- A Guideline on the use of Deforestation Risk Mitigation Solutions for Financial Institutions, published by De Nederlandsche Bank (DNB) in 2018. The guide provides a list of tools to help financial institutions tackle deforestation (Fuchs et al., 2018). In March 2023, DNB launched its Guide to managing climate and environmental risks, which helps financial institutions address issues like water or air pollution, deforestation and loss of biodiversity and ecosystem services.
- The Monetary Authority of Singapore's requirement that insurers apply risk criteria to identify sectors with higher environmental risk. The risk criteria may include the level of GHG emissions, vulnerability to extreme weather events and linkages to unsustainable energy practices, deforestation and pollution.

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HALTING DEFORESTATION THROUGH FINANCE: REGULATORY MAPPING OF THE CENTRAL BANK OF BRAZIL[14]

The Banco Central do Brasil (BCB) has played a crucial role in encouraging sustainable practices within the Brazilian financial sector. In 2020, the BCB added sustainability as one of the pillars of its Agenda BC# (BCB, 2020) and recognised climate change as not only a social and environmental concern but also as a risk to financial stability. In pursuit of the commitments within its Agenda, the BCB has taken measures to align agricultural financing with sustainability goals. These include initiatives that address deforestation and conversion through its rural credit policy, which supports Brazil's national Agricultural Plan.

Deforestation of the Amazon and conversion of the Cerrado

Brazil is home to the largest area of native tropical vegetation on the planet. However, the nine Brazilian states that constitute the Legal Amazon have already lost about 20% of their original forest cover (Gandour, 2021). Between 1985 and 2022, pasture areas for cattle farming have expanded from 3.3% to 13.7% of the region, and croplands have increased from 80,000 to more than 7 million hectares (equivalent to a percentage rise from virtually zero to 1.7%).

Brazil is also home to the Cerrado, a vast savanna that is also ecologically vital, but which benefits from little protection compared with the rainforest. Over recent decades, the Cerrado has lost more than 50% of its native primary vegetation (TerraBrasilis, 2023) and, from 2019 to 2022, over 40% of conversion in Brazil occurred in this biome (TerraBrasilis, 2023). The drivers of conversion in the Cerrado are also linked to global supply chains, agricultural expansion, land insecurity and speculation, and inadequate fire management.

Current environmental policy

The federal administration has established and activated an Action Plan for the Prevention and Control of Deforestation in the Legal Amazon and a Prevention and Control of Deforestation Plan for the Cerrado, (initially launched in 2010) to be implemented from 2023 to 2027.

In 2022, the federal government committed to achieve zero deforestation by 2030 in all biomes (Cristaldo, 2023).

Financial regulatory improvements

Within Brazil's financial sector, the National Monetary Council (CMN) and the BCB have a vital role to play to encourage sustainable finance. Through different regulatory, supervisory and monetary policy activities, the CMN and the BCB have integrated climate and nature considerations within the Brazilian financial system, including those addressing deforestation and conversion. Considering the scope of this guidance, it is not possible to describe in detail such a robust regulatory framework (see the full report commissioned within the framework of this guidance, Stussi et al., 2024). Due to its relevance in addressing deforestation through the regulation of incentives for agriculture, the below considers the BCB's regulatory agenda relating to the rural credit.

Rural credit

The national rural credit policy in Brazil is based on the Brazilian Agricultural Plan (Plano Safra), which is the main policy for supporting the agricultural sector in Brazil. It determines and provides subsidies to support the sector, including subsidised credit. Through the rural credit policy, subsidised rural credit is linked to compliance with environmental requirements and land tenure laws, which can boost productivity and contribute to reducing pressure on deforestation.

The normative proposals for the Agricultural Plan, including the financial conditions for loan allocation, were developed by the Ministries of Agriculture and Livestock, of Economy, of Agrarian Development and the BCB. The specific conditions for the credit lines are subject to approval by the CMN (which is the highest deliberative authority in the national financial system and regulates Brazil's monetary credit, budgetary, fiscal and public debt policies) and are recorded annually by the BCB. All beneficiaries and financial institutions operating in the National Rural Credit System, private or public, must adhere to these provisions.

The central bank, as the regulator, plays an important role in imposing restrictions and impediments to rural credit allocation and establishing financial incentives to promote sustainable practices in the agricultural sector. These efforts aim to address and discourage illegal deforestation and conversion while encouraging increased agricultural productivity without the need for opening new deforested areas.

14. This section is based on the work developed by Stussi et al. (2024), which was commissioned by WWF for the purpose of this project.

Unsplash – Ahmet Kurt

BOX 9: THE RURAL ENVIRONMENTAL REGISTRY

Brazil's Rural Environmental Registry (Cadastro Ambiental Rural or CAR) is an electronic registration system, introduced by the Forest Code, that maps and documents information about rural properties, including their vegetation coverage, land use and preservation areas. It aims to create a registry of all rural properties in the country to facilitate the environmental regularisation of rural properties and ensure control, monitoring and reduced deforestation.

Although it is mandatory that all rural properties disclose information to CAR, that information is self-declared by property owners. The development of the registry is still ongoing and involves various stages: registration (the deadline for which has been extended several times due to operational and logistical challenges), analysis and data validation. These last two steps depend upon state agencies to ensure the accuracy and compliance of information, as well as the proper application of environmental regulations. Despite progress, there are enormous challenges to CAR implementation: as of September 2023, about 27% of total registrations had undergone some form of analysis, and only 1.3% of registrations had completed environmental regularity analysis (MMA, 2023; Lopes et al., 2023).

The presentation of CAR registration became effectively mandatory in 2018 for receiving agricultural financing.

Among the most important resolutions by the CMN and the BCB are:

- Resolution No. 3,545/2008, passed by the BCB in 2008, requires documentary evidence of environmental compliance and rural property registration for financing agricultural activities in the Amazon biome.
- Resolution 4,106 from the CMN in 2012 established that producers can increase credit limits if they meet specific environmental criteria, for example the adoption of traceability systems. In addition, producers which adopt no-till practices, which help to reduce carbon emissions, can receive an additional increase in credit limits. In the following year, through Resolution 4,226/2013, the CMN adjusted this rule to also include producers enrolled in the Rural Environmental Registry (CAR) as beneficiaries of the increased credit limit.
- Resolution BCB 140/2021 established that provision of credit is not allowed for properties with cancelled CAR registration, or for enterprises located in conservation units, Indigenous territories, and/or Quilombola communities. In addition, enterprises under embargo from the Brazilian Institute of the Environment and Renewable Resources due to the economic use of illegally deforested areas in the Amazon biome, or those that subject workers to conditions akin to slavery, are also prohibited.
- CNM Resolution 5,021/2022 established that producers can be eligible for higher credit limits if they comply with an analysed and validated CAR by the corresponding state agency, and are in compliance with the Forest code.
- In 2023, CMN Resolutions 5,078/2023 and 5,102/2023 established that, in addition to an increase in working capital credit limits, producers can also obtain discounts on the interest rates paid on working capital operations.
- Resolution CMN 5,081/2023 expanded the restriction on granting of rural credit to enterprises with suspended CAR registrations[15] and to rural properties wholly or partially located in conservation units listed in the National Conservation Units Register (Cadastro Nacional de Unidades de Conservação, or CNUC), Indigenous reserves and embargoed areas, including embargoes issued by state agencies throughout the national territory, not limited to the Amazon biome.

15. The term 'cancelled CAR' refers to the revocation of the CAR registration due to the provision of false information, by judicial or administrative decision, or at the request of the owner/holder. This implies the loss of environmental compliance for the property, with possible legal implications. On the other hand, a 'suspended CAR' indicates a temporary interruption of registration due to irregularities or issues that require correction. Typically, this suspension allows the rural landowner to make necessary adjustments to the information, allowing its registration to be reactivated once regularisation is achieved (CNMP, 2022).

BOX 10: THE CREATION OF THE SUSTAINABLE RURAL CREDIT BUREAU AND SICOR

In 2021, as part of the BC# Sustainability initiative, the BCB announced the creation of the Sustainable Rural Credit Bureau.

This initiative involved the transformation of the Rural Credit and PROAGRO Operations System (Sistema de Operações do Crédito Rural e do Proagro, or SICOR)[16] into a comprehensive data system containing detailed information on all rural credit contracts nationwide. The SICOR system processes operations in real-time, conducting checks, cross-referencing data with sources external to the BCB, validating records and attesting to the accuracy of information to ensure that formalised operations comply with rural credit regulations.

In addition to details about the funded operation, such as value, programme, purpose and beneficiary, the system provides information on the financed product and agricultural specifics such as: cultivation methods, cultivation type, irrigation system, etc. By making these parameters explicit, the BCB encourages the financial system to offer more favourable conditions to producers with these characteristics, following the international trend of mitigating the social and environmental risk associated with granting credit.

The Bureau's implementation aims to verify rural credit impediments at the moment of contracting and subsequently in the monitoring process. For this to be feasible, the BCB is partnering with several institutions to integrate databases into SICOR, such as the National Institute for Colonisation and Agrarian Reform, the National Indigenous People Foundation, IBAMA, Chico Mendes Institute for Biodiversity Conservation, the National Water and Basic Sanitation Agency, and the Ministries of the Environment and of Justice. This process involves signing agreements with government agencies and collaboration between the BCB and experts from technical entities, enhancing the supervision of rural credit and PROAGRO.

The development of the Bureau also involves the complete disclosure of data on rural credit operations that receive any subsidy; this has been available since 2022 on the BCB's website. Resolution BCB 204/2022 enables beneficiaries to access information related to their operations registered in SICOR and authorise third parties for specific purposes, such as obtaining information about properties, financed enterprises, and rural credit operations, as well as using data in certification and validation processes.

The effectiveness of the resolutions is measured by the BCB through several indicators constructed using data available at SICOR. Independent studies of the effectiveness of the rural credit measures have not been widely undertaken. However, in 2019, an exercise to understand the avoided deforestation resulting from the rural credit resolution of 2008 concluded that, given the parameters of the study, the total area deforested during the sample period (2003 through 2011), was 60% smaller than it would have been in the absence of the policy (Assunção et al., 2019).

The BCB is working to pinpoint areas that show signs of non-compliance with these regulations. Financial institutions responsible for these operations are required to verify and provide explanations for any identified non-compliance. In cases where non-compliance is confirmed, institutions must declassify the operations. This measure results in a substantial increase in costs for the borrower and may lead to the reporting of irregularities to other authorities.

The successful implementation of the rural credit policy is directly linked the enforcement, transparency and monitoring through the SICOR and supporting databases and satellite imagery provided by other governmental agencies.

It is important to emphasise that these regulatory measures aim to promote sustainability in rural credit, with a focus on environmental preservation, protection of conservation areas and respect for social rights. However, the effectiveness of these measures depends on adequate oversight and the adoption of sustainable practices by rural producers. A joint effort between the financial sector, regulatory bodies, development institutions and producers is necessary to ensure compliance with these regulations and to promote more sustainable and responsible agriculture.

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16. The Agricultural Activity Guarantee Program (Programa de Garantia da Atividade Agropecuária, or PROAGRO) is a public policy that exempts beneficiary farmers from fulfilling financial obligations in working capital rural credit operations and compensates producers for their own resources used in operational expenses in the event of losses caused by climatic events. It works in a manner akin to insurance, providing financial relief and support to farmers affected by adverse weather conditions.

ACTION TAKEN BY FINANCIAL INSTITUTIONS IS INCIPIENT AND REGULATORY SUPPORT IS REQUIRED

Paper mill, Yueyang, Hunan, China. © Theodore Kaye / WWF China

Financial institutions play a fundamental role in underwriting the production of deforestation risk commodities. Whether through lending or investment, they enable the agricultural and forestry sectors to satisfy demand for these commodities but, at the same time, they generate associated deforestation and conversion risks – which jeopardise the agricultural and forestry activities themselves.

To preserve financial stability, CBFS need to understand the extent to which financial institutions drive and enable deforestation and conversion risks and support illegal deforestation activities, and how this can translate into systemic risk. In addition, CBFS should review financial institutions' risk management policies regarding deforestation and conversion, identify where they face challenges and gaps, and support them by publishing guidelines for the proper integration of those risks.

FINANCIAL INSTITUTIONS' EFFORTS TO HALT DEFORESTATION AND CONVERSION

Financial institutions contribute to deforestation and conversion associated with commodity production. Forest 500 calculated that, as of October 2022, 150 financial institutions studied had provided a total of US$6.1 trillion to the 350 companies most exposed to deforestation-risk commodities (Thomson et al., 2024).

Advocacy has highlighted the financial sector's significant influence on deforestation. As a result, the sector has rallied around initiatives like Finance Sector Deforestation Action (FSDA) in which, during COP 26, over 36 financial institutions managing US$8 trillion in assets pledged to eliminate deforestation risks linked to agricultural commodities such as cattle, soy, palm oil, and pulp and paper from their portfolios by 2025 (Finance Sector Deforestation Action, 2021). This commitment represents one of the first organised efforts by the financial sector to confront deforestation head on. Although it doesn't cover the conversion of non-forest ecosystems, it sets out a roadmap for financial institutions to follow (Finance Sector Deforestation Action, 2021). Among their actions, members of the FSDA published a document setting out investor expectations for companies, including around expected commitments, assessments and due diligence, and disclosure.

Another relevant initiative is the Glasgow Financial Alliance for Net Zero which, through its Statement on Deforestation Financing, encourages its members to eliminate commodity-driven deforestation from their investment and lending portfolios.

GUIDANCE FOR FINANCIAL INSTITUTIONS TO ELIMINATE DEFORESTATION AND CONVERSION FROM THEIR PORTFOLIOS

Guidance is available to help financial institutions formulate and monitor commitments to eliminate commodity-driven deforestation and conversion. Three noteworthy resources are: Finance Sector Roadmap by Global Canopy (2022b), WWF's Seeing the Forest for the Trees (WWF, 2023d) and the Sustainable Finance Platforms' Guideline on the use of Deforestation Risk Mitigation Solutions for Financial Institutions (Fuchs et al., 2018). In addition, the Accountability Framework initiative provides general guidance to financial institutions on how to establish policies for lending and investment in sectors exposed to deforestation and conversion, as well as on how to screen and engage clients and portfolios. Each of these guides provides a stepwise approach with specific recommendations, resources and tools for implementing each step. The following table summarises their advice.

TABLE 4: SUMMARISED GUIDANCE FOR FINANCIAL INSTITUTIONS TO ELIMINATE DEFORESTATION AND CONVERSION FROM THEIR PORTFOLIOS

Guidance steps	Description	Examples of challenges for the implementation of the steps
Step 1. Understand and map material risks	▪ Identify regions and sectors with the highest risk. ▪ Determine high-risk clients and investees, prioritising each based on probable risk. ▪ Assign priority level to each client and investee with probable risk.	Lack of availability of open-source public data relating to clients and investees on the degree of exposure and strength of mitigation response.
Step 2. Develop an effective deforestation and conversion policy that also addresses human rights	When structuring the policy, it is crucial to: ▪ Include important landscapes, comprising forests and other ecosystems; ▪ Address illegal and illegal deforestation and conversion; ▪ Guarantee and reinforce internationally recognised human rights; ▪ Cover the full spectrum of financial institutions' business areas, all clients and investees, and all material risks; ▪ Set a credible and ambitious target date, and a specific cut-off date (set in the past); ▪ Require clients and investees to set targets and policies to eliminate deforestation and conversion from their operations. The policy should outline a specific objective with clear expectations, a cut-off date with an ambitious target date, and a specified timeline with intermediate targets to track progress.	Financial institutions need to require their clients and investees to set targets to eliminate deforestation and conversion, who in turn, must also make sure that their suppliers align to these commitments. According to CDP (2023a), of 1,000 companies analysed on deforestation-related disclosures, only 1% offer suppliers the financial and commercial incentives, or the technical support, to help them set their own deforestation and conversion commitments.
Step 3. Due diligence and monitoring of progress	▪ The main focus of due diligence and monitoring should be on the clients and investees identified as high and medium risk in step 1. ▪ Aspects relevant to monitoring progress include the presence and strength of client or investee deforestation and conversion policies, progress towards ensuring internationally recognised human rights, demonstration of supply chain traceability, and confirmation of excluded activities in specific locations. **For conversion of non-forest ecosystems, WWF's publication Beyond Forests (WWF, 2022b) provides a roadmap for performing due diligence by companies, which can be adapted by financial institutions*	In-depth risk assessments and due diligence require asset data, with specific location and ownership information. Availability is limited and is usually a commercial service. This becomes even more challenging when it comes to addressing clients throughout an entire portfolio, and for aspects such as demonstration of supply chain traceability.
Step 4. Best practice engagement of clients and investees	▪ Identify clients and investees to engage (those with exposure to deforestation, conversion and human rights risks, that are best placed to mitigate risk and/or have made insufficient progress towards management of their risks). ▪ Develop a best-practice engagement strategy involving regular screening and progress monitoring. This can include supporting clients and investees in establishing DCF supply chains. Numerous tools exist to help provide this support, such as those offered by the Accountability Framework initiative and the DCF Implementation Toolkit. ▪ Consider managed phase-out or termination after substantial engagement efforts.	Engagement of clients and investees generally is time consuming; recommended six-monthly monitoring is resource intensive.

Step 5. Transparent reporting and continuing engagement	▪ Publicly disclose information and metrics on the policy commitments to eliminate deforestation, conversion and associated human rights abuses from portfolios, outlining target dates.
	▪ Provide evidence of policy implementation including:
	  ▪ The percentage of portfolio under the risk assessment;
	  ▪ Proportion of clients and investees in each risk category and those being engaged;
	  ▪ Details on any divestment decisions;
	  ▪ Financial exposure over time and progress towards targets.
	▪ Continue engaging non-compliant and exposed client/holdings.
	▪ Publish annual progress reports.	

Despite significant steps taken by signatories and members of these initiatives, most financial institutions exposed to deforestation risks are not doing enough. According to the 2023 Forest 500 analysis, only 55% of financial institutions analysed had a publicly available deforestation policy. Furthermore, 85% lacked a comprehensive approach to deforestation across their portfolios. The three financial institutions providing the most finance to Forest 500 companies without a single deforestation commitment are global systemically important banks including J.P. Morgan Chase (US$27 billion), Bank of America (US$23 billion), and Mitsubishi UFJ Financial (US$21 billion) (Thomson, E. et al 2024; FSB, 2023). In addition, such banks have been included in the Forest 500 analysis for the past decade without publishing any deforestation commitments.

This lack of progress also extends to financial institutions with notable climate commitments. The 2023 Deforestation Action Tracker Assessment (Thomson, 2023) found that, of the over 700 financial institutions with climate commitments, 75% (536) do not have a public deforestation policy. Alarmingly, only 21% (152) recognize deforestation as a business risk, and none are on track to eliminate commodity-driven deforestation by 2025. Only 25% (177) have published a deforestation policy for at least one of the highest risk commodities and only 10% (69) have a deforestation policy for all high-risk commodities.

Moreover, the financial institutions providing funds to these companies are also behind in implementing actions on human rights. The same study found that only 185 financial institutions assessed (26%) had a policy for requiring their clients to respect labour rights, 125 (18%) had a policy on free prior and informed consent for at least one the deforestation risk commodities, and only 7 (1%) had a policy on adopting a zero-tolerance approach to violence and threats against forest, land and human right defenders (Thomson, 2023). Finally, as explained in Box 8, the financial institutions analyzed are not addressing their exposure to crimes related to land conversion, and the resulting legal risks.

This is evidence that market initiatives have, so far, failed to address deforestation and conversion and associated crimes at the pace necessary to mitigate related financial risk. Efforts by financial institutions are nascent, but integration in financial regulation and monetary policy can bolster their response, helping to mitigate risk and reduce the contribution of the financial system to environmental crimes.

Women's association "Virgen del Rosario" carry harvested mate leaves. Tavapy, Atlantic forest. © Sonja Ritter / WWF

KEY MESSAGES FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

- Financial institutions responsible for allocating resources to deforestation-risk sectors, such as agriculture and forestry, do not fully recognise deforestation and conversion as a risk. This is reflected in the overall lack of effort to eliminate commodity-driven deforestation by the financial sector.
- Detailed guidance is available to support financial institutions in identifying, assessing and eliminating deforestation and conversion risks from their portfolios.
- A continued lack of recognition can translate to delayed action, which can create further nature- and climate-related risks, with cascading and compounding effects, leading to potentially systemic risks.
- Financial institutions are not adequately addressing environmental financial crimes related to deforestation and conversion, which represent transition risks.

Key recommendations

- Financial risks linked to deforestation and conversion may also represent potential systemic risks and therefore need to be properly integrated in financial institutions' risk management. The integration of financial crimes should also be taken into consideration within financial risk management frameworks. CBFS already have the tools and policies at their disposal to ensure their prevention and mitigation. For example:
  - Financial regulators and supervisors need to encourage the recognition of deforestation and conversion risks by setting clear expectations on their inclusion in financial institutions' risk management frameworks.
  - Financial regulators and supervisors need to set expectations for financial institutions to:
    - Disclose the exposure of their portfolios to deforestation- and conversion-related risks and require the necessary information of their clients and investees to estimate such exposure.
    - Assess, manage and mitigate their portfolios' exposure to material deforestation and conversion risks.
    - Provide support to their clients and investees in structuring action plans regarding deforestation- and conversion-free commitments.
    - Set deforestation- and conversion-free commitments and publish transition plans with ambitious target dates and past cut-off dates, following the recommendations of the guidance referenced in this section.
  - Financial supervisors should issue guidelines and requirements for financial institutions to manage the financial risks linked to deforestation and conversion. The supervisory review process should integrate the management of those risks, stricter capital requirements should be applied when risks are not properly taken into account, and penalties should be applied in case of non-compliance.
  - Financial regulators should include higher capital requirements in the prudential framework for activities that are always detrimental to forests and ecosystems.
  - Central banks should lead by example and recognise and start assessing and mitigating deforestation and conversion risks within their monetary and non-monetary policy portfolios.
- CBFS need to work with relevant stakeholders to ensure that the information and data on deforestation and conversion from financial institutions and companies is collected and disclosed. The collaboration with other stakeholders needs to:
  a. ensure alignment in data requirements with sustainability reporting standards, including national and regional reporting standards and regulatory frameworks, such as the European Sustainability Reporting Standards (ESRS) and the EUDR, and especially those that affect the upstream and midstream companies which are producers and exporters of deforestation-risk commodities.
  b. ensure monitoring and verification of the data and information. This will require collaboration with other public, private and academic actors to ensure accuracy and transparency.
- Financial supervisors must put in place stringent regulations to ensure that financial institutions do not engage in crimes related to land conversion and that they monitor the implementation and compliance of such regulation. Moreover, central banks must ensure that they conduct strict due diligence to avoid the embedding of crimes related to land conversion within their monetary and non-monetary policy portfolios.

04: TOOLS FOR DEFORESTATION AND CONVERSION FINANCIAL RISK ASSESSMENT

Rio Tapajos, Santarem stretch of Jacareacanga, Pará State, Brazil. © WWF-Brazil / Adriano Gambarini

SECTION 04: TOOLS FOR DEFORESTATION AND CONVERSION FINANCIAL RISK ASSESSMENT

This section describes 15 tools used by financial institutions to undertake the steps needed to eliminate deforestation and conversion from their lending and investment portfolios (according to the steps suggested in the guidance referenced in the previous section). These tools should also prove useful for central banks in their efforts to eliminate deforestation and conversion from their monetary and non-monetary policy portfolios.

In addition, the section sheds light on potentially useful tools for risk identification assessment by central banks and financial supervisors for the financial system as a whole (according to the phases suggested by the NGFS in its Nature-related Financial Risks conceptual framework, NGFS, 2024).

This section also suggests applicable tools for undertaking each of the steps of the LEAP approach to identify and assess nature-related issues, as set out in the TNFD disclosure framework.[17] Finally, the table is followed by a brief analysis of the most important gaps and challenges on the use and usability of the tools for financial institutions and CBFS. It Is important to stress that WWF's GFRI objective is not to endorse or suggest tools, but simply cover those that are most widely used.

Young and mature oil palms, Sabah, Borneo. © Chris J Ratcliffe / WWF-UK

TABLE 5: POPULAR DEFORESTATION AND CONVERSION TOOLS USED BY FINANCIAL INSTITUTIONS

		1. Forest 500 (open source)	2. Forest IQ (proprietary)	3. Forest and Finance (open source)	4. Global Forest Watch (open source)	5. CDP (open source)
Description		Identifies the 350 companies and 150 financial institutions with the greatest exposure to tropical deforestation risk and human rights abuses through their production, processing, procurement and financing of the six highest-risk forest commodities	Provides data and metrics on corporate performance on deforestation, including materiality assessments	Assesses finance received by over 300 companies in soft commodity supply chains, whose operations may impact natural tropical forests and communities	Global and local forest data on conservation/land use; deforestation alert and in-depth reporting on forest status	Data on voluntary reports of company data, based on a questionnaire outlining deforestation aspects
Category		Assessment and ranking service	ESG profiling	Assessment and ranking service	Forest GIS data	ESG profiling
Commodities		Palm oil, soy, beef, leather, timber, pulp and paper	Palm oil, soy, beef, leather, timber, pulp and paper, and natural rubber	Beef, soy, palm oil, pulp and paper, rubber and timber	Beef, soy, palm oil, pulp, paper, energy, minerals	Timber, palm oil, cattle products, rubber, cocoa and coffee
NGFS phases for risk assessment framework	**Identification of sources of physical and transition risk**	✓	✓	✓	✓	✓
	Assessment of economic risks		✓		✓	
	Assess risk to, from and within the financial system					
Steps for elimination of deforestation and conversion risks from portfolios		1, 2, 3	1, 2, 3	1, 2, 3	1, 3	1, 2, 3
TNFD LEAP approach step (L, E, A, P)		E	L, E, A	E	L, E	E

		6. ENCORE (open source)	7. Environmental Justice Atlas (open source)	8. MSCI Deforestation screening metrics (proprietary)	9. Roundtable on Sustainable Palm Oil (open source)	10. Starling (proprietary)
Description		An online tool that helps organisations explore their exposure to nature-related risk across different sectors. Impact analysis includes sectoral exposure to terrestrial ecosystem use.	Documents and catalogues social conflicts around environmental issues. It is an online interactive platform coordinated and managed by a team of researchers and activists	Indicates companies exposed to deforestation-related risks, including those that may directly or indirectly (via their supply chains) contribute to deforestation	Reports volume of palm oil and derivatives produced, processed and secured by RSPO member companies	Tracks forest changes, monitoring, traceability, diagnostic on deforestation verification, supply chain tracking and EUDR compliance
Category		Risk exposure analysis	Conflict and human rights mapping	ESG profiling Supply chain data Supply chain analysis	Supply chain data	Forest monitoring (dataset) Supply chain data Supply chain analysis
Commodities		No specific commodities	No specific commodities	Palm oil, soy, beef and timber	Palm oil	No specific commodities
NGFS phases for risk assessment framework	**Identification of sources of physical and transition risk**	✓	✓	✓	✓	✓
	Assessment of economic risks			✓		✓
	Assess risk to, from and within the financial system					
Steps for elimination of deforestation and conversion risks from portfolios		1, 2	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3, 4
TNFD LEAP approach step (L, E, A, P)		E	L, E	E, A	E, A	L, E, A, P

17. TNFD's LEAP is an integrated approach to guide companies in identifying, assessing, managing and disclosing nature-related issues across four phases: Locate the interface of the company with nature; Evaluate the dependencies and impacts that the company has towards nature; Assess the risks and opportunities; and Prepare to respond and report.

Agroforestry farm, East Usambara, Tanzania. © Juha-Pekka Kervinen / WWF

		11. Sustainalytics (proprietary)	12. Trase (open source)	13. WWF Biodiversity Risk Filter (open source) *Requires own asset-level data	14. World Benchmarking Alliance – Foo x & Agriculture (open source)	15. ZSL SPOTT (open source)
Description		Provides ESG research, ratings and data, including deforestation analysis	Maps supply chain linkages to increase supply chain transparency from production places to end consumers. This allows organisations to understand risk exposures and to identify opportunities for more sustainable production	Screening and prioritisation of biodiversity risk exposure as a whole. Includes layers on tree forest loss for assessing exposure.	Assessment of companies in the food and agriculture sector, according to their contribution to Sustainable Development Goals	A free online platform supporting sustainable commodity production and trade by providing in-depth analyses on the transparency of tropical forestry and palm oil companies (producers, processers and traders)
Category		ESG profiling	Supply chain data Supply chain analysis	Risk exposure analysis	Assessment and ranking ESG profiling	ESG profiling
Commodities		No specific commodities	Soy, beef, palm oil, shrimp, cocoa, coffee, corn, wood pulp, palm kernel, chicken, cotton, sugarcane, pork	No specific commodities	No specific commodities	Palm oil, timber, pulp and rubber (from tropical forestry)
NGFS phases for risk assessment framework	**Identification of sources of physical and transition risk**	✓	✓	✓	✓	✓
	Assessment of economic risks		✓	✓		
	Assess risk to, from and within the financial system					
Steps for elimination of deforestation and conversion risks from portfolios		1, 2, 3	1, 2, 3, 4	1, 2, 3	1, 3	1, 2, 3
TNFD LEAP approach step (L, E, A, P)		E, A	L, E, A	L, E, A, P	E	E, A

It is important to note that the tools in this section are categorised in relation to the objectives of this report. There are initiatives that provide a categorisation of tools according to the specific uses for companies and financial institutions, such as the guide by WBCSD (Grilli et al., 2023) or the Sustainable Finance Platforms' Guideline on the use of Deforestation Risk Mitigation Solutions for Financial Institutions (Fuchs et al., 2018). For example, the guide developed by WBCSD (Grilli et al., 2023) provides a useful decision tree for a deforestation-free investment or financing portfolio, which can also be useful for central banks when analysing the deforestation and conversion risks embedded in their monetary and non-monetary policy portfolios.

Additional tools can be found in the Finance Sector Roadmap by Global Canopy (2022b), WWF's Seeing the Forest for the Trees (WWF, 2023d), the Sustainable Finance Platforms' Guideline on the use of Deforestation Risk Mitigation Solutions for Financial Institutions (Fuchs et al., 2018) and the Accountability Framework initiative.

Challenges faced by financial institutions in the use of the available tools include:

- Limited coverage of asset-level data information by open-source datasets and tools that can link the location of production and processing operations with property ownership/rights (without which it is difficult to attribute deforestation and conversion to specific stakeholders), across global supply chains. This can constrain identification of exposures, reducing the possibility for wider due diligence and risk assessment. This also limits potential analysis of portfolio concentration risk in relation to creditors/investees, commodities and specific geographies.
- Limited coverage across commodities, geographies and ecosystems.
- The need to develop the necessary resources, capacities and expertise to be able to analyse the required data and use the appropriate tools.

Nevertheless, the available data, guidance and tools are already sufficient for financial institutions to start the process of recognising and accounting for deforestation and conversion risks. Moreover, information on exposure and due diligence can already provide the necessary elements for developing a deforestation- and conversion-free policy and action plan. As pointed out by WBCSD (Grilli et al., 2023), the combination of some of the available tools can provide enough information to assess lending and investment portfolios (as well as monetary and non-monetary policy portfolios) on their deforestation and conversion risks.

In addition, due to the importance of accounting for deforestation and conversion risks, tools are rapidly evolving and providing more precise datasets that aim to cover the exposure of sectors, locations, companies and financial institutions to deforestation and conversion risks.

As reflected in this section, significant progress is underway in terms of the availability and sophistication of deforestation- and conversion-risk tools for financial institutions. Their use for CBFS needs to be further investigated

KEY MESSAGES FOR CENTRAL BANKS, FINANCIAL REGULATORS AND SUPERVISORS

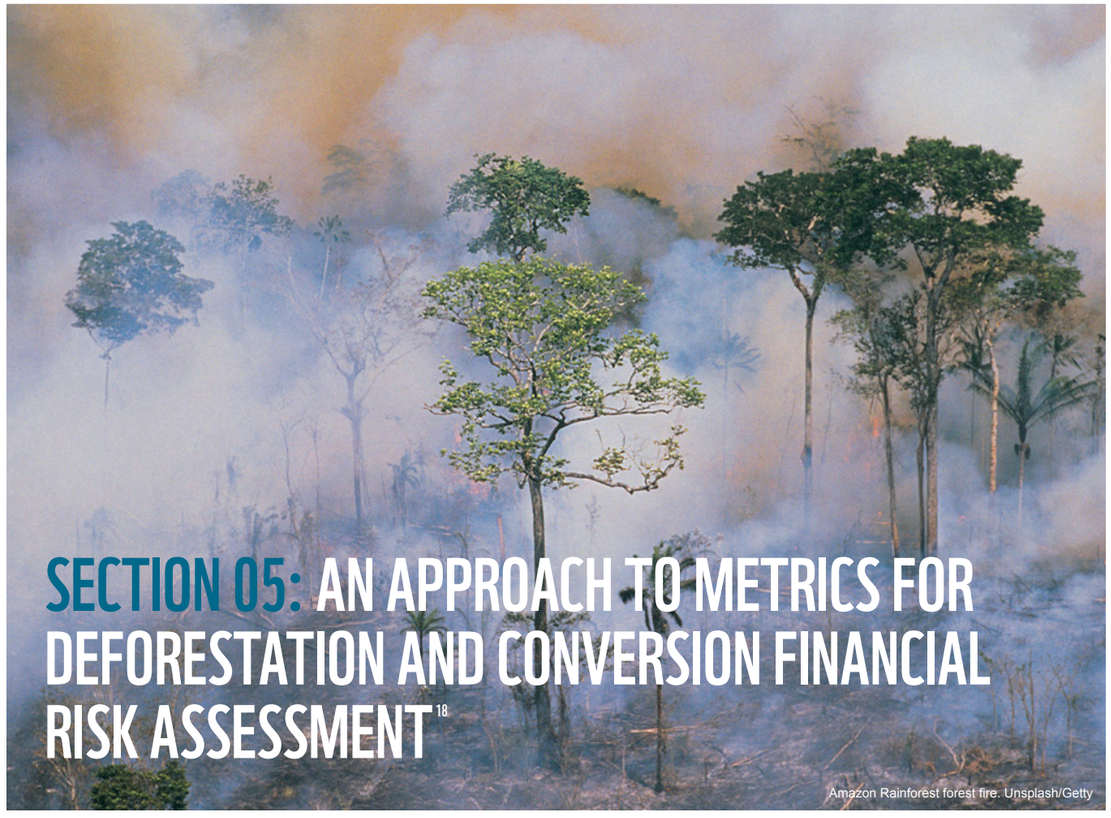
- There is a wide array of datasets and tools that can be useful for assessing exposure and deforestation and conversion risks of lending and investment portfolios, as well as for monetary policy and non-monetary policy portfolios.
- Challenges persist, especially when it comes to data and tools that allow analysis and traceability across commodities, geographies and ecosystems of global supply chains, creating particular challenges for overall risk assessments by CBFS.
- Even though the available open-source datasets and tools do not facilitate a straightforward assessment of deforestation and conversion risks, a combination of tools can provide the necessary information to do so.

Key recommendations

- Central banks can set an example by performing analysis of deforestation and conversion risks within their monetary and non-monetary policy portfolios.
- Financial regulators and supervisors should strive to provide the necessary guidance and technical support so that financial institutions can address challenges in the identification, assessment and mitigation of deforestation- and conversion-related risks. This also should include guidance in the support provided by financial institutions to their clients/investees on setting their own deforestation and conversion commitments.
- CBFS should engage with financial institutions to facilitate development of capacity on the use of guidance, datasets and tools to identify, assess and manage deforestation and conversion risks.

05: AN APPROACH TO METRICS FOR DEFORESTATION AND CONVERSION FINANCIAL RISK ASSESSMENT

Environmental damage caused by the palm oil industry to rain forest jungle © Richard Carey, Adobe Stock



SECTION 05: AN APPROACH TO METRICS FOR DEFORESTATION AND CONVERSION FINANCIAL RISK ASSESSMENT[18]

Amazon Rainforest forest fire. Unsplash/Getty

In this section, we explain the approach that CBFS can take in selecting and/or creating metrics on deforestation and conversion that allow them to adapt and set their banking and supervisory practices, as well as their monetary policies.

In contrast to risk assessment frameworks for financial institutions, risk assessment of the financial system by CBFS requires a wider approach. As recommended in this guidance, CBFS that assess the environmental materiality of the financial system when it comes to deforestation and conversion can also capture some transition risks approximately. This is because borrowers and investees with higher environmental impacts are, on average, more exposed to transition risks, since they are more susceptible to changes in environmental policies. Moreover, by actively contributing to the reduction of environmental exposures, CBFS will not only help address the environmental crisis, but also reduce the physical risks the financial system is exposed to.

Therefore, environmental adjustments to monetary and financial policy tools should never be based only on financial materiality perspectives: financial materiality adjustments should act as a complement to environmental materiality adjustments.

IDENTIFYING ENVIRONMENTAL MATERIALITY

Metrics for environmental materiality need to capture:

i. the physical flows generated by financial institutions that fuel deforestation and conversion;
ii. the types of activities that are financed through lending and investing; and
iii. the projects that they might run to reduce negative environmental impacts and decrease deforestation and conversion.

Table 6 summarises the features of these metrics, provides examples of them and of relevant databases/taxonomies, and illustrates how the metrics can be used in monetary and financial policy tools.

18. This section is based on the work developed by Dafermos et al., 2024, which was commissioned by WWF for the purpose of this project.

Physical flow-based metrics

In the case of deforestation and conversion, companies' environmental impacts can be quantified by metrics such as extent of forest and other ecosystems converted into other types of land, disaggregated by ecosystem and geographic location (and progress against targets), total deforestation and conversion emissions (and progress against targets), and land-use intensity.[19]

Physical flow-based metrics have the following features. They: can be used in absolute or normalised terms; can capture both the past deforestation and conversion (backward looking) and the plans of companies to reduce their deforestation and conversion according to their commitments (forward looking); should capture both direct and indirect impacts; and should be reported in net and gross terms (in order to allow for comparison and understanding of the process of balancing out physical flow-based metrics).

Activity-based metrics

These metrics rely on classifications that distinguish between 'dirty' and 'green' activities. They have the following features. First, in identifying dirty activities, these metrics can make a distinction between (i) always environmentally harmful activities and (ii) other environmentally harmful activities whose harm can be reduced if companies take action that can be captured by the metrics described above (which can reduce environmental intensity).[20] Examples of always environmentally harmful activities in the context of this guidance are those related to: logging or clearance of natural forests and ecosystems; mining of coal, iron ore, gold, bauxite and copper; and oil and gas production (with expansion plans). As long as companies engage in these activities without any plan to significantly reduce their associated deforestation and conversion through credible commitments, targets and cut-off dates, CBFS should penalise them. Measures that focus on environmental intensity cannot counteract their adverse environmental effect.

Second, activity-based metrics identify green activities as those that contribute to the reduction of negative environmental effects. Examples of such activities include those for which deforestation and conversion commitments and targets are formulated and were/are being implemented (as recommended by Finance Sector Roadmap by Global Canopy (2022b), WWF's Seeing the Forest for the Trees (WWF, 2023d) and the Accountability Framework Initiative), and those that include the rehabilitation and restoration of forests and non-forest ecosystems. CBFS can treat these activities more favourably.

Third, activities-based metrics can be either binary or continuous. For example, when they are based on a company's main activity, they are binary, since the main activity can be either green or not. However, many companies engage in more than one activity. In this case, metrics can capture the proportion of companies' activities that are green and dirty. It is also possible to develop continuous metrics about the degree of greenness and dirtiness of specific activities.

Project-based metrics

Project-based metrics refer to financial instruments that are used to finance specific projects that reduce negative environmental impacts. These instruments can be, for example, green bonds or green loans. The metrics are binary: a bond can be either green or not. Importantly, the verification process is necessary to reduce greenwashing risks.

From company-based environmental materiality to the environmental materiality of financial institutions and portfolios

The metrics discussed above refer to the environmental materiality of companies. These metrics can be used to calculate the environmental materiality of financial institutions or portfolios. In the case of climate, Weighted Average Carbon Intensity (WACI) is often used to evaluate the environmental performance of financial portfolios. It takes into account the carbon intensity of each borrower and its representation within the portfolio of the bank or investor.[21] Similarly, the deforestation impact of a pool of loans or bonds can be captured by taking into account the deforestation flows attributed to all borrowers in the specific pool. However, given the location-specific nature of many impacts on nature and biodiversity, financial institutions should avoid aggregating exposures in ways that may obscure material information.

Financial institutions can also report the proportion of assets in their portfolios that are related to dirty or green activities.[23] The greater the volume of loans/bonds that are linked to dirty activities as a proportion of total assets, the worse the environmental performance of these institutions, especially if the dirty activities are always environmentally harmful.

19. For some useful databases and metrics that capture climate change, land conversion and water stress see, for example: Refinitiv Eikon, (LSEG, NA); TNFD (2023b); WWF, 2023d; WWF (2022e); WWF (2022f).
20. For an analysis of always environmentally harmful economic sectors, see WWF (2016), and WWF (2022f).
21. Other emissions-based indicators include financed emissions, carbon intensity and carbon footprint (see ECB, 2023a).
22. See NGFS (2021).

TABLE 6: PHYSICAL FLOW, ACTIVITY AND PROJECT-BASED METRICS FOR DEFORESTATION AND CONVERSION RISK ASSESSMENTS

Metrics categories	Features	Examples of metrics	Databases/ classifications for supporting the development of metrics	Examples of use in monetary and financial policy tools
Physical flow-based metrics (Measure in physical units the impact that companies have on climate change, deforestation, land conversion and water stress)	1. Report absolute or relative performance 2. Capture past environmental performance (backward-looking) and transition plans and commitments (forward-looking) 3. Capture direct and indirect impacts (supply chains) 4. Report physical flows both in net and gross terms	**Climate change:** GHG emissions (tonnes of CO_2e); emissions intensity (tonnes of CO_2e per US$); GHG emissions reduction target (tonnes of CO_2e); forward-looking fossil-based electricity production (MWh) **Deforestation and land conversion:** Land-use change (km^2); land-use intensity (tonnes or litres of output per km^2); percentage of forest areas converted into other types of land; land annual progress against deforestation targets; land-use emissions reduction target; geolocation coordinates of plots of land **Water stress:** Extent of freshwater use change (km^2); water pollutant emissions (m^3); total water pollutant emissions/US$ million per revenue (m^3 per US$); water discharged ($m^3$); water withdrawal ($m^3$); water recycled ($m^3$); total water use/US$ million per revenue (m^3 per US$); water intensity reduction	▪ Refinitiv Eikon (e.g. GHG emissions, land use change) ▪ Bloomberg (e.g. GHG emissions, GHG emissions reduction target) ▪ SBTi (e.g. GHG emissions reduction target) ▪ SBTi Forest Land and Agriculture (FLAG) (e.g. land-use emissions reduction target) ▪ CDP (e.g. water intensity reduction targets)	**Monetary policy tools** ▪ Collateral framework (e.g. haircut adjustment based on physical flow-based metrics, concentration limits on specific dirty activities) ▪ Asset purchases (e.g. tilting based on physical flow-based metrics, exclusion of always environmentally-harmful activities) ▪ Refinancing operations (e.g. differentiated interest rates based on activity-based metrics for bank loans) ▪ Reserves tiering (e.g. the threshold for remuneration of reserves, adjusted based on activity-based metrics for bank loans). **Financial policy tools** ▪ Capital requirements (e.g. higher capital requirements for dirty activities) ▪ Credit guidance (e.g. credit floors for green activities)
Activity-based metrics (Capture environmental impact by distinguishing between 'green' and 'dirty' activities)	1. In defining dirtiness, they distinguish between (i) always environmentally harmful and (ii) environmentally harmful activities. 2. Define green activities as those activities that reduce negative environmental impacts 3. Can be binary or continuous	**Green binary metric:** Specifies whether the main activity of a company is green or not. **Always-harmful activity binary metric:** Specifies whether the main activity of a company is always environmentally harmful or not. **Green continuous metric:** Specifies the proportion of the activities of a company that are green. **Examples of green activities (based on TRBC):** Renewable Energy Equipment & Services (NEC) (5020101010); Waste Management, Disposal & Recycling Services (5220301012); Wind Systems & Equipment (5020101011) **Examples of always environmentally harmful activities (based on GICS):** Oil & Gas Drilling (10101010); Fertilisers & Agricultural Chemicals (15101030)	▪ EU Taxonomy (green activities) ▪ Climate policy relevant sectors (dirty activities) ▪ Urgewald's Global Coal Exit List and Global Oil and Gas Exit List (dirty activities) ▪ WWF (2022f)* (dirty activities)	
Project-based metrics (Capture environmental impact by identifying 'green' projects)	1. Can be used for classifying financial instruments related to specific projects 2. Are binary 3. Require a verification process	**Green binary metric:** Specifies whether a certain financial instrument (e.g. green bonds or loans) finances a project that reduces negative environmental impacts	▪ Refinitiv Eikon (e.g. green bonds, green loans, EU taxonomy bonds) ▪ Bloomberg (e.g. green bonds) ▪ Climate Bonds Initiative (e.g. green bonds)	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A location-specific approach to metrics

As explained in section 1, deforestation fronts refer to deforestation hotspots in the tropics and subtropics that face significant levels of forest fragmentation and other threats. Deforestation and fragmentation in these prioritised ecosystems due to economic activity could translate into higher risks to that economic activity and to the financial system.

In this sense, both environmental and financial materiality-related metrics need to take a location-specific approach.

When it comes to assessing environmental materiality, a location-specific approach enables an understanding of the relevance of the contribution of the main drivers of deforestation, especially if these are taking place in prioritised ecosystems, and if the drivers are related to the production of deforestation-risk commodities.

In addition, a location-specific approach should provide relevant information to assess financial materiality: dependence on prioritised ecosystems providing crucial services for economic activity will allow a better understanding of potential physical, transition and potential systemic risks.

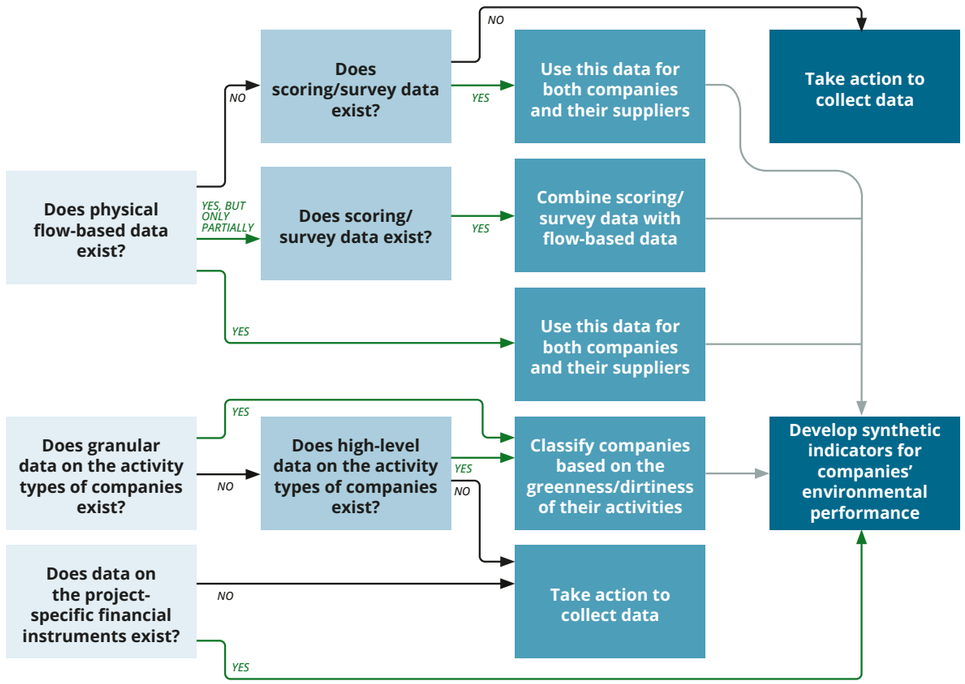
How can central banks and financial supervisors address data challenges?

To address data gaps, central banks and financial supervisors can follow a decision-making process specified in Figure 8. If physical flow-based data partially exists (e.g. if there is GHG emissions data but not water data) and scoring/survey data exists (see e.g. Forest 500), then the scoring/survey data could be combined with the physical flow-based metrics to evaluate a company's environmental performance. If neither physical flow-based data nor scoring/survey data exist, CBFS need to take action to collect physical flow-based data. As it has been previously pointed out (key recommendations in Section 3), this is not a solely task of CBFS. A collaborative effort and approach are necessary to ensure that the information and data on deforestation and conversion from financial institutions and companies is collected and disclosed. Additionally, relying on existing disclosure frameworks and regulation requirements can already be useful in terms of alignment.

In the case of activity-related data, if there is no granular data on the activity types of companies (e.g. NACE 4-digit), then high-level data on the activity types of companies (e.g. NACE 2-digit) might instead be used. If this is the case, then the greenness/dirtiness of the activities of the companies can still be identified and can be used to adjust monetary and financial policy tools in the absence of physical flow-based and granular activity-based data. In the absence of high-level data on the activity types of companies, CBFS will need to take action to collect this data. For the data collection process, it is important that regulators set clear timelines, so as to make sure that data collection does not overly delay action.

Once physical flow-based metrics and activity-based metrics have been developed, central banks and financial supervisors can develop synthetic indicators by combining these metrics. These indicators can form the basis for adjusting monetary and financial policy tools, as explained in the following.

FIGURE 8: DECISION-MAKING FLOWCHART FOR ADDRESSING DATA GAPS IN THE DEVELOPMENT OF ENVIRONMENTAL MATERIALITY METRICS



Source: Authors' depiction

Unsplash/Getty

IDENTIFYING FINANCIAL MATERIALITY

When it comes to financial materiality, CBFS can take measures that reduce the exposure of the financial system to transition and physical risks. The quantification of transition and physical risks is not, however, straightforward: an accurate quantification of these risks requires (i) the use of scenario analysis about the transition and physical risk drivers discussed in Section 1 and (ii) the running of stress tests.

Two broad steps are necessary as part of stress testing. First, CBFS need to collect environmental data about the exposure of companies (and households) to transition and physical risks. For transition risks, it is necessary to collect data about the environmental materiality metrics discussed above. For physical risks, data about environmental dependencies is needed, including data about the exposure of companies to acute and chronic climate risks.[23] In the case of land and water, environmental dependencies overlap to some degree with environmental materiality. For instance, agricultural companies that report significant land conversion are, by default, reliant on land and will face physical impacts if this land is degraded. However, environmental dependencies can be high even when environmental impacts are low. Take an agricultural company that does not convert land but relies on soil fertility for its operations.[24] This company has a high land-related environmental dependency, even though its environmental impact is small. If soil fertility collapses due to the environmental impacts of other companies, this company will face a physical impact.

Second, CBFS need to identify specific scenarios about how transition and physical risks might evolve in the coming years. These scenarios then need to be translated into macrofinancial effects, based on the channels depicted in Figures 4 and 5. This requires financial data and modelling at the micro level to capture, for example, how increasing costs caused by physical and transition impacts can affect companies' profitability and their ability to service debt. But it also requires data and modelling at the macro level to capture macroeconomic effects that also affect the financial position of companies.[25] Ideally, contagion effects should also be considered, e.g. through the use of network modelling.

Although environmental stress testing is necessary, the incorporation of environment-related financial risks into monetary and financial tools is not straightforward and should be approached with caution.[26] This is due to: uncertainties on how transition policies might be implemented; the way ecosystems will react to such policies and lack of sufficient data and weaknesses of modelling methodologies;[27] differing risks between different scenarios; and the fact that environment-related financial risks are not exogenous to the financial system, which complicates their quantification. This is why it will be hard to exactly quantify risk. CBFS should therefore not only rely on stress testing but rather acknowledge the constant uncertainties and difficulties to measure the risk and implement a precautionary approach. This should be based on qualitative methods and focus on the most environmentally harmful activities and most important drivers of climate change and nature loss, such as deforestation and conversion of other ecosystems.

Finally, incorporating transition risks into monetary and financial policies does not necessarily imply that borrowers that cause environmental harm will be treated unfavourably. Consider, for example, a company that engages in unsustainable logging and has issued a two-year bond. In a scenario in which tighter logging regulations are introduced six years in the future, this bond is not risky at all (unless it is assumed that these policies are anticipated by financial markets). This is also the case in a scenario where a transition does not take place at all. So, from a transition risk perspective, this bond should not necessarily be treated less favourably than other bonds. But, from an environmental materiality perspective, this bond should be penalised by central banks and financial supervisors since it contributes to the environmental crisis.

Because of these challenges, a pragmatic starting point for central banks and financial supervisors could be to adjust their tools based on environmental materiality metrics that also approximately capture some transition risks: borrowers with greater environmental impacts are, on average, more exposed to transition risks, since they are more susceptible to changes in environmental policies.

23. For environmental dependency metrics and their translation into financial risks, see e.g. Svartzman, R. et al. (2021), and Colesanti et al. (2022).
24. For examples of environmental dependencies, see the ENCORE database.
25. See, for example, ECB (2023b).
26. See also Dafermos, Y. (2022).
27. See Chenet et al. (2021).

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06: RECOMMENDATIONS FOR CENTRAL BANKS AND FINANCIAL REGULATORS AND SUPERVISORS TO ADDRESS DEFORESTATION AND CONVERSION OF NON-FOREST ECOSYSTEMS

SECTION 06: RECOMMENDATIONS FOR CENTRAL BANKS AND FINANCIAL REGULATORS AND SUPERVISORS TO ADDRESS DEFORESTATION AND CONVERSION OF NON-FOREST ECOSYSTEMS

The recommendations and tools and resources included in this section should be prioritised according to the specific context of the jurisdiction, including the instruments and tools most able to deliver change in the real economy, the most material topics and sectors, and the availability of data for their application.

The policy tools that CBFS need to adjust based on deforestation and conversion metrics refer both to monetary and financial regulation policies and differ between countries, due to different institutional structures and central bank mandates. CBFS should identify those tools that are most relevant for their economies and mandates and start incorporating environmental criteria without further delay.

Unsplash – Daniel Wallace

BOX 11: PRECAUTIONARY APPROACH

The first and most important recommendation consists in applying a precautionary approach, meaning that CBFS must aim to understand, assess and integrate the environmental and financial risks associated with deforestation and conversion in their daily decision-making processes. They must act pre-emptively to address potential system risks caused by deforestation and conversion, making use of all the financial regulation and monetary policy instruments they have at hand. They must focus on taking pre-emptive and proactive measures to limit the accumulation of risks at micro and macro levels. To that end, they should focus first on the most impactful sectors, that is, those which are driving deforestation and conversion associated with the greatest risks. This will assure their role as stewards of financial and price stability and deliver their primary mandates (WWF, 2022d), but it also supports an orderly transition to more sustainable economy, avoiding abrupt changes and disruptions.

SHORT TERM

CBFS need to undertake their own research to better understand and manage the risks associated with deforestation and conversion, from a double materiality perspective, as well as their potential to cause systemic risks.

Research should focus on the most significant sectors in terms of deforestation and conversion, such as agriculture and mining. Relevant areas of research include the environmental impacts of deforestation and conversion and its effects on ecosystem services but also, over the longer term, how those impacts materialise in the financial system, taking into consideration the specificities of the jurisdiction.

CBFS should engage with national universities, research institutions, and scientific and civil society organisations to develop this research, as well as with policymakers to inform other relevant complementary policies that could contribute to halting deforestation and conversion.

Financial supervisors need to send the right signals and issue clear supervisory expectations for financial institutions to integrate deforestation- and conversion-related risks, from a double materiality perspective, in their risk assessment and management.

These supervisory expectations should cover all activities of financial institutions and reflect both environmental materiality and financial materiality. The financial supervisor should then regularly track financial institutions' compliance with these expectations and take enforcement actions if needed, especially if there is evidence of financial institutions' complicity in environmental crimes. This should be accompanied by expectations on data collection and that financial institutions should be preparing for a changing data landscape.

Financial supervisors should require financial institutions to integrate risks associated with deforestation and conversion into their strategies and risk appetite. They should make sure that the associated knowledge and the role and responsibilities of board members are clearly defined.

The understanding of nature-related risks within financial institutions should include knowledge about deforestation and conversion. At least one board member should be aware of the identification, assessment, monitoring and mitigation of deforestation- and conversion-associated risks, from a double materiality perspective. It is important to monitor how often such risks are discussed in board-level meetings, and if training, specifically on deforestation and conversion, is taking place.

Financial regulators and supervisors should establish expectations for the institutions they oversee, based on the information provided by clients and investees, to estimate the environmental materiality associated with deforestation and conversion within their portfolios, as well as the exposure to associated financial risks, and when such exposure is material.

Financial institutions need to map and prioritise the regions and sectors in which they make the greatest contribution to deforestation and conversion, as well as those with the highest exposure to deforestation- and conversion-associated financial risks; they should map their clients and investees against these regional and sectoral maps.

Based on this, financial institutions need to assess their materiality and mitigation strategies.

Guidance should also be provided to financial institutions on recommended steps and tools to be applied in this analysis, including those necessary to detect and monitor environmental financial crimes related to deforestation and conversion.

Financial regulators and supervisors need to issue supervisory expectations that disclosure requirements and due diligence on climate and nature need to integrate deforestation and conversion associated risks.

Financial institutions should disclose their impacts, dependencies and climate- and nature-related risks, following the TCFD and TNFD frameworks (or other internationally recognised sustainability reporting frameworks, such as the CSRD, the SFDR and the EU Taxonomy). Within these disclosures, they should integrate deforestation and conversion as a crucial source of impact and dependencies, especially for the agriculture and mining sectors. Disclosure should integrate information on transition plans of clients and the financial institution itself regarding deforestation and conversion commitments and management of the associated risks, from a double materiality perspective.

In addition, financial institutions should demonstrate that they have not committed or are associated with environmental financial crimes related to deforestation and conversion.

Financial regulators and supervisors should apply strict regulations and penalties for financial institutions that underestimate deforestation- and conversion-related risks, from a double materiality perspective, and use all their financial regulation and supervision tools to mitigate those risks, such as capital add-ons, concentration limits or fines.

If financial institutions fail to identify and integrate deforestation- and conversion-related risks in their risk assessment and management processes, financial supervisors should act by using capital add-ons, concentration limits or fines. The buffer created by these tools should, of course, be enough to absorb any potential losses. It is important to take into account the complexity of the business activities and the importance and materiality of the associated risks, using a double materiality perspective.

Financial regulators and supervisors should look into integrating stress-tests that reflect deforestation and conversion as sources of physical, transition and potentially systemic risks. They should identify and include indicators for measuring such risks and rely on a broad set of scenarios, including the most adverse ones.

Financial supervisors need to account for deforestation and conversion as crucial contributors to floods, droughts, soil degradation and reductions in air and water quality, etc.; and as a source of transition risks, such as from regulations related to deforestation- and conversion-free commitments.

Central banks need to assess the contribution of their own portfolios to deforestation and conversion, and the exposure of their own portfolios' associated financial risks. They should also manage and mitigate such risks.

MEDIUM TERM

Financial regulators and supervisors should establish expectations for financial institutions to develop deforestation- and conversion-free policies, with clear objectives and time-bound targets, covering all their financial activities and all deforestation-risk commodities, which should include human rights compliance. These expectations should also be integrated into the financial institution's transition plan for nature or, at least, be consistent with it, and be based on an exposure and risk analysis. Progress towards objectives and targets should be monitored and assessed.

Financial institutions need to formulate, implement, monitor and assess deforestation- and conversion-free policies that are aligned with the recommendations of the Finance Sector Roadmap by Global Canopy (2022b), WWF's Seeing the Forest for the Trees report (WWF, 2023d) and the Accountability Framework Initiative).

For those clients and investees that need to meet the EUDR, compliance with its due diligence, risk assessment and mitigation plan can be requested as part of the requirements on financial institutions. Step-by-step orientation for companies on how to comply with the EUDR is provided in guidance by WWF EUDR Step-by-Step Guide for Business.

Financial institutions should also start tracking their progress towards their deforestation- and conversion-free policies and targets.

Central banks should account for deforestation- and conversion-associated risks within tools such as their refinancing operations and reserves tiering.

The banking system currently provides a significant volume of lending to companies that engage in environmentally harmful activities, including deforestation. By greening their refinancing operations, central banks can make the cost of refinancing a function of the greenness and dirtiness of loans that are on the balance sheet of commercial banks: the higher the proportion of green compared with dirty loans, the lower the cost of borrowing from the central bank. This can incentivise banks to allocate lending to borrowers with better environmental performance.

As well as adjusting the cost of lending for banks based on environmental criteria, central banks can also calibrate the interest rate related to the reserves that commercial banks hold on the asset side of their balance sheet.

Financial regulators and supervisors should account for deforestation and conversion within tools such as capital requirements and credit guidance.

Capital requirements (a key component of Basel III) are another tool that can have an impact on lending.[28] Generally speaking, higher capital requirements are associated with lower loan supply. Capital requirements can increase for loans to companies with poor environmental performance, which do not take into consideration their contribution to deforestation and conversion, or which have no transition strategy – a dirty penalising factor.[29] In addition, loans linked to companies engaged in always environmentally harmful activities which will not adapt their business model could be subject to the so-called one-for-one rule, where a dollar of a financial institution's own capital must be held in reserve against every dollar of financing that contributes to deforestation or conversion.[30]

Central banks should account for deforestation and conversion within their monetary policy portfolios by setting conditions on the assets acquired by these asset purchase programmes and collateral frameworks. Based on this, they should adapt asset purchase programmes by expanding tilting, and the collateral framework by setting concentration limits and adjusting haircuts, to take into account deforestation- and conversion-related risks.

When it comes to bond market-related tools, central banks need to introduce environmental criteria, including deforestation and conversion considerations, for both their asset purchases and their collateral frameworks.

Central banks can also introduce environmental-related criteria for corporate assets used as collateral. Central banks can also adjust haircuts[31] and eligibility based on environmental materiality metrics. Bond issuers with a better (worse) environmental performance could see a reduction (increase) in the haircuts assigned to their bonds. In addition, central banks could exclude from collateral frameworks bonds issued by companies involved in always environmentally harmful activities related to deforestation and conversion that have no plans to adapt or transition. Collateral concentration limits could be imposed on other environmentally harmful activities.

For companies that refuse to transition from environmentally harmful activities, exclusion could send strong signals to the financial markets and could be conducive to reducing the environmental materiality of the financial system. However, this exclusion needs to be done carefully, with a holistic perspective. If contribution to deforestation is used as the sole land-related exclusion criterion, there is a risk that a company that does not contribute to deforestation but converts grasslands and savannahs into agricultural land will not be excluded.

As far as government bonds are concerned, recent years have seen growing issuance of green sovereign bonds (Cheng, 2022). Most of these bonds are linked to climate projects. However, there is potential for proceeds from green sovereign bonds to fund broader environmental projects. For example, governments can issue green sovereign bonds for projects that protect forests and other ecosystems, improve freshwater storage systems, modernise water pipelines and increase water recycling. If central banks tilt their asset purchases towards these types of bonds, their interest rates can decline, and governments can be incentivised to issue more such bonds. Central banks can also provide preferential treatment to green government bonds in their collateral frameworks. Central banks' support of green sovereign bonds through asset purchases and collateral frameworks would be a type of fiscal-monetary policy coordination that is very much needed in this era of environmental crisis.

Consistency between financial supervision and monetary policy should be ensured.

28. See e.g. Fraisse et al. (2020); and De Marco et al. (2021).
29. For some key issues and challenges in designing green capital requirements, see Dafermos et al. (2022).
30. See Philipponnat (2020).
31. Central banks determine the haircut on eligible assets based on various criteria such as the credit rating and the maturity of bonds: the higher the haircut, the lower the liquidity that can be obtained using the asset as collateral. For example, if the value of the collateral is €1,000,000 and the haircut is 10%, then the amount of liquidity that the bank will get is €900,000.

FURTHER AREAS FOR DEVELOPMENT

This guidance has set out why CBFS need to act on deforestation and conversion, has pointed to the tools needed to do so, and makes recommendations for action. It is clear that transition risks relateing to deforestation and nature loss are already materialising, meaning that it is crucial the CBFS and the financial institutions they oversee begin to take action. This means that work on transition plans is a priority.

For this, data collection will be crucial. CBFS should collaborate with other stakeholders to determine the data that needs to be collected and verified, and how this can collected with existing disclosures. It will be important for CBFS to work with other stakeholders to develop holistic solutions to deforestation and conversion. The financial system will be fundamental in structuring and designing mechanisms and instruments that reflect the value of standing forests and ecosystems.

It is also vital that the indirect and inadvertent contribution that the financial system makes to land-conversion crimes must be halted. Financial regulators and supervisors play an important role in requesting the disclosure of information and implementing the necessary regulatory measures and monitoring to ensure that financial institutions do not engage in crimes. Moreover, central banks should conduct strict due diligence on their own operations in this regard.

This work also needs to be extended to other ecosystems, and tools needed to be developed to help financial institutions to better understand the relationship of the financial system to environmental risks, impacts and dependencies, from a double materiality perspective.

Bwizibwera Tree Nursery Projects, Rwenzori Mountains, Uganda. © WWF / Simon Rawles

GLOSSARY

Conversion is the change of a natural ecosystem to another land use, or profound change in a natural ecosystem's species composition, structure, or function, of which deforestation is one form. Such a change that meets this definition is considered to be conversion whether or not it is legal. (AFi, 2024). For the purpose of this guide, when referring to conversion, we refer to all other natural ecosystems, excluding forests.

Cut-off date, related to no deforestation and no-conversion commitments is the date after which deforestation or conversion makes a given area or production unit non-compliant with no-deforestation or no-conversion commitments (AFi, 2024).

Deforestation is the loss of natural forest as a result of: i) conversion to agriculture or other non-forest land use; ii) conversion to a tree plantation; or iii) severe and sustained degradation (AFi, 2024).

Deforestation and conversion risk is the financial risk faced by companies and financial institutions through their production and finance of deforestation-risk commodities.

Deforestation-risk commodities are those whose production is associated with deforestation, mostly commonly: beef, leather, palm oil, pulp and paper, soy and timber.

Degradation refers to changes within a natural ecosystem that significantly and negatively affect its species composition, structure, and/or function and reduce the ecosystem's capacity to supply products, support biodiversity, and/or deliver ecosystem services (AFi, 2024).

Ecoflation is inflation related to ecosystem instability and the resulting effects on costs and supply within the economy.

Environmental materiality refers to the negative impacts that economic and financial actors have on nature, contributing to the risks they have to manage (based on NGFS, 2023a).

Forest fragmentation is the breaking up of large, contiguous forested areas into smaller forest patches, due to, for example, construction of roads, agriculture, etc. Fragmentation disrupts the processes of the forests and decrease their resilience to the impacts of the surrounding environment, especially at the edges. (Pacheco et al., 2021). Deforestation tends to be preceded by fragmentation and leads to forest degradation, which tends to reflect political, social and economic transitions (Pacheco et al., 2021).

Forests are defined as land spanning more than 0.5 hectares with trees higher than five metres and canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or other land use. Forest includes natural forests and tree plantations. For the purpose of implementing no-deforestation supply chain commitments, the focus is on preventing the conversion of natural forests. For the purpose of this guide, when referring to forests, only natural forests are considered, excluding tree plantations (AFi, 2024).

Land grabbing is control (whether through ownership, lease, concession, contracts, quotas, or general power) of larger than locally-typical amounts of land by any person or entity, via either legal or illegal means, for purposes of speculation, extraction, resource control or commodification at the expense of peasant farmers, agroecology, land stewardship, food sovereignty and human rights (Baker-Smith, 2016).

Land use change is transformation from one land-use category (e.g., cropland, grassland, forest/woodland, urban/industrial, wetland/tundra) to another category (SBTi, 2024).

Natural ecosystems are ecosystems that substantially resemble – in terms of species composition, structure, and ecological function – one that is or would be found in a given area in the absence of major human impacts. This includes human-managed ecosystems where much of the natural species composition, structure, and ecological function are present (AFi, 2024). For the purpose of this guide, natural ecosystems include natural forests (referred in this guide as forests), natural grasslands (referred in this guide as grasslands) and natural wetlands (referred in this guide as wetlands).

No deforestation (also referred to as deforestation-free) relates to commodity production, sourcing or financial investments that do not cause or contribute to deforestation (as defined by the Accountability Framework, adapted from AFi, 2024).

No conversion (also referred to as conversion-free) relates to commodity production, sourcing or financial investments that do not cause or contribute to the conversion of natural ecosystems (adapted from AFi, 2024).

Physical risks are those resulting from the degradation of nature (such as changes in ecosystem equilibria, including soil quality and species composition) or climate change, and consequential loss of ecosystem services that economic activities depend upon. These risks can be chronic (e.g. a gradual decline of species diversity of pollinators resulting in reduced crop yields, or water scarcity, or sustained higher temperatures) or acute (e.g. natural disasters or forest spills, or increased severity of weather events) (adapted from TNFD, 2023 and TCFD, 2017).

Systemic risks are risks arising from the breakdown of the entire system, rather than the failure of individual parts. Systemic risks are characterised by modest tipping points combining to produce large failures and cascading interactions of physical and transition risks. (adapted from TNFD, 2023).

Transinflation is inflation that can be caused during the transition to a more environmentally sustainable economy, and the effects of costs and supply within the economy (Dafermos, et al., 2024).

Transition risks are risks that stem from the misalignment with actions aimed at protecting, restoring, and/or reducing negative impacts on nature, and to address mitigation and adaptation requirements related to climate change. These risks can be prompted by, for example, changes in regulation and policy, legal precedent, technology, or investor sentiment and consumer preferences (adapted from TNFD, 2023 and TCFD, 2017).

ANNEXES

ANNEX 1. CASE STUDY METHODOLOGY: DEFORESTATION AND CONVERSION RED FLAGS IN THE COLLATERAL BASKET OF THE EUROPEAN CENTRAL BANK

The analysis consisted in a comparison of a selection of issuers and their ultimate parent companies (UPCs) to different ratings connected to deforestation and conversion. The analysis entailed three steps. First, filtering the ECB's list of eligible marketable assets[32] according to specific criteria. Second, identification of ratings connected to deforestation and conversion and match the selection of asset issuers with the identified ratings. Last, the identification of examples to be further be qualitatively investigated.

FILTERING THE LIST OF ELIGIBLE MARKETABLE ASSETS

The ECB's collateral basket from 26/07/2023 was used. At this point, it comprised 29 '209 assets from 1763 unique issuers. For this analysis, this list was filtered down to 259 ultimate parent companies of issuers in the ECB's collateral basket (CB). The final selection contained 259 issuers and UPCs of assets eligible for the ECB's CB. The following filters were employed:

Issuer Group: The ECB distinguishes between nine issuer groups.[33] Therefrom, the issuer groups "regional/local government" and "supranational issuer" were excluded as they were deemed irrelevant to the present analysis".

Issuer Residence: Ensuing, the database was filtered by issuer country. Following "WWF's publication Stepping up? The continuing impact of EU consumption on nature worldwide" (WWF, 2021), two countries were selected: the Netherlands and Germany. Between 2005 and 2017, Germany imported the highest average deforestation in ha. per year. Meanwhile, the Netherlands topped the list in terms of m^2 per year per person. Additionally, Canada was added to the country selection to cover an anomaly in the CB. The ECB's CB only include few issuers from non-member state countries, and a group of Canadian financial institutions.

Ultimate Parent Company ("UPC"): Often, assets are issued by subsidiaries. However, for the present analysis, the aim was to identify the risk exposure of specific companies. Therefore, the UPC for each asset issuer was researched. Multiple assets on the ECB's CB were issued by subsidiaries of the same UPC.[34]

Duplicate entries: To avoid duplicate entries, miss- and alternate spellings of individual issuers were manually corrected and all duplicate UPCs were then excluded.

Disclaimer: The country selection (Netherlands, Germany, Canada) was based on the issuer's country of residence. The UPCs in the sample cover a wider selection of countries, as some issuers were subsidiaries of UPCs based in countries outside the selection.[35]

SELECTION OF RATINGS AND DATA MATCHING

To identify the issuers and/or UPCs exposed to deforestation and conversion risk commodities, the present analysis identified ratings, scores, indicators, and databases ("the ratings") that enabled insights into a company's behaviour and exposure towards deforestation and conversion. The issuer and UPC sample were looked up in the ratings.

The following two tables gives an overview of the chosen ratings, an indication of scope, orientation, as well as data source.

Forest 500 and the Global Atlas of Environmental Justice Atlas were used to make a first filter to identify examples of issuers/ UPC that are exposed to deforestation and conversion risk commodities, as they had the fullest coverage throughout the sample. The rest of the ratings were used to review additional data and information that allowed a selection of examples through different geographies, sectors and commodities.

32. The ECB notes that the list of eligible marketable assets does not include all eligible marketable assets. Specifically, marketable assets issued by non-financial corporations without a rating from an external credit assessment institution are not directly included. The eligibility of these assets is determined based on the credit assessment provided by a provider chosen by the counterparty, in line with the Eurosystem credit assessment framework's rules.
33. Agency-credit institution, agency-non credit institution, central government, corporate and other issuers, credit institution (excluding agencies), financial corporations other than credit institutions, public corporation, regional/local governments and supranational issuers.
34. However, in a list of 259, individual UPCs might have changed in the time since the UPC research (Mid-August 2023).
35. Including, but not limited to, Switzerland, Denmark, Spain, France, UK, Ireland and the USA. To research all UPCs from the country selection in the ECB's CB, it would have been necessary to identify the UPC of all issuers. Considering the amount of manual research involved in finding UPCs, this would not have been feasible.

RATINGS

Forest 500 by Global Canopy	Identifies and annually assesses the 350 most influential companies and 150 financial institutions with the highest exposure to tropical deforestation risks. It focuses on their deforestation and human rights commitments and highlights gaps and shortcomings of these commitments.
Global Atlas of Environmental Justice by Universitat Autonoma de Barcelona	Documents ecological conflicts and resistance movements globally. It combines scholarly and community-driven data collection. It documents over 2,100 cases of environmental conflicts, providing detailed information on each.
Forests & Finance	From a coalition of NGOs, evaluates financial services provided to over 300 companies involved in deforestation-risk sectors and commodities (beef, soy, palm oil, pulp and paper, rubber, and timber) in Southeast Asia, Central and West Africa, and parts of South America. It researches financial providers that fund these companies. It calculates the absolute financial involvement as well as assesses the financial provider's commitments and policies to prevent involvement in deforestation and related ESG issues.
Palm Oil Buyers (POB) Scorecard by WWF	Evaluates the efforts of 227 major retailers, manufacturers and hospitality companies in supporting a sustainable palm oil industry. It rates companies based on a comprehensive set of criteria, focusing on key actions for sourcing and supporting sustainable palm oil, with an emphasis on ethical supply chains.
Financial Flows: Who is financing the palm oil buyers? by WWF	Examines the role of financial institutions in promoting sustainable palm oil. It emphasizes the influence these institutions have through their financing and investments in palm oil companies.
Sustainability Policy Transparency Toolkit (SPOTT) from the Zoological Society of London	Evaluates and scores commodity producers, processors and traders involved in tropical forestry, palm oil, and natural rubber, based on their public disclosures related to ESG issues.
Food and Agriculture Benchmark by World Benchmarking Alliance	Evaluates and ranks the world's most influential food and agriculture companies on critical aspects essential to transforming food systems.
Violation Tracker by Good Job	Is a comprehensive database of corporate misconduct in the United States, covering a wide range of violations.
Refinitiv ESG Controversy Score by London Stock Exchange Group	Data-driven assessment of companies' ESG performance, commitment and effectiveness.
A List by CDP	Evaluates companies based on their environmental disclosure and performance, with a focus on climate change, deforestation and water security. The scoring system ranges from D- to A, guiding companies from initial disclosure through awareness, management and leadership in environmental stewardship.

RATINGS/ASSESSMENTS COMPARISON

RATING	SCOPE[36]	ORIENTATION[37]	DATA SOURCE
Forest 500 (companies and financial institutions)	Forest-Only/No-Conversion: Geographical focus on "tropical deforestation". However, includes no-conversion of other ecosystems in policy assessment.	Forward: assesses the strength and implementation of actors' commitments on deforestation (and human right).	Publicly available information disclosed by actors. Companies and financial institutions can comment on the complete assessment, but this one is done independently.
Forests & Finance: Policy Assessments	Forest-Only/No-Conversion: Geographical focus on "natural tropical forests." However, includes no-conversion of other ecosystems in policy assessment.	Forward: policy assessments evaluate the quality and robustness of the financing and investment policies of financial institutions.	Assessments are based on publicly available information. Financial institution can comment on the draft assessment prior to publication.
Forests & Finance: Financial Data	Forest-Only: Geographical focus on "natural tropical forests."	Present: financial data assess the current amount of investment and credit of financial institutions to at risk companies. Amounts of credit covers the years 2013-2022 and are, thus, also assessing past behaviour.	Financial Databases (Bloomberg, Refinitiv, TradeFinanceAnalytics, and IJGlobal), company reports (annual, interim, quarterly) and other company publications, company register filings, media and analyst reports.
Palm Oil Buyers' Scorecards by WWF	No-Conversion: POBS includes no-conversion through the assessment.	Forward/Present: WWF assesses commitments and includes the total amount of palm oil reported as well as scores on the ground action.	Extensive questionnaire to companies, 2020 annual communication of progress of Roundtable on Sustainable Palm Oil members, company sourcing policies and sustainability reports.
Financial Flows for palm oil buyers by WWF	No-Conversion: POBS includes no-conversion through the assessment.	Forward/Present: WWF assesses commitments, but also current amounts of financing.	Financing: financial databases, annual reports other company periodic disclosures, company websites, company registry entries, and media archives. Policy Reviews: forest-risk policies, Forests & Finance; Forest 500, and WWF's SUSBA.[38]
SPOTT	No-Conversion: While SPOTT is focused on ESG in general, it includes multiple indicators linked to deforestation and conversion.	Forward: assesses transparency (commitment and reporting). However, it also lists media mentions.	Publicly available company disclosures and media mentions.
Food and Agriculture Benchmark	No-Conversion: Specific indicators on deforestation and conversion.	Forward/Present: mostly assess commitments and disclosure. In order to score highest marks, companies need to disclose "quantitative evidence" of impact.	Company disclosures, third-party sources and company feedback.
Global Atlas of Environmental Justice	Climate: Covers environmental justice incidents in general.	Past: collects past and ongoing environmental justice incidents.	Scientific publications, news outlets, court documents.
Violation Tracker	Climate: Covers all environmental and workplace violations documented by local US officials and agencies.	Past: Official reports of workplace and environmental violations and the penalties incurred are scraped and reported in one database.	Publicly available information.
ESG Controversy Score	Covers all controversy related to ESG.	Present and past: The database uses sentiments in the media to forge an indicator that would give companies a rating.	Publicly available information as well as subscription based financial news.

36. The assessment categorised the scope into three distinct areas: 'Climate-Only', 'Forest-Only', and 'No Conversion'. 'Climate-Only' applies when the focus is solely on general climate issues, without specific reference to no-deforestation commitments. 'Forest-Only' is used when no-deforestation commitments and their impacts are addressed, but without considering the conversion of other ecosystems, like non-forests. Finally, No-Conversion' encompasses discussions on the conversion of various ecosystems, such as peatlands or savannahs, in addition to no-deforestation aspects.
37. The ratings are divided into three categories: Forward-looking, assessing current status or assessing past behaviour. For example, an analysis of company policies is forward-looking as the it tries to evaluate an impact in the future. On the other hand, an indicator of the number of times a company's got fines in violation of environmental standards is assessing past behaviour. This assessment does only assess the categories used for this research.
38. https://www.wwf.sg/susba/assessments/

GENERAL LIMITATIONS

Most ratings/assessments target tropical forests, with limited coverage of other forests and scarcely any non-forest (and in particular non-tropical) ecosystems like savannahs, grasslands, peatlands, or mangroves. This gap stems from the nascent stage of biodiversity assessments and the traditional emphasis on risks associated to tropical deforestation only.

The present analysis relies heavily on benchmarks and indices that rank companies and gives them scores based on certain benchmarks. One limitation of the used ratings is that they favour big companies who have the capacities to build big governance structures that address a diverse set of issues.

Comparability of ratings and assessments is not possible, as they rely in different indicators and methodologies.

Longitudinal comparisons of ratings should be treated with caution, as the underlying methodology has been adjusted substantially over the years.

It is important to not rely solely on future-oriented ratings that assess commitments of a company as well as the implementation of and reporting on said commitments. But instead, said ratings need to be combined with indicators that can say something about a company's actual impact on the ground.

It is essential to consider the reciprocal relationship that underlines these ratings. A controversy indicator might plummet because a company's misbehaviour has been uncovered. Yet, it can also plummet because a company has increased its reporting. To truly answer the question of how meaningful commitments are further investigations and data collection are always necessary.

The findings of this analysis provide a platform for both financial institutions and policymakers to engage in more informed dialogues, and to evolve strategies that not only safeguard the financial system's stability but also contribute meaningfully towards global environmental sustainability.

Through analysis, strategic guideline development, and the adoption of standardised benchmarks, the ECB can significantly better its environmental footprint, aligning its operations with the broader societal shift towards sustainability and climate resilience. Lastly, considering that the ECB plans to apply measures to limit assets with high carbon footprint in their collateral framework by 2024, the identification of issuers and UPCs that embed deforestation and conversion related risks is highly recommended. This in turn will flag those assets that require further analysis for climate and biodiversity loss related risk management.

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Our Mission

Together, we protect the environment and create a future worth living for generations to come.

WWF Switzerland, Hohlstrasse 110, PO Box, 8010 Zurich. Tel: +41 (0) 44 297 21 21, wwf.ch/contact
For contact details and further information, please visit our international website at wwf.panda.org