

**PRB Sector Action
Guidance for Nature**

UN 
environment
programme

**finance
initiative**

Principles for
Responsible Banking



**Getting Started in the
Agricultural, Forestry
and Mining Sectors**


October 2024

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The authors of this report are:



Johanna Dichtl

PRB Implementation Lead

Oualid Rokneddine

Banking & Nature Manager

Grant Rudgley

Technical Director, Nature Finance

Dr Susanne Schmitt

Principal Consultant, Nature Finance

This Guidance has been developed through discussions and collaborative work with volunteer banks from the Principles for Responsible Banking (PRB) Nature Working Group:

- Banco de Bogota
- Banco Estado
- Banorte
- Danske Bank
- Groupe BPCE
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- Itaú Unibanco
- Piraeus Financial Holdings S.A

UNEP FI contributors: Jessica Smith, Joana Pedro, Romie Goedicke den Hertog, Aditi Srivastava, Samantha Burke.

Glossary

Abbreviation/ concept	Definition
AMD	Acid mine drainage
Beneficiation	The treatment of raw material, such as mineral ore, to improve physical or chemical properties in preparation for smelting ¹
BAP	Biodiversity action plan
CO ₂ eq	Carbon dioxide equivalent, is a metric used to compare the emissions of various greenhouse gases based on their global warming potential
Critical habitat	The International Finance Corporation (IFC) Performance Standard 6 (PS6) defines critical habitat as areas with high biodiversity value. These areas meet one or more of the following criteria: (i) habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting significant global concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; (v) areas associated with key evolutionary processes.
CBD	Convention on Biological Diversity
EIA	Environmental impact assessment
FSC	Forest stewardship council
GBF	Kunming-Montreal Global Biodiversity Framework
GHG	Green house gas emissions
HCVA	High-conservation value area
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
Invasive species	A species introduced outside its natural past or present distribution whose introduction and/or spread threaten biological diversity. ²
KBA	Key biodiversity area
Land-use change	Land-use change refers to the modification or management of natural environments into human dominated environments, such as settlements, semi-natural and agricultural areas. ³
Nature positive	Nature positive refers to halting and reversing biodiversity loss, through measurable gains in the health, abundance, diversity and resilience of species, ecosystems and processes. ⁴
NG	'Net gain' means the biodiversity gain exceeds the loss. ⁵
NNL	'No Net Loss' is a goal for a development project, policy, plan or activity in which the impacts on biodiversity it causes are balanced or outweighed by measures taken to avoid and minimise the impacts, to restore affected areas and finally to offset the residual impacts, so that no loss remains. It must be defined against and appropriate reference scenario. ⁶
PEFC	Programme for the Endorsement of Forest Certification.

Pollution	Pollution is the introduction of contaminants into the natural environment that cause adverse change. ⁷
PA	Protected area
PRB	Principles for Responsible Banking
RTRS	Roundtable on Sustainable Soy Association
RSPO	Roundtable on Sustainable Palm Oil
SEA	Strategic Environmental Impact Assessment, also known as a Strategic Environmental Assessment, is a process used to evaluate the environmental, social, and economic impacts of proposed policies, plans, or programs before they are approved and implemented.
TNFD	Taskforce for Nature Related Financial Disclosure
WBCSD	World Business Council of Sustainable Development
WHS	World Heritage Sites



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Executive summary

Around half of bank loans are to firms in sectors subject to potential financial losses due to deterioration of ecosystem services, and those in lower-middle-income economies allocate on average 55% of loans to firms in these sectors.⁸ The [UNEP FI Principle of Responsible Banking \(PRB\) Nature Targets Setting Guidance](#) is directly aimed at empowering the banking industry to act on this exposure and contribute to the annual USD 700 billion biodiversity financing gap.^{9,a} This guidance document aims to further empower banks by making explicit the specific priority actions they can support their clients to take in the high impact sectors of mining, agriculture and forestry.

This guidance complements existing sector action guides, such as those developed by TNFD. Going down to the commodity level, it details specific priority actions that can be taken for bauxite, copper, cattle, wood, soy and palm oil to avoid and mitigate impact on nature. By delivering commodity-level guidance, it aims to increase the actionability of sector-level guidance, making it simpler for banks to include nature in client dialogues and policies as they seek to manage nature-related risks and support nature-positive action by clients.

There are several common themes that banks can use to inform this dialogue with clients. For example, the well-established concept of the mitigation hierarchy—in which priority actions are usually about steps to avoid the negative impact in the first place—provides an organising framework for the majority of client actions highlighted and that banks can support.

Banks can take the commodity-level insights provided and use them to evolve policies and existing client dialogues. For policies, there is an opportunity to use the actions showcased to shift from exclusion policies to policy approaches that support client transition toward a more harmonious relationship with the natural world. For client dialogues, the priority actions provide example questions that drive forward client engagement frameworks from the likes of the PRB¹⁰ and Cambridge Institute for Sustainability Leadership (CISL),¹¹ empowering banks to catalyse and lead conversations with clients about their impacts on the natural world. By doing so, banks will be better positioned to scope opportunities to support clients with their nature-related transition—via new financing or technical assistance—and to reduce the bank’s nature-related physical and transition risk exposures.

Equipped with greater knowledge and a deeper menu of sector and commodity related insights, this guide empowers banks to build capacity internally, reduce risk exposure, deepen client relationships and accelerate their support of clients and a nature positive future.

a The gap between the cost to preserve biodiversity and what is currently being spent on economic activity that benefits nature annually.



1. Introduction

1.1 Nature in crisis

Only three per cent of the terrestrial surface is ecologically intact,¹² and on average there has been a 69% decline in monitored species since 1970.¹³ The financial materiality of nature loss is beginning to be felt, particularly in the agricultural sector. 75% of all crops are at least partially dependent on pollination services from nature, meaning that the steep decline of pollinators is starting to impact yields, particularly of cash crops such as fruit and nuts.¹⁴ To compensate for the loss of these services, interventions such as transporting bee colonies (e.g., to almond farms in the US) are beginning to be needed.¹⁵

The scale of this nature loss has been driven by human activities—notably large-scale economic activities such as animal and plantation agriculture, mining and urban development. Transformative change is needed to address this crisis for nature. Recognising this, 196 nations signed the Kunming-Montreal Global Biodiversity Framework (GBF) in Montreal in December 2022,¹⁶ which defines 23 global action-oriented targets.

Target 15 (Private Sector) and Target 21 (Data and Knowledge) are particularly relevant for banks and financial institutions. They require the assessment of nature-related impact and dependency and identification of priority sectors and clients, to mainstream nature within banks' operations and how they manage, for example, risks emerging from the degradation of the natural world (physical risks) (see Figure 1).

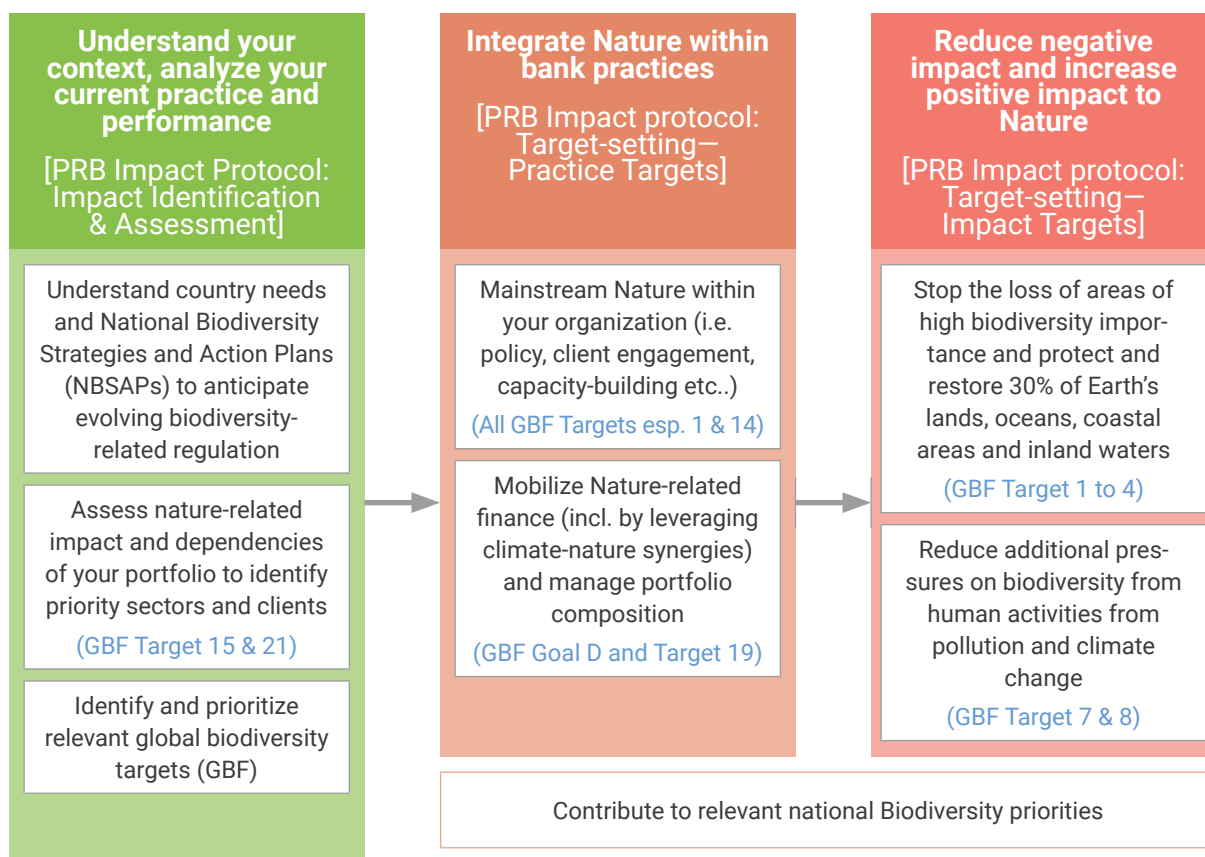


Figure 1: PRB Target setting guidance and GBF targets (2023)

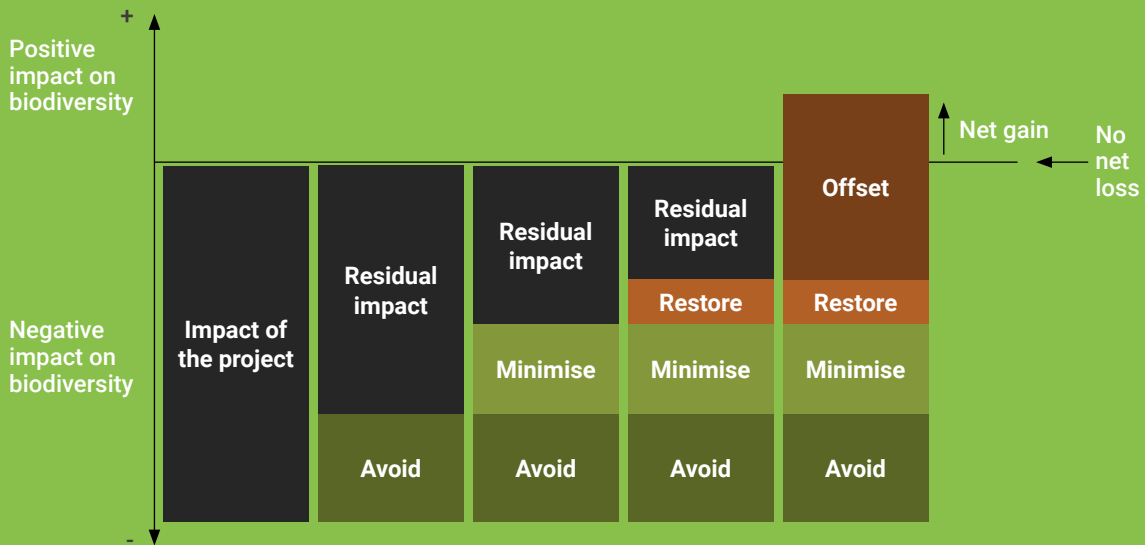
1.2 The role of banks

To align with the GBF, the PRB introduced industry-first guidance on setting nature-related targets and committed to integrating nature considerations into core bank practices, and thereby playing a role in reducing the future financial risks they and their clients face from the degradation of the natural world.¹⁷ One aspect of integrating nature into core banking requires banks to engage and support clients to take priority actions—meaning those actions that are “no regrets”^b actions—to avoid and reduce their impact on nature.

b In the context of banks, “no regrets action” refers to strategic decisions or initiatives that are beneficial regardless of how future uncertainties unfold. These actions are typically low-risk and provide value under various scenarios, making them prudent choices even when the future is unpredictable”

The key concept of the Mitigation Hierarchy

To move toward net positive impact for nature, sectors such as agriculture, forestry and mining can follow the mitigation hierarchy, especially at the point of extraction and production.¹⁸ Under the mitigation hierarchy, activities first look to avoid negative impacts as much as possible. Impact that cannot be avoided is then minimised, with any residual damage restored. Offsetting the residual impact after avoiding, minimising and restoring must be done with a sensitivity to context and equivalence under very specific circumstances with expert guidance.



1.3 How action can be taken now by clients: a deep dive on commodities

Sector-level or principle-based guidance about nature action can be complemented with highly specific examples of ‘what good action looks like’. This guide therefore details priority actions to mitigate and reduce harm to nature when producing and extracting six commodities in the mining, agricultural and forestry sectors; namely for bauxite, copper, cattle, wood, soy and palm oil. The specificity of actions profiled aim to enable banks and their staff to more easily discern what, specifically, they can engage and support their clients to do on nature. To ensure this action-oriented guidance is immediately useful to banks, it takes these commodity deep dives and applies them to two bank use cases—client engagement and policies—with the primary end users being:

- Client relationship managers, who can put nature into client dialogues using granular insights about high impact commodities and sectors
- Group sustainability functions developing policies, or those responsible for client questionnaires
- Cross-bank stakeholders impacted by those policies, such as sector coverage teams

1.4 Methodology

This guide was created using the scientific evidence-base, existing sector guidance and The Biodiversity Consultancy's practical experience working directly with clients in high impact sectors, at both corporate and site-level. To make the material as relevant as possible to end users, PRB members in the Nature working group were consulted, with more detailed input from project members from eight banks incorporated.

Selecting sectors with impact mitigation opportunities

The PRB target-setting guidance recommends that banks adopt a prioritised approach to nature-related targets, identifying high-impact sectors in their portfolios for which they will set targets. Based on the work of UNEP WCMC (ENCORE), SBTN, TNFD and Finance for Biodiversity combined, the highest impact sectors are those listed in Table 1 and should be prioritised.

Table 1: Nature key sectors^c

- Agriculture, logging and fishing
- Silviculture
- Mining
- Manufacture of metal & non-metallic mineral products
- Manufacture of coke & petroleum products
- Manufacture of chemical products & pharmaceuticals
- Manufacture of rubber, plastics & paper products
- Manufacture of textiles & apparel
- Electric power generation
- Construction
- Transport
- Waste management & sewerage

Mining, agriculture and forestry were selected due to their high direct impact on nature through their significant contribution to the five Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) drivers of nature loss:¹⁹

- Land-use change, particularly in high biodiversity areas in the tropics
- Climate change, e.g., large-scale deforestation caused by conversion to pasture
- Pollution, e.g., mining tailings; agricultural run-off of pesticides and fertilisers
- Resource exploitation, e.g., overexploitation of aquifers for farming
- Invasive species, e.g., introduction through use of heavy mining machinery

Selecting commodities to bring action-orientated guidance to life

The PRB Nature Working Group was consulted on ten high impact commodities (five minerals and five agricultural/forestry commodities) proposed by The Biodiversity Consultancy (see Appendix) and asked to choose five commodities—two minerals and three agricultural/forestry commodities—via a short survey. The minerals chosen were bauxite and copper, due to their overall importance and critical role in the energy tran-

^c (see page 18 [PRB Nature Target Setting Guidance](#))

sition. The agricultural/forestry commodities chosen were cattle and wood, and there was a special request to cover soy and palm oil as key soft commodities linked to deforestation. The latter being covered together due to the similarity of the key actions that can be taken.

Focus on extraction and production stage

The priority actions to be profiled are in the extraction and production stage of mined, agricultural and forestry commodities. The rationale for this is three-fold:

- i.** impacts on nature are greatest at this point in the value chain,
- ii.** actions to mitigate impact can be taken by the bank client directly, and
- iii.** the outcomes of actions can be measured by the bank client directly.



2. Priority nature actions for bank clients in mining, agriculture and forestry

This section aims to enhance the applicability of sector-level guidance by summarising the nature impacts of the mining, agricultural and forestry sector. It then provides deep dives on six commodities in the focus sectors: bauxite, copper, wood, cattle and soy/palm oil with examples of specific actions clients can take, and suggestions on how they complement existing sector guidance.

2.1 Mining

Mining transforms natural landscapes via direct impacts but also causes indirect pressure on nature related to in-migration and the need for infrastructure. The impacts on biodiversity are often particularly significant in tropical regions. Mining-related forest loss contributed to around 10% of total Amazon deforestation between 2005 to 2015, much of that due to the indirect impacts of roads and staff housing.²⁰

Impacts from mining on nature and people include:

- Contributions to climate change through the high consumption of fossil fuels for extraction, processing and transport
- The pollution of water with sediment and toxic effluent
- Overextraction of water for the mining process
- Dust and noise pollution

Banks are important financiers of the mining industry through revolving credit facilities, corporate loans, and bond issuances.²¹

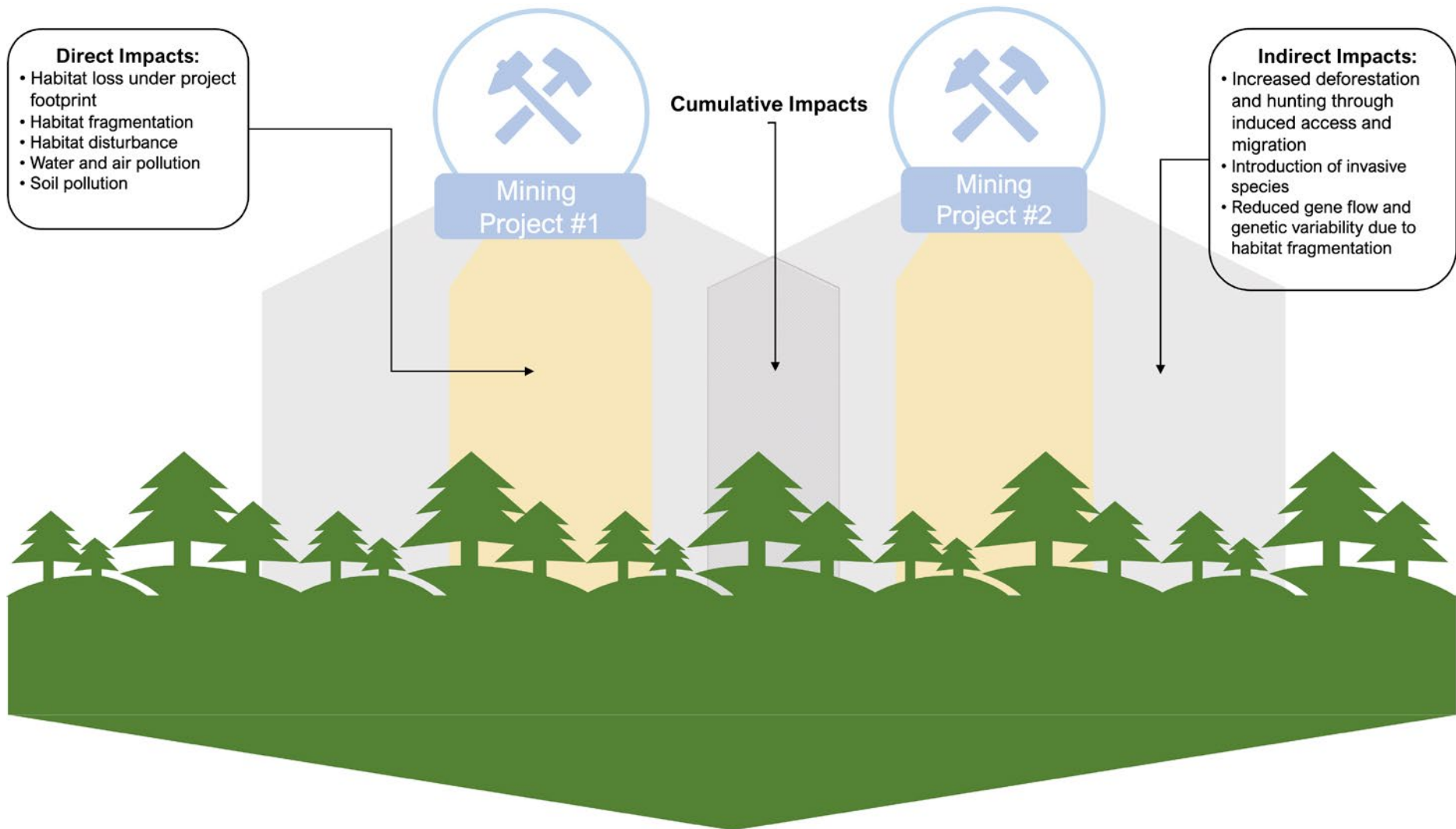


Figure 2: Schematic of direct, indirect and cumulative impacts of mining in a landscape

2.1.1 What existing mining sector guidance focusses on

Existing mining sector guidance and related standards tend to focus on similar themes and provide broadly similar recommendations relating to nature, such as:

- Avoiding negative impact, particularly related to land-use change and recommending the use of the mitigation hierarchy with a focus on the 'avoid' stage
- No-go for World Heritage Sites (WHS)
- Greater due diligence/avoidance of legally protected areas (PAs), key biodiversity areas (KBAs) and/or high conservation value areas (HCVAs).
- Working toward no net loss (NNL) or net gain (NG) of biodiversity.

Table 2: Common features of mining sector guidance relevant to the extraction stage.

Document	Description	Features/recommendations (extraction stage)					
		Mitigation hierarchy	Recognition of GBF	Avoid sensitive sites (e.g., PA, KBAs, WHS)	Signposts globally recognised reporting practice	NNL/NG for new projects	Practical examples
ICMM Position Statement on Nature	The Statement sets out broad commitments on nature for ICMM members, grouped according to the sphere of influence. For direct operations, it specifies no-go areas and NNL.	✓	✓	✓	✓	✓	✗
TNFD Additional sector guidance—Metals and mining	The Guidance sets out good practice for disclosure in the metals and mining industry, highlights key commitments and provides some examples of practical actions that can be taken.	✓	✓	✓	✓	✓	✓

Table 3: Common features of performance/certification standards relevant to the extraction stage for the mining sector.

Document	Description	Features/recommendations (extraction stage)					
		Mitigation hierarchy	Recognition of GBF ^d	Avoid sensitive sites (e.g., PA, KBAs, WHS)	Signposts/represents globally recognised reporting practice	NNL/NG for new projects	Practical examples
GRI 14 & 101	GRI 14 provides guidance on mining sector reporting across a range of issues including biodiversity. It gives examples of how the mining sector impacts biodiversity. The standard links to GRI 101, which gives more detailed, non-sector-specific guidance on the identification of biodiversity impacts.	✓	✗	✓	✓	✗	✗
IFC PS6 Guidance note	The Guidance Note is a companion to IFC's Performance Standard 6, providing practical guidance on how to implement the principles described in Performance Standard 6. While it does not refer exclusively to the mining sector, the guidance has relevance for the sector.	✓	✗	✓	✓	✓	✗
Aluminium Stewardship Initiative	Mineral specific certification standard relevant for the extraction of bauxite. Particularly Principles 5–8 are relevant to nature loss.	✓	✓	✓	✓	✓	✗
Copper Mark	Mineral specific assurance framework relevant for the extraction of copper ore.	✓	✗	✓	✓	✓	✗

^d 'No recognition' may simply mean that the standard or guidance version was published before GBF was signed in December 2022

2.1.2 Priority actions: Bauxite

Overview

The raw mineral Bauxite is refined into alumina (aluminium oxide) and then smelted at high temperatures into aluminium. Aluminium is the second most widely used metal in the world due to its unique properties of being light weight, malleable and ductile, yet strong as steel when alloyed.

Location and size of deposits

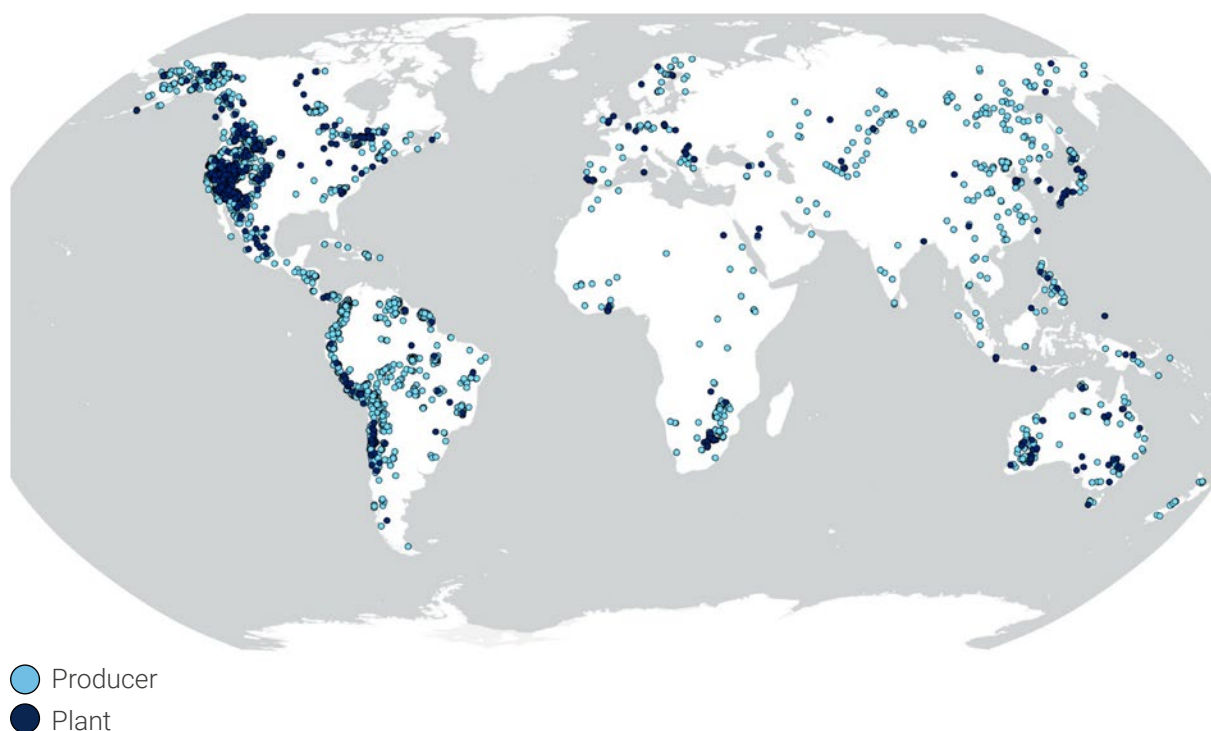
Bauxite is found around the world, but the most significant deposits lie within the equatorial belt, which is characterised by very high biodiversity. Thus, understanding where extraction takes place is key to understanding the most important biodiversity risks and how to mitigate them. Five countries with the largest bauxite deposits account for nearly 75% of global reserves: Guinea (24%), Australia (20%), Vietnam (12%), Brazil (9%) and Jamaica (7%).²²

Mining method

Bauxite is usually found near the surface and is strip-mined from shallow layers of ore.²³ The open cast mining for bauxite removes the top layer of overburden to extract the bauxite ore.

Demand

Aluminium is used by the automotive, construction, renewable energy, machinery, packaging (e.g., drinks cans) sectors, amongst others. Notably, it has a big role to play in the clean energy transition, particularly for wind turbines, contributing to demand for aluminium being forecast to grow by 40% by 2030.²⁴ However, aluminium is endlessly recyclable, making upscaling a major opportunity to reduce the demand for virgin extraction.



Data source: USGS Mineral Resources Data Systems (MRDS) mrdata.usgs.gov/rds

Figure 3: Map showing bauxite mining (producers) and aluminium manufacturing plants

Suggestions of priority actions for bank clients

Impact type	Impact on nature (at extraction stage) ^e	Suggested actions for bank clients	Practical examples
Land-use change	<p>High. Direct impacts: Open cast mining requires large-scale clearance of vegetation and soil, removing the habitats that support species, impact water resources and potential migration routes.</p> <p>Indirect impacts: e.g., from immigration and induced access, can present even higher risks than direct impacts in some cases. Extraction is often in ‘frontier’ areas with low historical human impact and high biodiversity value.</p>	<p>Apply the mitigation hierarchy, with particular attention to avoiding operation in high biodiversity areas (e.g., PA, KBA, WHS)</p> <p>Work towards compliance with IFC PS6—recognised as a good practice standard for biodiversity risk management.</p> <p>Avoid impacts on critical habitats, such as those with critically endangered or endangered species, globally significant populations of migratory species or highly threatened/unique ecosystems.^f</p> <p>Get International Aluminium Institute or Aluminium Stewardship Initiative^g (ASI) certified; e.g., ASI certification would require the mining company to desists from exploring or developing new properties in World Heritage sites.</p>	<p>The mitigation hierarchy and IFC PS6 have been applied in the case of a planned large bauxite mine in Guinea to avoid and minimise the impact on the habitat of Western Chimpanzee. The mine is located in the habitat that holds 60% of the world’s Western Chimpanzee population.</p> <p>Initial screening can be done using the Global Critical habitats spatial data layer, and if critical habitat is potentially indicated systematic biodiversity surveys and impact assessment prior to financing and development of a bauxite mine will be required.</p>
Climate	<p>Low. Emissions linked to the extraction of bauxite reach about 3 million tonnes CO₂eq yearly—about 0.003% of global emissions.</p>	<p>Electrification of the mining truck fleet or installing solar plants within the mining concession to supply renewable energy to the mine.</p>	<p>Rio Tinto is installing 5.25 MW solar farms at its Gove Bauxite Mine in the Northern Territory of Australia.</p>

e If impact indicated as low, this does not mean that these are not serious impacts, for example, to people’s health, e.g., in case of dust pollution.

f IFC PS 6 critical habitat definition : areas with high biodiversity values, which meet one or more of the following criteria: (i) Critically Endangered (CR) and/or Endangered (EN) species. (ii) Endemic and/or restricted-range species.(iii) Significant concentrations of migratory or congregatory species.(iv) Highly threatened and/or unique ecosystems. (v) Key evolutionary processes¹².

g Certification relates to all impact types, but is drawn out as particularly relevant to address the issue of land-use change.

Pollution	<p>Low. Dust pollution can have a localised impact on both soil and the atmosphere. The beneficiation^h process does not create toxic waste, but fine sediments can leak into waterways causing sedimentation.</p>	<p>Implement dust control measures during drilling and blasting, grinding and transport, etc. Collaborate and engage with government, community stakeholder and external experts to minimize impact such as pollution.</p>	<p>The installation of water spraying equipment for stockpiles and regular water spraying of haulage roads in mines can greatly reduce dust, amongst several other measures. Involving communities in Zimbabwe in citizen science water sampling has improved accountability of the mining companies in the catchment to reduce water pollution and empowered them to ask for more water points/boreholes which helps.</p>
Resource exploitation	<p>Low-medium. Mines that do not need to undertake beneficiation do not require large amounts of water but will need water for operational use; on average 0.5m³ of water is needed per tonne of bauxite. Impacts will be higher in areas of water scarcity. Indirect impacts to natural resources can have greater impacts.</p>	<p>Increase water recycling: large volumes of process water can be reclaimed from bauxite residue disposal areas, reducing overall water consumption.</p>	<p>The Hydro Paragominas Mine in Brazil has developed a comprehensive water management plan that involves a closed loop water system where water is continuously recycled.</p>
Invasive species	<p>Medium. Invasive species can be introduced to new areas via imported equipment and machinery.</p>	<p>Develop and implement an invasive species management plan with actions such as</p> <ol style="list-style-type: none"> i. Strict standards of inspection and cleaning of equipment and vehicles to prevent the introduction of invasive plants through seeds contained in dried mud on tires ii. An eradication programme using chemical, mechanical or biological (e.g., introduction of natural predators) control iii. Regular population monitoring of the invasive species through surveys to track changes in abundance and distribution of invasive species 	

^h Beneficiation is the treatment of raw material, such as mineral ore, to improve physical or chemical properties in preparation for smelting.



Credit: SR Livingstone

Bauxite mining and chimpanzees

Guinea holds the world's largest known bauxite deposits but is also a home to 60% of the remaining Critically Endangered Western Chimpanzees. Bauxite mining directly impacts chimpanzees through removal of their habitat but indirect impacts can be far more significant than direct impacts. Indirect impacts are associated with immigration of people looking for work and with induced access through creation of new transport links. Increases in population result in further pressures on land use and increases in hunting pressure on chimpanzees as well as other species. To provide sufficient habitat for the Chimpanzees an offset site was identified and approved by the government as a new national park—Moyen Bafing.

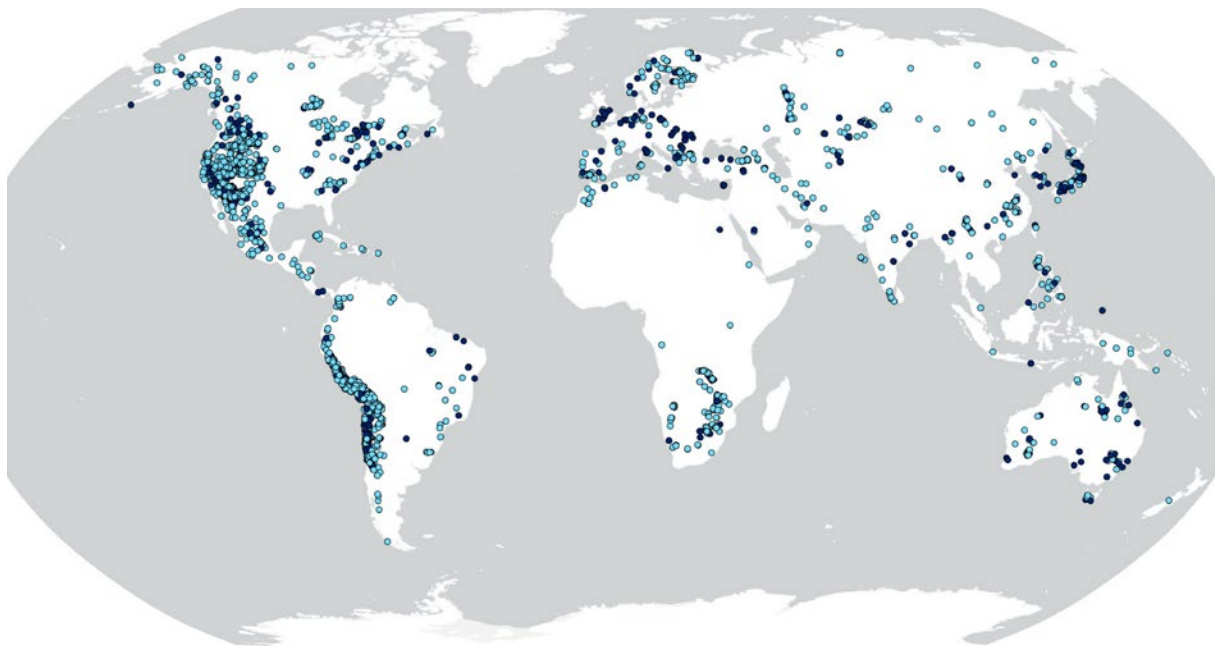
2.1.3 Priority actions: Copper

Overview

Copper is an extremely ductile metal, with the highest electrical conductivity of any metal apart from silver. It is corrosion resistant and antimicrobial.²⁵ These properties make copper highly useful and economically important for many industries with applications in electronics to construction.

Location and size of deposits

Deposits of copper ore are particularly rich within the western cordillera of the Americas and in central Africa. Chile currently has the highest mining capacity with 5.8 Mt in 2019 (1/3 of the world copper mine production), followed by Peru (2.45 Mt), China (1.8 Mt), Democratic Republic of Congo (1.29 Mt) and USA (1.29 Mt).²⁶ Total copper resources (undiscovered + identified) are estimated at 5,600 Mt.²⁷



- Producer
- Plant

Data source: USGS Mineral Resources Data Systems (MRDS) mrddata.usgs.gov/rds

Figure 4: Global distribution of copper mines (producer) and processing plants.

Mining method

Primary copper production starts with mining of copper-bearing ores, undertaken via open pit or underground mining. Open-pit mining is used for extensive ore bodies that are close to the surface. They tend to contain lower grade ore and result in some of the largest mines in the world, such as Escondida mine in Chile and Bingham Canyon mine in the USA. Open-pit mining removes the topsoil layers before drilling and blasting the layers containing the ore.

The copper content of the ore is low (typically 3–5%) and most rock extracted during mining is unwanted material. Extraction requires large amounts of land, resulting in habitat removal, degradation and fragmentation. The ore is separated from the rock, called gangue, and often concentrated before transportation for further processing. Waste rocks and slurry is disposed of as mine tailings.

Demand

Copper and copper-based alloys are used in a variety of applications from electronic products to building, machinery and equipment and consumer products. Demand is high and increasing, due to the transition to low-carbon electricity-based energy systems. Copper, like aluminium, can also be endlessly recycled without loss of performance, reducing demand for extraction of copper ores.

Suggestions of priority actions for bank clients

Impact type	Impact on nature (at extraction stage) ⁱ	Suggested actions for bank clients	Examples of actions
Land-use change	<p>High.</p> <p>Direct impacts: Open-pit and underground mining results in direct removal of habitat and habitat fragmentation.</p> <p>Indirect impact: e.g., from in-migration and increased access, can be even greater than direct impacts in some situations.</p>	<ul style="list-style-type: none"> Apply the mitigation hierarchy, with particular attention to avoiding operations in high biodiversity areas (e.g., PA, KBA, WHS), which is also crucial for compliance with IFC PS6—recognised as a good practice standard for biodiversity risk management. The IBAT tool can be used to check for proximity or overlap with high biodiversity areas.²⁸ And Initial screening can be done using the Global Critical habitats spatial data layer, and if critical habitat is potentially indicated a systematic biodiversity surveys and impact assessment prior to financing and development of a copper mine will be required. Avoid impacts on critical habitats, such as those with critically endangered or endangered species, globally significant populations of migratory species or highly threatened/unique ecosystems. This requires a systematic Biodiversity impact assessment prior to financing and development of a copper mine, including systematic biodiversity surveys. Collaborate and engage with government, community stakeholders and external experts to minimize indirect impacts and cumulative impacts and encourage and participate in Strategic Environmental Assessment (SEA)^j that focus much wider than just Environmental Impact Assessment (EIA)^k for a mining project alone. 	<ul style="list-style-type: none"> Oyu Tolgoi in Mongolia is the world’s largest known copper and gold deposit. Rio Tinto has successfully applied IFC PS6 to manage land-use impact, by assessing the biodiversity risk at the site-level and creating a comprehensive plan to meet global standards. That has satisfied the lenders IFC and EBRD resulting in successful funding of the project.

ⁱ If impact indicated as low, this does not mean that these are not serious impacts, for example, to people’s health, e.g., in case of dust pollution.

^j A Strategic Environmental Impact Assessment (SEA), also known as a Strategic Environmental Assessment, is a process used to evaluate the environmental, social, and economic impacts of proposed policies, plans, or programs before they are approved and implemented.

^k An Environmental Impact Assessment (EIA) is a process used to evaluate the potential environmental consequences of a proposed project, plan, policy, or program before a decision is made to proceed with it.

Climate	<p>Low-medium. Energy consumption by vehicles, machinery and ore transport creates emissions as does the decomposition of carbonate minerals during weathering.</p>	<p>Electrification of the truck fleet and trolley systems in mines.</p>	<ul style="list-style-type: none"> ▪ BHP is planning to replace 160 trucks with EV trucks from Caterpillar and install an electric trolley system in the Escondida mine in Chile. ▪ Freeport McMoran has reduced its GHG emissions from its copper mining operations in the Americas by 21% between 2015–2019 from a mixture of technology enabled efficiencies of use of truck fleet, and switching to renewable energy.
Pollution	<p>High. Arsenic is present at many copper mines, especially in Latin America, creating ecotoxicity risks. Arsenic is leached out of the waste rocks exposed to water and oxygen, generating sulphuric acid, leading to acid mine drainage.</p>	<p>Implementation of acid mine drainage (AMD) prevention, involving several strategies:</p> <ol style="list-style-type: none"> reduce exposure of sulfide minerals in copper mining waste, including neutralisation with lime flooding abandoned mines to remove oxygen which is necessary for AMD formation reclamation by covering contaminated topsoil, planting vegetation 	<p>A “treating waste with waste” system can neutralize acid and remove heavy metals from mining waste by using the reducing barrier system constructed with common industrial wastes of activated sludge and fly ash as the reaction medium.</p>

Resource exploitation	<p>High. Large amounts of water are required during the extraction process; the lower the grade, the larger the amount of water required. Water is needed for mining operations but also for the separation of ore from gangue.¹ The process known as froth flotation uses air, water and chemicals to float the copper mineral to the surface while the waste drops down to the base of the cell. These phases use about 70% of all the water used in the copper industry and can have significant impacts in areas with low rainfall.²⁹</p>	<ul style="list-style-type: none"> ▪ Increase water recycling rates by installing closed loop systems ▪ Reduce water use where possible by adopting water-saving initiatives, including dry stacking for tailing or water-less cooling systems. ▪ Develop desalination, ideally run on renewable energy 	<p>The Escondido Water desalination plant reduces the pressure on the nearby aquifer.</p>
Invasive species	<p>Medium. Movement of equipment and supplies across borders can result in the spread of invasive species and pathogens</p>	<p>Develop and implement an invasive species management plan (see Bauxite table for examples of actions)</p>	

¹ Gangue is the commercially worthless material that surrounds, or is closely mixed with, a wanted mineral in an ore deposit.



Copper mining and salares

Chile produces nearly a third of the world's copper supply³⁰ and northern Chile is one of the driest places on the planet. Mining has been using ground water aquifers which have taken many thousand years to fill but are now diminishing. Where ground water levels are close to the surface, wetland areas or 'salares' exist—these are important areas of water in a desert landscape creating habitats for unique species of flora and fauna as well as providing ecosystem services for local communities. Damaging these can trigger legal battles and community tensions, potentially impacting mine profitability. Desalinisation plants have begun to operate to reduce ground water requirements. However, mines need to reduce water use overall, which can be done, for example by installing closed loop systems to increase water recycling.

2.2 Agriculture and forestry

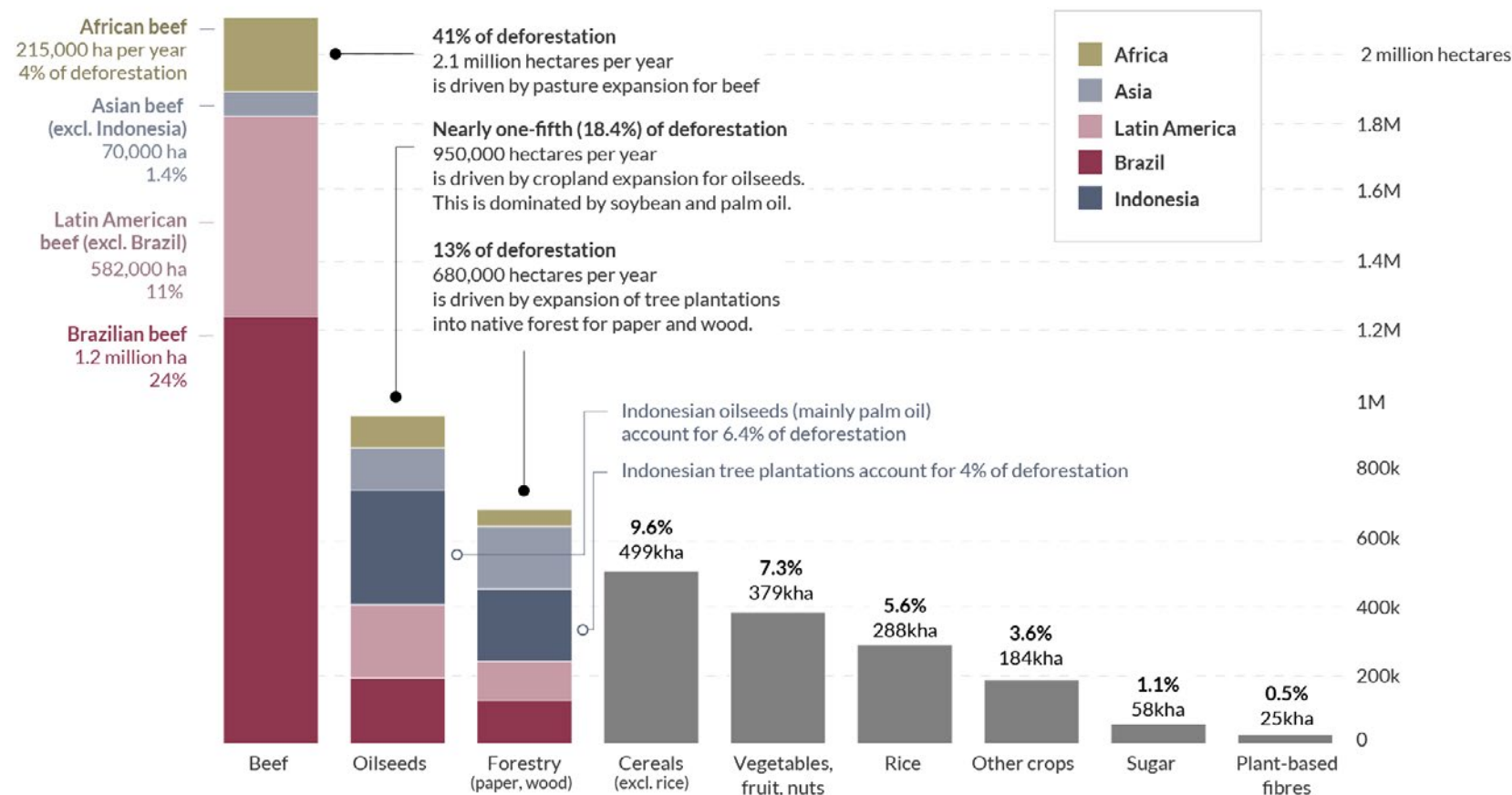
The agriculture and forestry sectors convert and degrade natural habitat, as well as placing other pressures on nature. Deforestation linked to agriculture and forestry is a major source of reputational risk for companies, and area of attention for regulation by policymakers.

Cattle, oil seeds (predominantly soy and palm oil) and forestry products (wood and paper) account for three quarters of tropical deforestation.³¹ Most of this conversion and degradation is taking place in emerging economies in the tropics with high levels of biodiversity. Agriculture uses 70% of global freshwater³² and occupies half of the world's habitable land.³³ It is also a major contributor to GHG emissions. In 2017, the percentage contribution of agriculture to world CO₂eq^m emissions from all human activities were 20 per cent. This included a contribution of 11% from crop and livestock activities within the farm gate and an additional nine per cent from related land use.³⁴

m CO₂eq, or carbon dioxide equivalent, is a metric used to compare the emissions of various greenhouse gases based on their global warming potential (GWP).

What are the drivers of tropical deforestation?

Nearly all of global deforestation occurs in tropical and subtropical countries. 70% to 80% is driven by conversion of primary forest to agriculture or tree plantations. Shown is the breakdown of these drivers averaged over the years 2005 to 2013. Further observations since 2013 suggest that drivers have not changed substantially over this period.



Data source: Florence Pendrill et al. (2019). Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest transition.

OurWorldinData.org – Research and data to make progress against the world’s largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

Figure 5: Drivers of deforestation in the tropics. Source: [Our World in Data \(2024\)](https://ourworldindata.org).

Forestry related impacts come from both natural forest logging and tree plantation expansion and management. Plantation expansion contributes 13% to tropical deforestation by driving the expansion of tree plantations into native forest to produce wood and pulp for paper.³⁵

Timber extraction from natural forests varies from complete clear felling to selective logging, and impacts associated with timber extraction range from complete land-use change to various levels of forest degradation impacting biodiversity and ecosystem function. Furthermore, the indirect effects of logging roads can be greater than the extraction of timber as this opens previously intact forest landscapes to further exploitation and permanent conversion through new settlements and agriculture.

The impacts upon nature from the agriculture and forestry sectors can also have significant human rights risk for workers and communities that are relevant for banks. While this guidance will not delve into those, more information can be found at the [UNEP FI human rights toolkit](#).

The impacts of agricultural and forestry commodities on deforestation have led policy-makers to craft regulations aimed at preventing this. A major source of regulatory risk for bank clients is the European Deforestation-free Regulation (EUDR), which comes into full force from 2025. The regulations specify strict traceability requirements, including geolocation points or polygons of commodity production, for seven major commodities (of which timber, cattle, soy and palm oil are covered in this guide) and certain derivatives of those commodities. This traceability is utilised to prevent products grown on land deforested after 31 December 2020 from entering the EU market. These regulations have the potential to significantly reduce tropical deforestation, but may create risks for bank clients, including commodity producers in all relevant geographies and commodity purchasers in the EU. Engaging clients to ensure that they are prepared for the regulations may prevent losses due to sanctions or loss of customers.

2.2.1 What existing agricultural and forest sector guidance focusses on

Common features of existing agriculture and forestry sector guidance and related certification standards tend to include:

- The High Conservation Value Areas (HCVAs) which identifies natural habitats, which are of outstanding significance or critical importance due to their high biological, ecological, social or cultural values.ⁿ It is used in certification standards, such Round Table on Sustainable Palm Oil (RSPO) and the Round Table on Responsible Soy Association (RTRS). The Forest Stewardship Council (FSC) certification initially introduced the concept.
- The importance of sensitive sites, and no-go criteria for World Heritage Sites (WHS) and greater due diligence/avoidance of legally protected areas (PAs), key biodiversity areas (KBAs).
- And contain signposts to globally recognised reporting practices.^o

n [High Conservation Value Areas \(HCVA\) definition | Biodiversity A-Z](#)

o Examples include Global Reporting Initiative standard (GRI13), Sustainable Accounting Standards Board (SASB) with industry specific standards for agriculture and forestry among others

Table 4: Common features/recommendations relevant to agriculture and forestry at the stage of production.

Document	Description	Features/recommendations (extraction stage)					
		Mitigation hierarchy	Recognition of GBF	Avoid sensitive sites (e.g., PA, KBAs, WHS)	Signposts/represents globally recognised reporting practice	NNL/NG for new projects	Practical examples
TNFD Additional sector guidance – Food and agriculture	The Guidance sets out good practice for disclosure in the food and agriculture industries, highlights key commitments and provides some examples of practical actions that can be taken.	x	✓	✓	✓	x	x
Business for Nature Sector Action towards Nature Positive – Agri-food	The Roadmap describes actions that can be taken towards nature-positive for row crops. It highlights how specific commodities may differ from sectoral averages in terms of impacts and dependencies.	x	✓	✓	✓	x	x
Business for Nature Sector Actions towards Nature Positive – Forest Products	The Roadmap describes actions that can be taken towards nature-positive for forest products.	x	✓	✓	✓	x	x

Table 5: Common features and recommendations of the main timber, soft commodity and agricultural certification schemes

Document	Focus	Description	Features/recommendations (production)			
			Mitigation hierarchy	HCV approach	KBA approach	Signposts globally recognised reporting practice
FSC Principles and Criteria for Forest Stewardship	Timber	The FSC outlines the key principles for sustainable forest management. It requires that forestry be carried out in such a way that protects forests' biodiversity. It has requirements on both protecting habitats for animal species and preventing the spread of non-native tree species.	x	✓	x	x
Round Table on Sustainable Palm Oil (RSPO)	Palm oil	The RSPO covers the most significant environmental and social impacts of palm oil production. It encourages the protection of natural habitat and endangered species, and ensures fair treatment of workers, including fair wages.	x	✓	✓	✓
Roundtable on Responsible Soy (RTRS)	Soybeans	RTRS covers soy production for uses from human consumption to animal feed, to biofuels. It encourages the maintenance of biodiversity corridors, promotes on-farm biodiversity, requires that agrochemicals be used in a way that minimises harms to biodiversity, and limits the introduction of invasive species.	x	✓	✓	x
Soil Association	All crops	The Soil Association encourages the protection of biodiversity, particularly soil biodiversity, primarily through the avoidance of pesticide use. Practitioners are required to map ecologically significant features on farms and include these in a Biodiversity Action Plan.	x	✓	x	x

2.2.2 Priority actions: Wood

Overview

Timber for wood and pulp is harvested from forests all around the globe. The main demand is as industrial roundwood, sawn wood, wood-based panels, fuel wood, pellets, charcoal and pulp for paper. There are two dominant sources of timber: felling of natural forest and plantation forestry:

- Natural forest harvesting tends to be either clear-cut or selective. Clear-cut is the most common and refers to a model in which all trees in a stand are felled in the same harvest. Selective refers to a model in which trees felled are selected from a concession area, based on species, size and, occasionally, sustainability criteria.
- Tree plantations cover about three per cent of the wood production area in the world.³⁶ They are intensively managed areas, mainly composed of one or two tree species, native or introduced, of equal age, planted with regular spacing and mainly established for productive purposes.
- Illegal logging, leading to natural forest conversion is estimated to be between 15 and 30% of the overall market for wood products.³⁷ It is a legal risk for banks and their clients, due to, for example, the EUDR and the well-established US Lacey Act, which is aimed at preventing the trading of illegally sourced timber and wood products amongst other plant and animal species and their products.³⁸

Suggestions of priority actions for bank clients

Impact type	Impact on nature (at extraction stage)	Suggested actions for bank clients	Examples of action
Land-use change	High. Deforestation and degradation for logging drive land use change. Managed natural forests occupy large areas of lands across the globe and tree plantations displace highly diverse forests and grasslands.	<ul style="list-style-type: none"> Follow the mitigation hierarchy and avoid clearing forest/harvesting timber in high conservation value forests (HCV),³⁹ and legally protected areas. A HCV approach is a key principle of FSC certification. Obtaining FSC certification for forest concessions as well as plantations will ensure the use of management practices that avoid and reduce the biggest land-use change impacts on biodiversity. 	The HCVA approach has been applied by Mistik Forest Management Area, Saskatchewan, Canada for a number of years as part of FSC certification. This includes, for example, complying with HCV 2—one of 6 HCV values—which focuses on conserving large-landscape level ecosystems and mosaics.
Climate	High. Deforestation, including for wood production, is the most important source of GHG ^p emissions for some countries. Forest regrowth and tree planting partially compensates emissions of change in land cover.	<p>Clients purchasing wood and wood products can reduce impact by ensuring:</p> <ol style="list-style-type: none"> wood comes from legal sources by requesting a FLEG-T licence^q the company has a zero-conversion policy wood is certified by PEFC or FSC, the latter guarantees that it is not from land converted from forest after 1994 	Both IKEA and Home Depot have comprehensive timber sourcing policies, where proof of legality and (in the case of the former) FSC certification is required and in the latter certified timber products receive preference.
Pollution	Low. Soil loss into rivers is possible post-harvesting. Area preparation for planting may require herbicides and fertilizers during the first 1–3 years.	<ul style="list-style-type: none"> After harvesting, areas can be managed to avoid soil loss and particles being carried to rivers. Reduce pollution impact by employing innovative techniques to reduce run-off. 	Techniques such as contour-planting and the creation of micro-catchments will help to maximise water capture and reduce run-off.

^p When forests are removed, carbon that was stored by trees and soil is released into the atmosphere, and our most cost-effective means for absorbing GHG emissions is lost

^q FLEG-T licence is a document that confirms that a shipment of timber or timber products has been legally produced, in accordance with the relevant laws of the country of harvest.

Resource exploitation	<p>Medium. Excessive harvesting of natural forest is a form of resource exploitation. Exotic tree species plantations, particularly in water constrained areas, can negatively impact the water table.</p>	<p>Follow sustainable forest management practices, not extracting more timber than the annual allowable cut^r and employing sensitive tree harvesting methods, to allow rapid regeneration of forest to a productive and biodiversity supporting state.</p> <p>Avoid the planting of exotic tree species with high water resource needs (e.g., eucalyptus), particularly in water-constrained catchments, using native species alternatives where possible.</p>	<p>Techniques such as contour-planting and the creation of micro-catchments will help to maximise water capture and reduce run-off.</p>
Invasive species	<p>Medium. Saplings can carry disease across countries. Exotic tree species used in plantations may colonize natural areas and modify open natural vegetation.</p>	<ul style="list-style-type: none"> ▪ Adherence to strict biosecurity protocols and only buying saplings with a legitimate plant passport. ▪ Avoid the planting of known invasive species and have monitoring programmes in place that allow early control. 	<p>Forestry practices needed to reduce the risks of plant invasions involve: continued surveillance for invasive species; minimizing canopy opening during harvesting and other silvicultural operations in natural forests; encouraging rapid canopy closure in plantations; minimizing the width of access roads and ensuring that vehicles and other equipment are not transporting seeds of invasive species.</p>

^r The Annual Allowable Cut (AAC) is the annual amount of timber that can be harvested on a sustainable basis within a defined forest area, ensuring that the rate of harvest does not exceed the forest's capacity to regenerate.

2.2.3 Priority actions: Cattle

Overview

Cattle is primarily reared for meat and dairy, with hides for leather being an additional product. Cattle are produced and consumed globally and reared in both extensive (e.g., on pasture) and intensive form (e.g., shed reared) by large-scale producers for export, as well as medium to small-scale farmers for domestic and/or own consumption.

The most significant impact associated with cattle farming is deforestation and conversion of natural habitat in biodiversity rich regions such as the Amazon, the Chaco in Argentina and tropical Northeastern Australia. Cattle production area overlaps with deforestation fronts are shown in the below Figure 6.

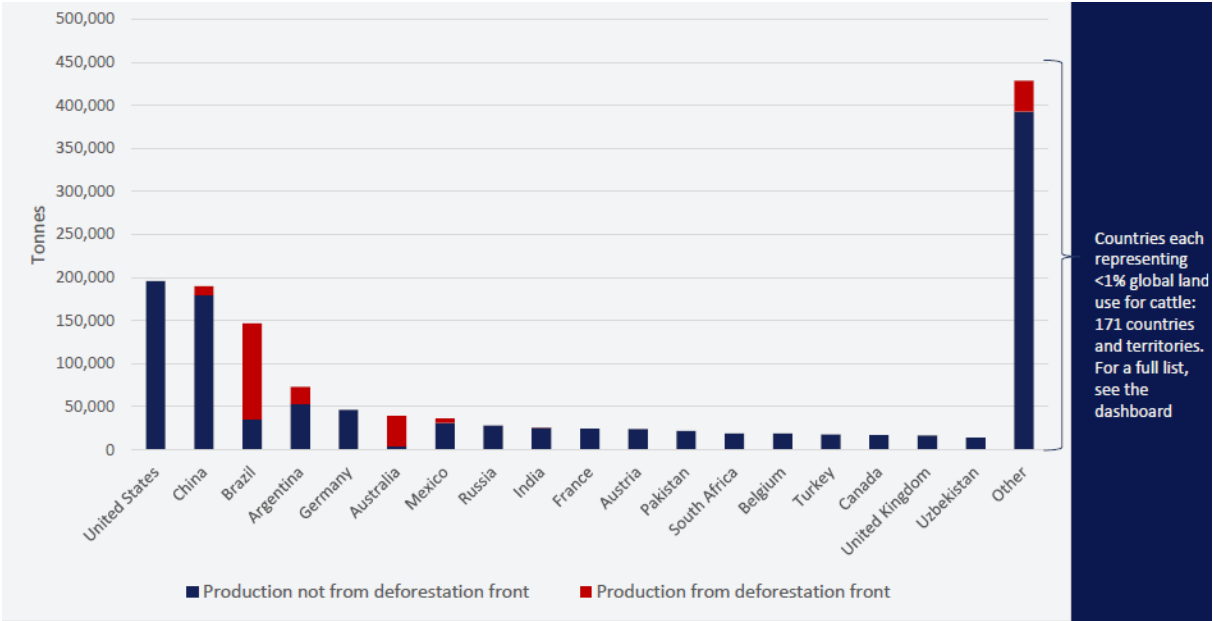


Figure 6: Main cattle producing countries and indication of link to deforestation fronts.

Source: The Biodiversity Consultancy based on [Pacheco et al. \(2021\)](#)

Cattle (beef and buffalo) meat production has more than doubled since 1961,⁴⁰ which can be linked to population growth and the increase in the proportion of the global middle classes that can afford to regularly buy meat. The consumption of dairy products in the form of milk has largely remained stable in western countries but increased dramatically in some emerging economies. In Brazil, for example, the consumption of dairy products has more than double since 1961, driving significant deforestation and conversion.⁴¹ Most deforestation risk cattle products are consumed domestically, placing it beyond the reach of regulations such as EUDR.⁴²

Suggestions of priority actions for bank clients

Impact type	Impact on nature (at production location)	Suggested actions for bank clients	Examples of action
Land-use change	High. Deforestation for pasture is the main driver of deforestation in Latin America, especially in the Brazilian Amazon, but also in Australia. The main feed for cattle—soy—is also linked to major deforestation, particularly in the Cerrado in Brazil and the Chaco in Argentina.	Cattle producers and buyers can reduce impact by developing or improving strict no deforestation and conversion policies (e.g., do not rear cattle in or buy cattle from recently deforested areas) or requiring proof of where the cattle/beef has come from.	Use tools such as Trase to establish high deforestation risk areas associated with beef and require companies operating in these areas to have livestock traceability or (if not possible) avoid sourcing beef from these countries/regions or companies
Climate	High. Major source of GHG emission particularly in the form of methane from cows and the release of CO ₂ from associated large-scale deforestation and conversion.	<ul style="list-style-type: none"> Ensure beef or cattle purchased is not from deforestation fronts Employ manure and slurry lagoon management for methane capture and anaerobic digestion of manure for biogas Explore feed supplements and dietary adjustments. 	Examples of successful anaerobic digesters powered by manure exist across the US . They can often provide the whole electricity for a large dairy farm and associated dairy. The manure is transformed into liquid fertilizer and cow bedding.
Pollution	Medium. Pollution from manure/slurry can run off into freshwater ecosystems and cause eutrophication, killing aquatic wildlife; veterinary pharmaceuticals can also leak into the environment via manure/slurry, including anti-biotic leakage, with negative impacts on plants and animals and ecosystem function. This issue is catching the attention of policymakers, and may be regulated in future.	<ul style="list-style-type: none"> Ensure slurry management and tanks are leak proof and employ effective processing techniques Reduce the use of anti-biotics and other veterinary drugs as much as possible to prepare for potential restrictions on antibiotic use and look for alternatives 	Effective composting (e.g., 60 degrees C) treatment and aerobic processes have been found to decrease the antibiotic activity to safe levels and could be encouraged by large cattle farming operations.

Resource exploitation	<p>Medium/high—depending on type of cattle rearing (extensive vs. intensive), and whether animal feed from soy and maize requires water and fertilisers to grow; soil degradation is an issue when overgrazing occurs.</p>	<p>Understand where your cattle feed is coming from and engage with your supplier to ensure it is 'deforestation free', e.g., RTRS certified in case of soy; have a clear pasture management regime that ensures no overgrazing is taking place.</p>	<p>The Nature Conservancy in the US is working with companies in the beef supply chain to adopt a sustainability framework that keeps grasslands ecologically intact and economically productive.</p>
Invasive species	<p>Low. Cattle can lead to unintentional introductions of plant species attached to their fur or carried in their dung</p>		

Going deeper: a spotlight on how cattle drives nature loss

Land-use change: Cattle production is one of the main drivers of deforestation worldwide.⁴³ Brazil has been highlighted for the role of cattle in driving deforestation in the Amazon biome in multiple reports in recent years, creating significant public controversy. Over 40% of deforestation in tropical and subtropical regions is due to conversion to pasture, much of this concentrated in Brazil.

Cattle is a driver of forest loss on several fronts, including eastern Australia, where it is the primary driver of loss in the region. Other countries where cattle production is associated with deforestation risk include eastern Madagascar, the southern Mexico Mayan forests, northern Argentina, parts of Paraguay, Bolivia, Ecuador and Colombia.⁴⁴

Climate: Cattle is a major source of GHG emissions, in particular methane. The emissions come from the loss of forest when they must make way for pastures, as well as the emissions produced by the cows themselves in the form of methane, and GHG emissions associated with feed production, including deforestation for the growing of soy (see 2.2.4), housing, manure storage and application. Emissions associated with cattle production are a major force in driving dietary changes away from meat and may impact the profitability of the industry.

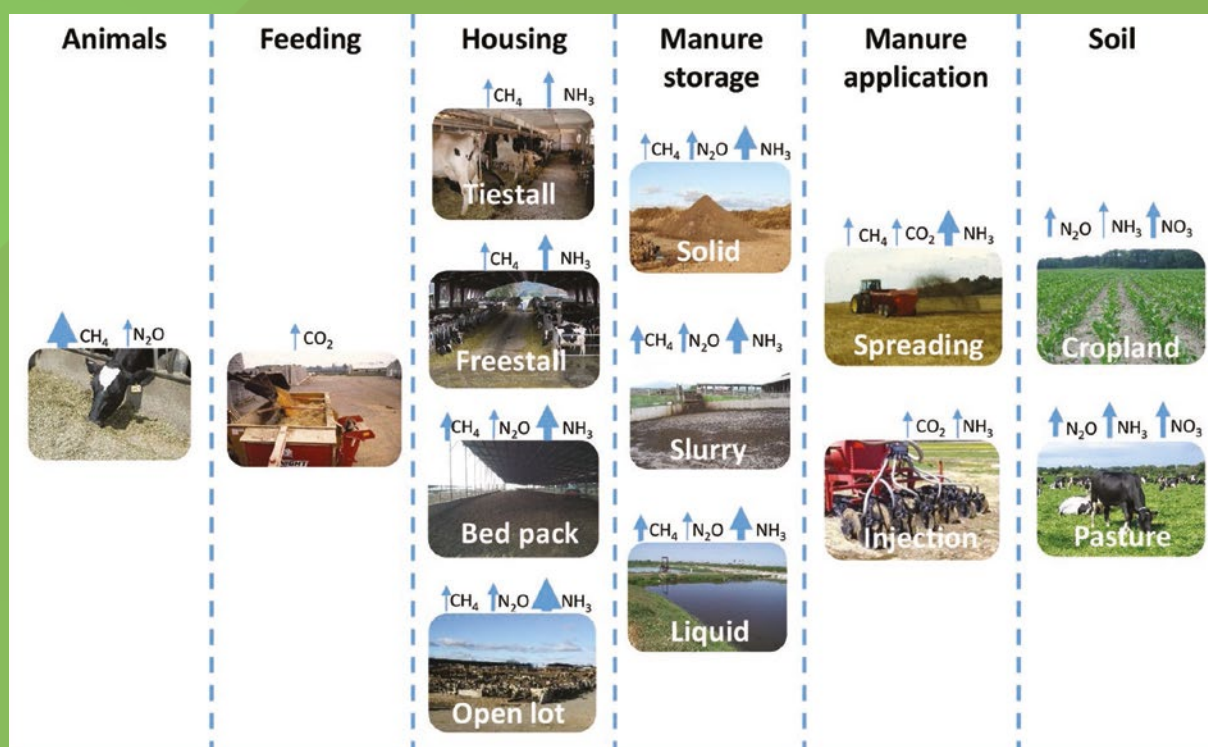


Figure 7: Direct and indirect GHG sources and relative amounts (size of the arrows) emitted from dairy farms. Does not indicate GHG emissions from conversion of forests to pasture. Source: [Rotz \(2018\)](#).⁴⁵

It is estimated that three quarters of all emissions from livestock come from cattle. That livestock contribute 19.6% of all GHG emission.⁴⁶

Pollution: Cattle produce large amounts of slurry (up to 53 litres a day per dairy cow⁴⁷), which can be used as fertiliser, but in areas of intensive cattle and livestock rearing the escape of slurry or spreading of slurry on fields can cause eutrophication of rivers leading to loss of fish and wildlife species. More than 50 major antibiotics have been detected in poultry, swine, cattle, and horse manures, increasing the threat of anti-microbial resistance.⁴⁸ These and other veterinary pharmaceuticals, such as deworming treatments, can be taken up by soil components, broken down by soil microbes, absorbed by plants, and moved to ground and surface waters via runoff and leaching. This can damage both terrestrial and aquatic ecosystems.⁴⁹

Resource exploitation: Direct water usage for drinking and sanitation of cattle is considerable. However, the indirect water consumption of cattle is much more significant than direct water usage. This is mostly association with growing cattle feed in the form of soy (see section 3.2.4 on soy), maize and silage, and with production of artificial fertilizer to grow these crops. The growing of feed stock for cattle also causes deforestation and conversion of natural habitat.

Soil erosion as result of overgrazing is also a major issue in many cattle rearing areas. Drylands are especially at risk of overgrazing and reduction in the quality of soil which can be a cause of desertification.⁵⁰

Invasive species: Although cattle can lead to unintentional introductions of plant species attached to their fur or carried in their dung, carefully managed grazing by cattle can also be beneficial in reducing invasive species and encouraging native plant and associated animals. Certain cattle grazing regimes have a beneficial role for biodiversity by mimicking the role that large native herbivores would play.⁵¹ Grazing with older breeds of cattle adapted to rougher pastures can play an important role in conservation⁵² and rewilding programmes by maintaining a mosaic of vegetation that provides habitat for more plants and animals, sequestering more carbon, and reducing fire risk by reducing fuel load in fire prone ecosystems.⁵³

2.2.4 Priority actions: Soy and Palm Oil

Overview

Soy and palm oil are major oilseed commodities associated with significant nature impacts, particularly in Latin America and Southeast Asia. The most significant nature impacts are from land use change, primarily deforestation of tropical forests. This causes major degradation of ecosystem services, including climate regulation, soil health and water flow regulation.

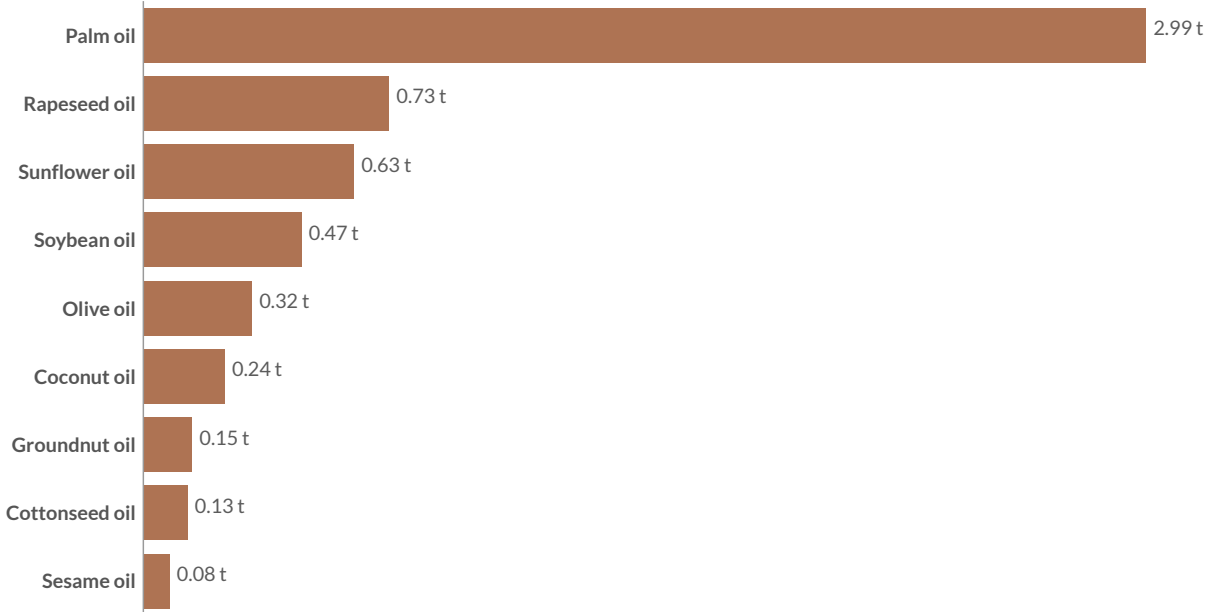
Palm oil

Oil palm is the most productive oil seed crop per area of cultivation, producing an annual 81 million tonnes (Mt) of oil from about 19 million hectares (Mha), roughly 3t/ha of vegetable oil. By contrast, the second and third largest vegetable oil crops, soybean and rapeseed, yield a combined 84 Mt oil but occupy over 163 Mha of land, roughly 0.5t/ha.⁵⁴ Palm oil has been the subject of major boycott campaigns in response to deforestation associated with its cultivation. If production of oil were to shift to other oilseed crops while maintaining overall volumes, this would cause a much greater land use change, so efforts to reduce deforestation associated with palm oil must be mindful of spillover effects and ensure that it is grown sustainably and does not contribute to deforestation.

Oil yields by crop type, World, 2021



Global oil yields are measured as the average amount of vegetable oil produced (in tonnes) per hectare of land. This is different from the total yield of the crop since only a fraction is available as vegetable oil.



Data source: Food and Agriculture Organization of the United Nations (2023) OurWorldinData.org/crop-yields | CC BY
Note: Based on oil production and area harvested data. Maximum yields can vary depending on the ratio of oil production to co-products (e.g. what fraction of soybeans or coconuts are used for oil production).

Figure 8: Oil yield per ha is the highest for palm oil and >6x that of soybean. [Our World in Data \(2023\)](#)

Oil palm thrives in hot and humid conditions of high rainfall found near the equator, the same conditions as rainforest. Most oil palm is grown in Indonesia and Malaysia. Colombia is to date the only major oil palm producer in Latin America.

In Southeast Asia, oil palm expansion has played a significant role in deforestation and biodiversity loss, estimated to be 23% of total deforestation between 2001 and 2019. Oil palm plantations are also impacting coastal ecosystems. Between 2000–2012, it is linked to 40% of mangrove conversion in Thailand, 28% in Brunei and 38% in Malaysia.⁵⁵

Palm oil is a key dietary component consumed daily by over three billion people, mostly in Asia, and has a wide range of important non-food uses including in cleansing and sanitizing products.⁵⁶ More than two thirds is used for food and just under one third for industrial uses.⁵⁷

Soy

Soy is the second most important oil seed crop after palm oil but has by far the biggest land footprint. Demand increases have largely been driven by its use as feed for livestock and in aquaculture, to meet the demand of the growing global middle class for meat and fish (see below Figure 9).

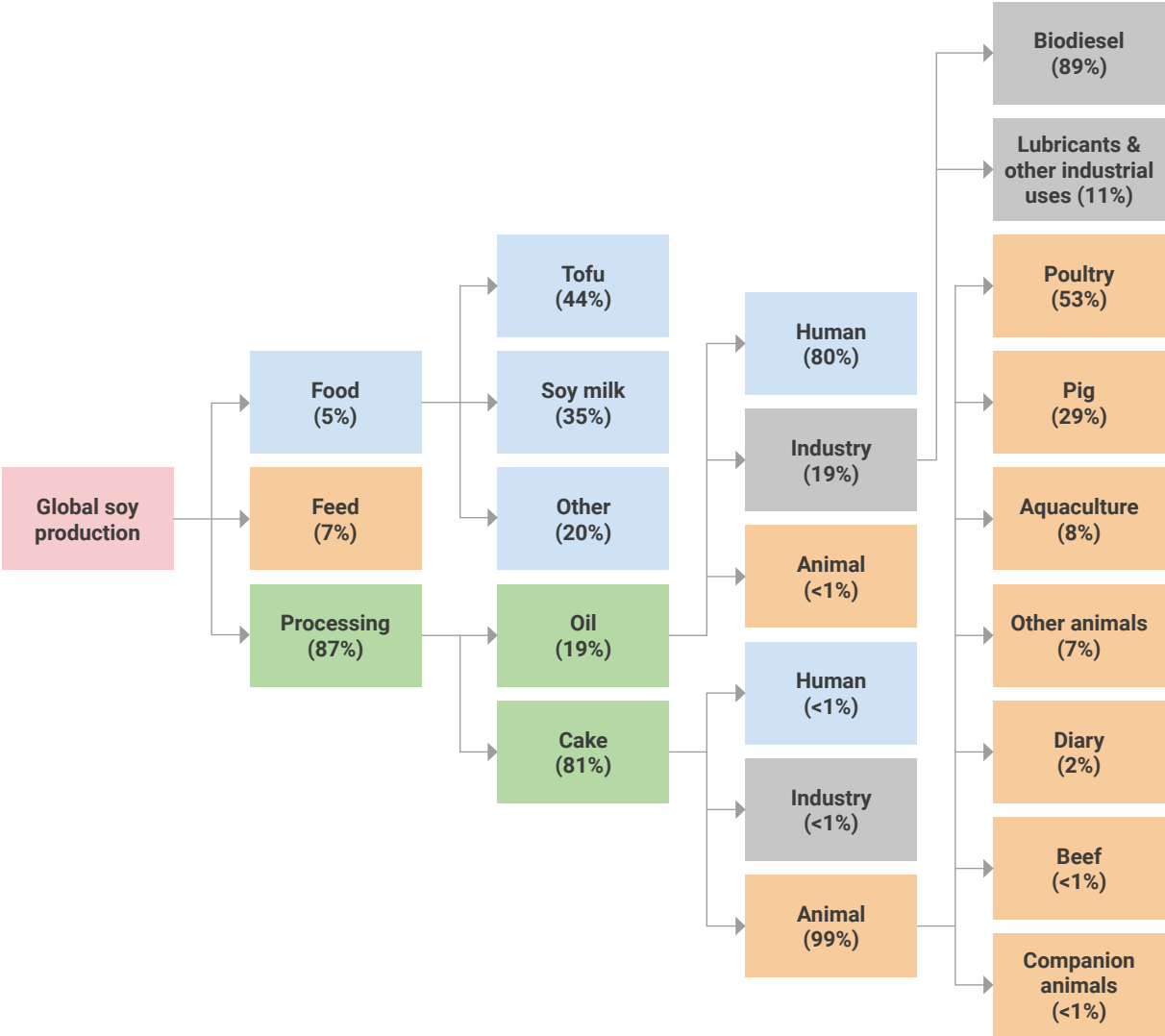


Figure 9: Showing that most soy is used to feed livestock. Source: [Fraanje & Garnett \(2020\)](#)

Soy is cultivated in large monocultures and production is dominated by large landowners and agribusinesses. Cultivation is highly mechanised, requiring significant capital investment into machinery, as well as significant inputs of artificial fertiliser and pesticides and herbicides.

The biggest producing countries are the US, Brazil and Argentina, having an 82% share of global soy production in 2018–19. In Latin America, there has been a 200-fold increase in the land area used to grow soy between the 1960s to 2017, despite a 2–3 times increase in yield during the same time period.⁵⁸ Increased demand for soy has been a direct driver of deforestation and conversion in South America, particularly in the Brazilian Amazon, Cerrado and Gran Chaco regions. Often the land is initially converted to cattle and then planted with soy shortly afterwards. The demand for land to grow soy leads to more deforestation for cattle pasture. Additionally, with land prices increasing there is speculative and sometimes illegal clearance with the intention to sell the land for soy production.⁵⁹

Suggestions of priority actions for bank clients

Impact type	Impact on nature (at production location)	Suggested actions for bank clients	Illustrative examples
Land-use change	<p>High—SOY. Deforestation and conversion of natural habitats has major biodiversity impact. E.g., around 50% of the Cerrado savanna woodlands of Brazil have already been lost, mostly to cattle (often the precursor of soy) and soy. The Cerrado contains 5% of globally known biodiversity.⁶⁰ In parts of South America, soy expansion has led to wetland loss and degradation, including through soy expansion displacing other agriculture into wetlands. Draining wetlands directly impacts biodiversity as breeding / nesting habitats are lost.</p> <p>High—PALM. Tropical forest deforestation and conversion of coastal ecosystems such as mangroves is the biggest impact of palm oil cultivation.</p>	<p>Ensure areas cultivated have not been converted from natural habitat in recent years.</p> <p>PALM: The RSPO cut-off date for deforestation is December 31, 2020, which is the same as the cut-off date for the European Union's (EU) Regulation on Deforestation-free Products (EUDR).</p> <p>SOY: The RTRS cut-off date for zero deforestation is 2009 and the cut-off date for zero conversion is 2016.</p> <p>Expansion should be in areas of degraded land or those already under cultivation and not recently deforested e.g., for cattle.</p>	<p>Both SOY and PALM</p> <p>Encourage all supply chain actors to work towards certification against RSPO or RTRS standards.</p> <p>Use tools such as Trase to establish high deforestation risk areas associated with soy production (e.g., 10% of Brazilian soy growing regions are associated with 90% of deforestation), and require companies operating in these areas to provide traceability information such as proof of location and cross checking with satellite imagery of historic deforestation or, if not provided, avoid sourcing soy from these regions.</p> <p>Support growers to convert to improved varieties with higher yields, to reduce land demand.</p>

Climate	<p>High—SOY. Expansion of soy production via conversion and deforestation of previously natural habitat produces high GHG emissions.</p> <p>High—PALM. Expansion of oil palm production via conversion and deforestation of previously natural habitat, particularly peatland, produces high GHG emissions, which can continue with the drying of peatlands;</p>	<p>SOY & PALM: See above regarding conversion and deforestation.</p> <p>To reduce GHG^s emission from soy cultivation, regenerative agricultural practices could be considered, including low tillage and crop rotation.</p> <p>PALM: GHG emission from existing palm plantations on peatland can be reduced by rewetting through blocking of drainage ditches.</p>	<p>RTRS and RSPO both require non-conversion of tropical forest and wetlands including peatlands and encourage rewetting of existing plantations on wetlands.</p> <p>SOY: Support innovation, such as the RTRS led project on regenerative agriculture for soy production to reduce GHG</p> <p>PALM: Rewetting peatlands that are under oil palm plantations to reduce GHG emissions, which also reduces the risk of fire.</p>
Pollution	<p>High—SOY. Soybean production is becoming increasingly input-intensive, where excessive use of fertilisers and pesticides pollute soil and aquatic ecosystems. For example, spillover into wetland ecosystems can be toxic to species, with knock on effects throughout the food chain. When used in excess, glycophosphate-based herbicides can adversely affect non-target species, persist in the environment and affect nutrient availability in soils.</p> <p>Medium—PALM: Whilst use of fertilizer and pesticides is much lower per ton of oil for palm than for soy, soil contamination and water contamination from run-off can still impact biodiversity of the soil and local water bodies so need to be managed.</p>	<p>SOY: Regenerative agricultural practices, including nutrient management practices and cover cropping, which reducing fertiliser and improves soil health.</p> <p>PALM: Reduced application of artificial fertiliser and pesticide and change in management practice. Oil palm plantations consume more commercial fertiliser than any other crop in Southeast Asia, which can lead to significant run-off of nutrients (and sediment) into freshwater systems.</p>	<p>Both RTRS and RSPO have specific requirements regarding the use of fertilisers and pesticides to safeguard the environment and people.</p> <p>SOY: Support innovation, such as the RTRS led project on regenerative agriculture for soy production to reduce inputs</p> <p>PALM: Experiments have shown that mechanical weeding and reduced fertiliser use do not have detrimental effects on yield, but many environmental benefits.</p> <p>Use of oil palm waste for mulching fertilization has been shown to reduce fertiliser use by 50%, when replanting oil palm</p>

s Soy and palm cultivation have GHG impacts linked to forest conversion, but also to cultivation and management linked to artificial fertilizer use and intensive cultivation methods with significant opportunities for reductions.

Resource exploitation	<p>Medium– SOY: As a relatively water-use efficient crop, water usage is dependent on climatic conditions and soil type.</p> <p>Low -Medium–PALM: Whilst the water use intensity of palm oil is relatively low, the rapid conversion of tropical rainforests for commercial operations in recent decades has been associated with water scarcity. This is driven by green water use, not direct withdrawals for irrigation.</p>	<p>SOY: in water constraint areas lower plant density can be used to reduce the need for irrigation; plants will adapt by producing more branches and legume cultivar selection most suited to climate and soil type is also important.</p>	<p>SOY: support innovation, such as the RTRS led project on regenerative agriculture for soy production to reduce water use</p>
Invasive species	<p>Low–medium: SOY & PALM: threat of introducing invasive species through soy and oil palm cultivation can happen through trucks and farming equipment. This is different from invasive pests on the crop itself, such as the soybean aphid, which needs management via pesticide use.</p>	<p>Both RTRS and RSPO certification include guidelines on monitoring and managing invasive species</p> <p>Developing an invasive species management plan is good practice (see the Bauxite commodity deep dive)</p>	

2.3 Common themes from commodity deep dives

The high impact commodities of bauxite, copper, wood, cattle, soy/palm highlighted in this sector action guidance all include common themes that banks can use to inform dialogue with clients, per the below Figure.

Dialogue topics	
<p>Asset operation</p> <p>Does the client take action to reduce the impact</p> <ul style="list-style-type: none"> ▪ on climate (e.g., reduce emissions) ▪ avoid, reduce and remedy pollution (e.g., strict tailings management) ▪ implement efficient resource use (e.g., minimise water consumption, pesticide use) ▪ avoid and reduce introducing invasive species 	<p>Location-sensitive sites</p> <p>Prior to financing a new project, establish if there is any risk (direct or indirect) to biodiversity sensitive sites (e.g., PA, WHS, KBAs).</p> <p>If yes, decide if it is a 'no-go' (especially for WHS) or enhanced due diligence required from the client.</p>
<p>Mitigation hierarchy</p> <p>As a key organising framework for engagement and action</p> <p>Does your client follow the mitigation hierarchy when developing new or expanding existing operations/plantations/farms and considering all drivers of nature loss?</p>	<p>Certification requirements related to nature</p> <p>Use nature impacts management principles of key certification schemes. These can inform dialogues with clients about specific actions (e.g., ASI certification principles related to biodiversity; water; GHG, emissions, effluent and waste; FSC Principle 9 on HCV)</p>

Figure 10: Common themes to inform dialogues with clients.

3. Bank use cases

This section connects the commodity-level insights about what actions bank clients can take with the sectoral policies and client dialogues of banks.

It begins by outlining the sphere of influence of a bank and reason to focus on policies and client dialogue, before showcasing how actions noted on mining, agriculture and forestry can inform both.

3.1 How a bank can navigate clients toward lower nature-related impact

Banks are a mirror of the real economy. Almost all types of enterprise and individual are in some way connected to the banking system. Therefore, how a bank interacts with and finances those in the real economy can influence the choices companies make. This means that the banking system must play a role if overarching global policy goals on nature such as the GBF are to be achieved. Where there is clear misalignment between company actions today and the ambitions of the GBF, there is a potential transition risk if companies are not supported to make changes in anticipation of the policy changes required by the GBF.

However, whilst a bank can actively support particular action by clients, their sphere of influence is constrained by the fact they are in this supporting role. Banks primarily influence their clients via the front office, i.e. relationship managers, who scope the need for financial services as well as offer counsel.

However, as well as the obligation to serve their customers banks have operational and fiduciary duties to shareholders, regulators and wider society, given their central importance to financial stability (the social license to operate). Managing the client relationship in the context of these competing obligations is a balancing act into which the transition to a nature positive future needs to be integrated. That balancing act will see the front office expected to (1) help the bank reduce risk exposure—to nature-related reputational, legal or transition risks—and (2) surface opportunities to promote and finance measures that reduce the impact of clients on nature. The actions that bank clients in the mining and agricultural sectors can take to reduce their impact on nature, as detailed in Section 3, broadly fall into these two buckets: (1) risk-reduction and (2) opportunity-oriented. This Section focuses upon those two buckets in two ways. First, how the client actions to reduce negative impact noted earlier can inform bank sectoral policies. And second, how client dialogues can evolve to include the client actions highlighted in Section 3.

The approach a bank can take to positively support, and influence clients will also vary depending on the size of the bank, the types of clients it has (e.g., SME versus large corporate) and the jurisdictions in which it operates. For example, a bank that operates in one domestic South American jurisdiction and finances predominantly SME businesses will have different opportunities to support clients than a globally systemically important bank with multinational corporate clients.

3.2 Evolving bank policies using commodity-based insights

Existing sectoral policies tend to focus on risk mitigation, meaning they take an approach of restriction or prohibiting finance to clients that engage in certain activities. This exclusion focus is increasingly complemented by a supportive approach typified by the promotion of practices that reduce pressure on nature, such as agroforestry.

There has also long been a focus in policies on tackling deforestation. Many commitments on tackling deforestation also tend towards being commodity specific, acknowledging the nuances in (a) reducing risk exposure to reputational, legal and transition risks and (b) supporting positive practices that are particular to that commodity.

The below table summarises the typical features of mining, agriculture and forestry and sustainability or environmental policies where agriculture, forestry and mining show up. It then notes where the actions bank clients can take detailed in Section 3 could inform the evolution of these policies.

Table 6: Typical features of mining, agricultural and forestry policies, and how previous sectoral and commodity insights can inform policy evolution^t

Category of policy / approach	Features	How insights from Section 3 can inform policy evolution
<p>Challenge/ Avoid^u</p> <p>Note there are often varying degrees to which policies that lead to exclusion (unless action is taken by the client) are applied, e.g., types of finance, client etc.</p>	<ul style="list-style-type: none"> ▪ Avoid sensitive areas, e.g., HCV forests, Ramsar wetlands, UNESCO World Heritage sites, IUCN Category I-IV areas, Peat lands, Alliance for Zero Extinction sites. ▪ Avoid specific economic categories at high risk, e.g., Activities in Embargoed Rural Properties ▪ Avoid specific production processes or techniques, e.g., those that have used fires for clearing land, or the use of certain agro-chemicals ▪ Avoid intentional introduction of alien species into natural landscapes or marine environments that have not been designated as farming areas ▪ Trade or capture of wildlife in contravention with international guidance ▪ Activities that do not adhere to certain principles, e.g., reduction of water consumption ▪ For certain commodities and jurisdictions, activities not certified by sector initiatives, e.g., RSPO, RTRS, Global Roundtable on Sustainable Beef ▪ Companies which do not have certain policies, e.g., water management plans, supplier policies, environmental management systems ▪ Conversion of peat into agricultural land, deforestation or NDPE for all activities or for certain commodities or activities ▪ Those not reporting according to good practice, e.g., GRI ▪ In line with obligations, restricting illegal activities, e.g., illegal deforestation, illegal trade in wildlife 	<ul style="list-style-type: none"> ▪ A commitment to utilize the mitigation hierarchy during strategy conversations with clients that operate in high biodiversity sensitive locations; so that, for example, avoidance is the top priority and that any actions the client has taken to offset any residual impact are being taken appropriately. ▪ For mining, an expectation that dust control measures are utilized in mining ▪ For mining, an expectation that invasive species management plans are in place, e.g., strict inspection and cleaning of imported equipment ▪ For mining, an expectation that pollution control measures are in place amongst mining clients for ecotoxicity risks, such as acid mine drainage ▪ For plantation forestry, an expectation that exotic tree species with high water demand are not planted in areas of very high water stress ▪ For forestry, an expectation that plant passports are used ▪ Using a risk-based approach for farmers involved in beef production in high deforestation risk countries. Determine if further data to verify plot-level sourcing information is required ▪ Consider a requirement for a time-based transition away from antibiotic use in livestock

^t This review of bank policies was not exhaustive.

^u Using the PRB [Nature Sector Screening and Action resource](#) categories of recommended bank actions, to pursue relative to a selection of key sectors (avoid/challenge, engage and seek out) .

Category of policy / approach	Features	How insights from Section 3 can inform policy evolution
Engage/Seek Out ^v	<ul style="list-style-type: none"> Promoting activities which reduce risk of harm, e.g., “Support the environmental regularization of rural properties”, and “Encourage the adoption of differentiated production models including crop-livestock-forest integration, agroforestry or agroforestry pasture systems” 	<ul style="list-style-type: none"> Support the integration of the mitigation hierarchy into project and strategy planning. For example, supporting a client to identify ways to avoid harm before supporting measures that reduce harm to nature. A time-bound commitment, either publicly or internally, to get certified under the appropriate certification schemes for agricultural commodities producer or minerals extractors (e.g., RSPO for palm oil and ASI for Aluminium). Commit to supporting measures to increase water recycling, such as closed loop water systems Support the development of Biodiversity Action plans beyond project finance by connecting clients with experts—the bank playing the role of suggester and referrer Scope opportunities to fund desalination or water recycling systems in mining areas with high water stress For forestry, integrate into the relationship a method for offering financial incentives for, e.g., contour planting in steep areas to reduce run-off from chemical inputs Offering incentives to ensure minimum road widths for infrastructure associated with forestry or mining expansion to reduce the risk of invasive species Seek opportunities to support manure and slurry management programmes, including by offering the client guidance on monetization pathways and price guarantees Supporting truck electrification technologies (companies or asset finance) with concessionary finance as electrification of haulage represents a key lever to reducing the pressure mining operations places on the climate

^v Using the PRB [Nature Sector Screening and Action resource](#) categories of recommended bank action, to pursue relative to a selection of key sectors (avoid/challenge, engage and seek out).

Category of policy / approach	Features	How insights from Section 3 can inform policy evolution
Transform ^w	<ul style="list-style-type: none"> ▪ Not yet prominent in policies 	<ul style="list-style-type: none"> ▪ Commitment to supporting the producer or extractor to participate in initiatives aimed at transforming value chains, e.g., any efforts on the part of the mining and metals industries to improve supply chain traceability or multi-stakeholder initiatives aimed at restoring a landscape (landscape finance) ▪ Facilitate dialogues between different forestry clients operating within the same jurisdiction, to promote and support shared invasive species monitoring programmes ▪ For agriculture, support non-technical assistance programmes—either via funding or referral to client—that leads to lower inputs and greater recycling of waste products, e.g., mulching oil palm waste for fertiliser ▪ Actively promote the development and distribution of crop varieties that increase yield as this decreases demand on land area

^w The transform category relates particularly to clients that would be regarded as leaders in their actions to avoid and reduce harm to nature. These are clients, therefore, who are looking at ways to transform their value chain via multi-stakeholder collaboration—across jurisdictions and sub-sectors—to ensure that the whole value chain begins shifting toward nature positive.

As the above table highlights, bank support can be:

- direct, such as actively supporting the implementation of solutions (infrastructure or otherwise) that reduces water withdrawals, pollution, or indirect pressure (e.g., road width); or
- indirect, through choosing to support clients promoting or developing higher yield crops or with haulage electrification enabling the bank to have a positive impact at the beginning of the value chain in agriculture and mining respectively.

Also, as highlighted by the 'Transform' category, a bank can look to promote transformation of extraction/production within a landscape by aiming to use its relationships with multiple stakeholders in that landscape to promote measures that reduce the pressure on nature and from which they all benefit, e.g., invasive species monitoring.

3.3 Informing client dialogue using commodity-based insights

Banks have traditionally had rigid nature-related policies to manage reputational and legal risk, which focus on excluding particular practices by clients. These are now tentatively being built upon and reframed as broader approaches to support clients with the transition to a sustainable economy.

As a result, engagement and escalation in response to non-compliance with a policy is only one feature of a wider dialogue with a client about their transition, and that dialogue is supportive rather than one that can prove challenging to navigate for the trusted relationship between bank and client. To frame this process of supporting clients, the recently published [PRB Guidance on Client Engagement](#) has five stages:

1. Scene setting and opening dialogue
2. Needs assessment and awareness raising
3. Defining a support plan for the client
4. Implementing the support plan by structuring and offering products and services
5. Monitoring

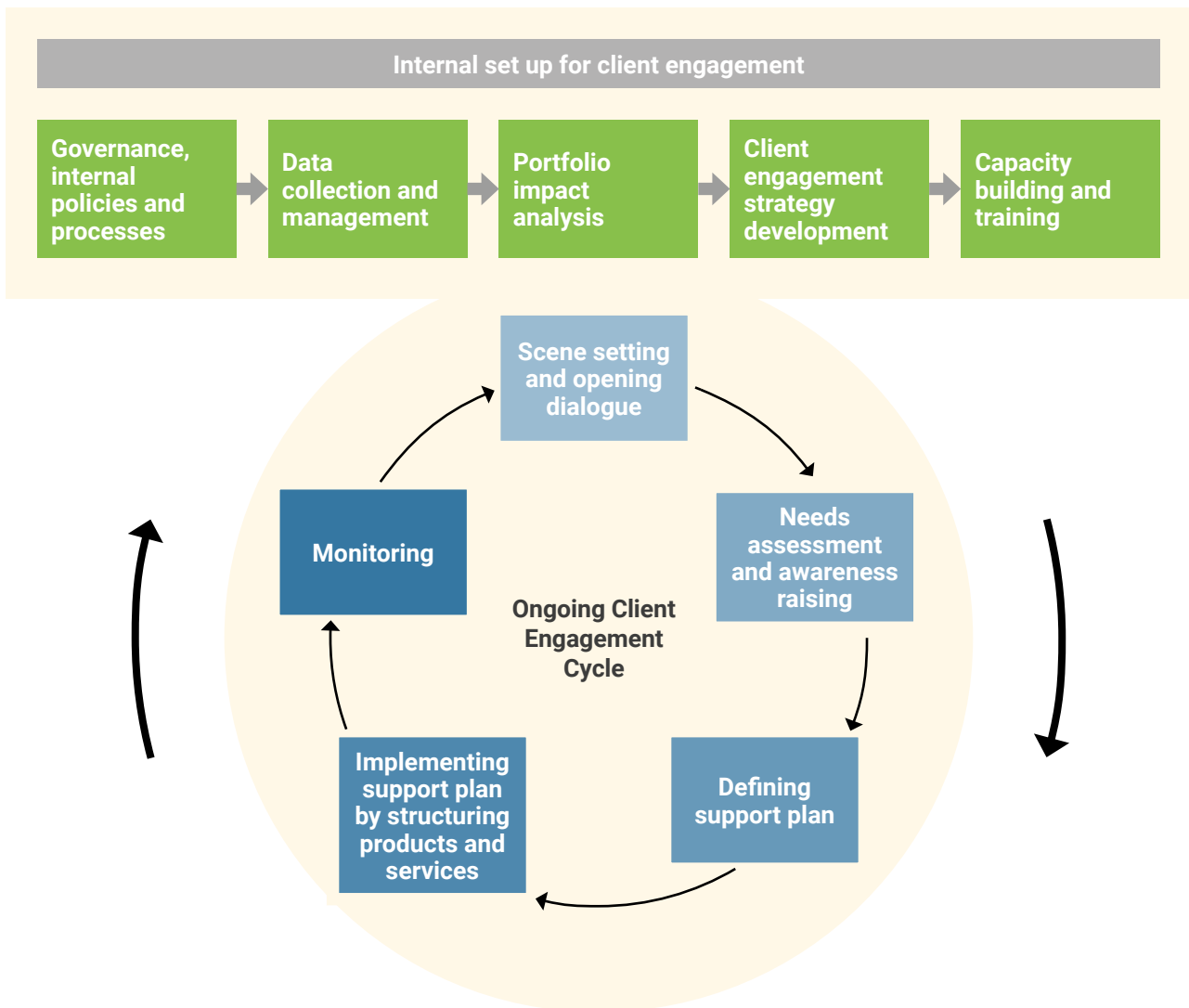


Figure 11: Five-step client engagement cycle against which the action-oriented questions in Table 6 have been tagged.

To complement this client engagement cycle, we have mapped sector and commodity-specific insights from Section 3 into types of dialogue the front office has with clients of the bank. To make this actionable, we present the insights in the form of questions. The types of dialogue we see with clients are as follows:

- **Site location-related:** What is the operational context in which the mine, farmer or forester operates (e.g., proximity to biodiversity sensitive sites)? What opportunities and challenges does the environment pose (e.g., mining in water scarce areas requires water recycling or installation of desalination plants)?
- **Site operations-related:** How is the site being operated? These are detailed conversations about how the sites of the business are currently run and are likely to be a part of very well-established relationships with clients. Cash flow management is an example where the front office has the opportunity to learn about the operations.

- **Investment-related:** What are the plans to expand or alter the interface with nature the client currently has? This could mean an expansion of operations or an investment in technologies.
- **Corporate strategy-related:** How is the overall business looking to evolve and mitigate risk, especially nature-related transition risks (e.g., regulation looking to tackle deforestation or reduce fertiliser use) and nature-related physical risk (e.g., related to drought and soil degradation).

Each question in the below Table 6 is categorised as (1) risk-reduction (in red) or (2) opportunity-oriented (in green), and additionally tagged with S='Scene setting'; N = 'Needs Assessment', DSP = 'Defining support plan'; ISP = 'Implementing Support Plan by structuring products and services', to indicate which part of the client engagement cycle the question relates to.

Table 6: Client dialogue questions by level and type of finance, dialogue category, focus of dialogue and stage of the client engagement cycle. (Questions in red relate to 'risk-reduction', and those in green to 'opportunity-oriented'.)

Level and type of finance (project/corporate-level)	Dialogue category	Focus of dialogue	Example questions, informed by Section 3	Client engagement cycle stage
Operational level Project finance and/or KPI-linked finance from aggregated results of actions	Site location-related	What is the environmental context in which the client operates sites	■ Do you operate in or adjacent to: key biodiversity areas, protected areas or world heritage sites?	S
			■ [Agriculture] Do you see a significant deforestation still occurring in the regions where you operate? What do you think is driving it?	S
			■ How do you see your operations depending on nature?	S
			■ Has the business been harmed over the past five years because you see the natural environment in which your business operates changing?	N
			■ Are you concerned about whether some of your operations are in locations where natural habitat was recently converted or deforestation occurred.	N
			■ [For large corporates] What tools do you use to understand how the operations of your business are connected to nature?	N
	Site operations-related	How does the company operate its sites now	■ Have you ever collaborated with governments, communities or fellow businesses to reduce the pressure on the environment in the areas you operate? For example, joint efforts to reduce water withdrawals or pollution within a catchment area?	S, N, DSP
			■ Do you have an invasive species or water management plan?	N
			■ Have you pursued any certifications for your commodities? What do you see as the benefits and drawbacks?	N
			■ What substances do you use during extraction or production of the commodity that could be considered harmful to the environment and how do you manage that?	S, N
			■ How have you reduced your water use per unit of output over the past five years?	S
			■ [Agriculture and forestry] What measure are you currently looking at to increase yields? Is it possible to claim that these are also having a positive impact on the environment?	DSP ,ISP
			■ [Mining only] Do you implement any dust control protocols?	DSP, ISP

Operational level cont... Project finance and/or KPI-linked finance from aggregated results of actions	Investment-related	How the business will be growing or evolving where it is located and/or how it operates	<ul style="list-style-type: none"> Do you see any need to invest in infrastructure that would supply you with water or reduce your water dependence? 	DSP, ISP
			<ul style="list-style-type: none"> What measures could enable you to re-use or recycle waste streams from your operations? 	DSP, ISP
			<ul style="list-style-type: none"> [Mining only] Have you considered investing in the electrification of the mining truck fleet and trolley system, or installing solar plants within the mining concession to supply renewable energy to the mine? 	DSP, ISP
			<ul style="list-style-type: none"> [If expanded operational footprint] Will you be expanding operations into an area that you would consider to have sensitive biodiversity? Have you looked into that yet? 	S, N
Corporate level Any type of corporate finance	Corporate strategy-related	How is the overall business looking to evolve and, in particular, mitigate transition risk	<ul style="list-style-type: none"> Are you seeing your buyers ask you more about what impacts your business has on the natural world, beyond climate change? What are the buyers asking and is that leading you to consider any major initiatives within the business? 	S,N
			<ul style="list-style-type: none"> Are you participating in, or considering participating in, an initiative involving peers, governments and communities that would mean you evolving your understanding of an issue related to nature (e.g., deforestation) and how you could best tackle that individually or with others? 	S
			<ul style="list-style-type: none"> How fundamental do you see reducing your impacts on the natural world being to the direction your business goes in, and why? 	S

These example questions will enable the front office to better understand the business and operational context of clients. This is key for increasing familiarity with the future nature-related risks the client may face, both if ecosystem services become unavailable (physical risk) or as policies are implemented to protect and restore nature (transition risk). That improved understanding can position the bank ahead of peers and generate deeper relations and new business opportunities. Integrating such questions into existing dialogue will also provide the colour needed for reporting nature-related exposures under ESRS, TNFD, and other regulatory and reporting frameworks.

4. Call for action

PRB members have the opportunity to be at the forefront of preventing nature loss and incentivising nature gain, and in doing so reduce nature-related risk exposure and position themselves to generate deeper relationships and financing opportunities.

Whilst banks perform exposure assessment exercises, such as TNFD LEAP,^x they can still begin engaging their clients in the highest impact sectors on what priority actions they can take on nature.

Such priority actions are the most actionable when a specific context is considered, which can be the commodity being produced or the location or type of operation performed. For this reason, a deep dive on commodities—in this case of this guidance bauxite, copper, cattle, wood and soy/palm—can prove instructive; highlighting the importance of the mitigation hierarchy as an organising concept at the production and extraction phase to avoid and reduce the impacts on nature.

Such deep dives are highly instructive for any client engagement process. Be that in setting the scene with the client about what nature-related policies are emerging and what priority actions can be taken now, or in stimulating conversation about what specific actions the bank could procure financial support to incentivise. Furthermore, the deep dives offer concrete examples of granular ways bank clients can contribute to a nature positive future. They thereby showcase not only how bank policies that seek to avoid and challenge clients can evolve, but how those policies can become approaches aimed at supporting client transition.

Taken as a whole, the priority actions detailed in this guidance showcase but a small sample of the knowledge already available to improve our relationship with nature, and therefore also showcase the specific ways in which banks can work toward supporting client action on nature.

x The TNFD LEAP approach has four phases of 'Locate' the interface with nature; 'Evaluate' the business's dependencies and impact on nature; 'Assess' requires the evaluation of the risks and opportunities related to nature; and 'Prepare' requires the business to respond to and report on the business's nature-related risks and opportunities.

Appendix

Table 7: The other six high-impact commodities suggested to PRB members for selection. Their industry/value chain links, highest IPBES impacts of nature loss, geography of extraction/production and some additional considerations were provided. Note that palm oil and soy was not initially suggested but voted for by PRB members.

Commodities	Industry/ value chain link	Highest nature impact drivers (e.g., main IPBES drivers of biodiversity loss)				Geography	Additional considerations
Forestry and Agriculture							
		Land-use	Climate	Pollution	Resource use		
Cocoa	Food (dominated by 6 major companies/ traders; complicated supply chain)	High deforestation; also in protected areas (e.g., Cote d'Ivoire)		Water and soil contamination from high herbicide and pesticide use		West Africa (70% of supply), Latin America	Illegal deforestation (e.g., in Cote d'Ivoire); livelihood importance for small scale farmers (e.g., 60% of Ghana's work force in cocoa growing)

Rice	Food	Land-use requirement; conversion of wetlands;	Largest climate impact per unit of calorie; especially methane from paddy	Over-fertilisation is a major issue particularly in China; and extensive use of pesticides;	Water use is very high as predominantly paddy rice	90% concentrated in Asia.	Staple for half of global population; much potential for improvement in yield through hybrid rice = less need for land; also resource sharing for small holders for mechanisation;
Maize (Corn)	Food, Livestock Feed industry, Biofuel	Area under production doubled between 1961–2000; recent expansion driven by demand for livestock feed (60% of consumption) and biofuel policies		Pesticide and fertiliser run-off	Water use and soil degradation	Latin America, sub-saharan Africa, US	
Cotton	Farming; Textile (60% of production)	Long-established agricultural areas, but reported expansion e.g., in Brazil; projected rise in demand (6% in 2024/2025)		Herbicide and pesticide use extremely high	Water consumption for irrigation often in water stressed areas; soil degradation	60% of global production in India, China, US; etc.	Major livelihood provider—1 billion people; 100 million farmers;

Mining and metal							
		Land-use	Climate	Pollution	Resource use		
Cobalt	Automotive (EV); battery storage; medical; jet engines and spacecraft component;	Habitat destruction and deforestation; new cobalt reserves overlapping with protected areas (e.g., in Northern Zambia)		Toxic water pollution from industrial cobalt mining affecting people and wildlife in DRC			Key mineral for the energy transition (battery storage—though technological development may soon reduce need for cobalt)—investment opportunity in alternative battery technology; linked to major human rights and conflict issues
Silica	Glass manufacture; construction; semi-conductor industry (high purity)	Erosion and habitat destruction, particularly sand mining from rivers and deltas causing major impacts (e.g., sinking Asia river deltas)	High energy cost of production of glass and concrete		Semi-conductor production is highly water intensive	Global, well documented impacts in Asian rivers and deltas	Opportunities to use recycled concrete in construction; reinvigorate deposit schemes for glass bottle use; etc.

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