Draft sector guidance

Construction materials

tnfd.global

June 2024
Open for consultation and feedback

SICS® industry:
Construction materials (E&MP - CM)

Taskforce on Nature-related Financial Disclosures

Contents

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Draft for consultation

This sector guidance is a draft for consultation with market participants and other interested stakeholders. The Taskforce welcomes feedback provided via the TNFD website by 27 September 2024.

Feedback will be reviewed by the Taskforce and final sector guidance issued by the TNFD by 30 December 2024.

1. Introduction

1.1. The purpose of this guidance

In September 2023, the TNFD published its recommendations for disclosure of nature-related issues and supporting implementation guidance. This document provides sector-specific additional guidance for the construction materials sector, covering:

- The assessment of nature-related issues using the TNFD's LEAP approach (Section 2); and
- The disclosure of sector-specific metrics in line with the TNFD's recommended approach to metrics (Section 3).

The TNFD's Guidance on the identification and assessment of nature-related issues: The LEAP approach is designed as an iterative process – across business locations and business lines – in line with established risk management processes and corporate reporting cycles. Organisations may choose to start with a narrow scope for a LEAP assessment, and gradually expand the scope of the assessment as they gain experience and insight.

The TNFD recognises that there can be significant differences across sectors for corporates applying the LEAP approach. It has published this additional guidance with significant input from a range of knowledge partners and market participants, to help construction materials sector participants apply the LEAP approach to their context. The overall structure of the LEAP approach is set out in Figure 1. This guidance follows that structure and Table 1 sets out the elements of LEAP for which this document provides additional guidance.

The Taskforce also recognises that investors and other stakeholders require quantitative information to compare performance and nature-related issues within sectors. To facilitate that sector-level analysis, this guidance also includes:

- Guidance on the application of the core global disclosure indicators and metrics to the construction materials sector (Section 3.1); and
- Core and additional sector disclosure indicators and metrics (Sections 3.2 and 3.3).

Figure 2 provides an overview of the TNFD disclosure measurement architecture and where indicators and metrics are listed in the TNFD recommendations and relevant sector guidance.

Figure 1: The TNFD approach for identification and assessment of nature-related issues – LEAP

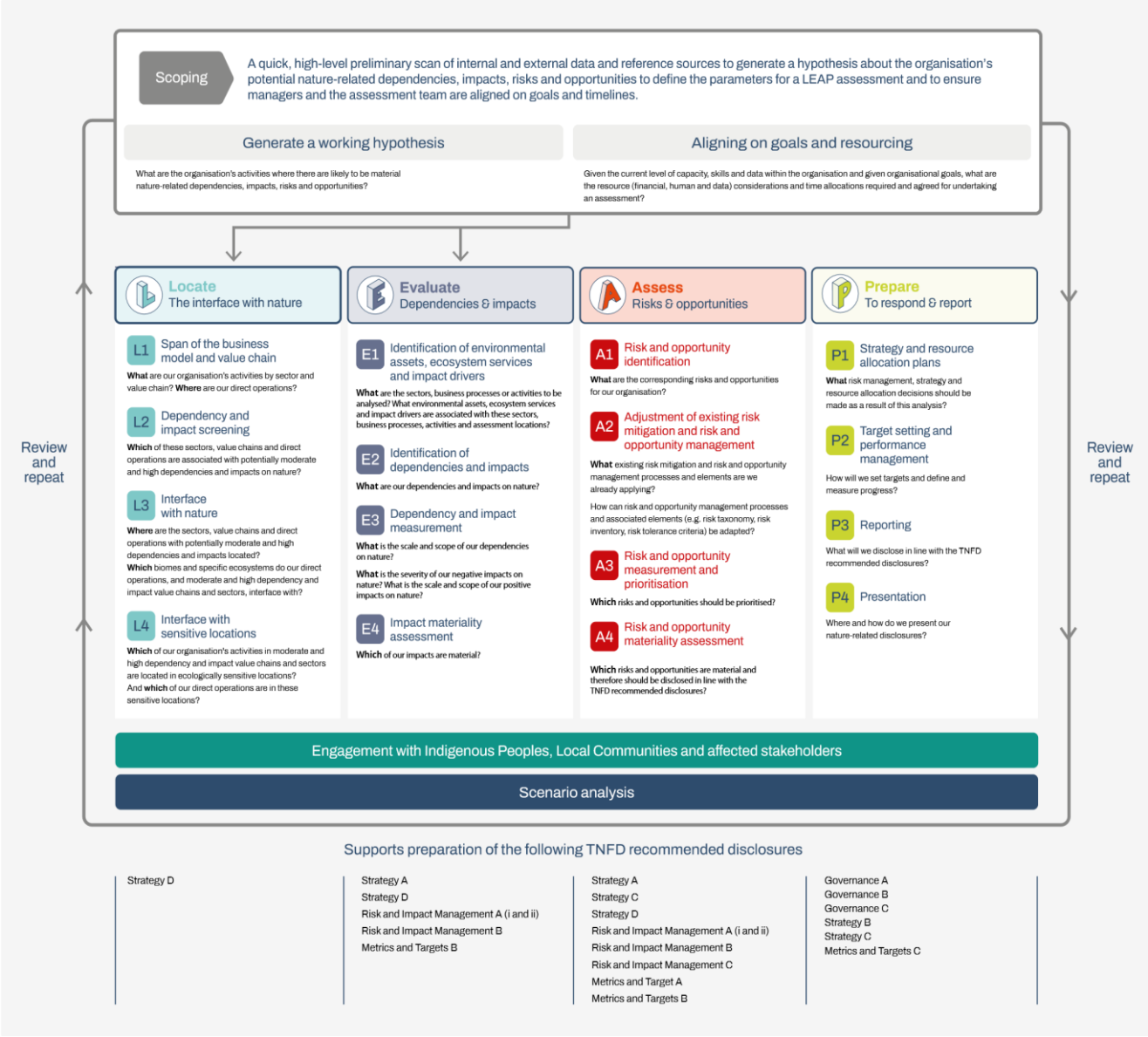
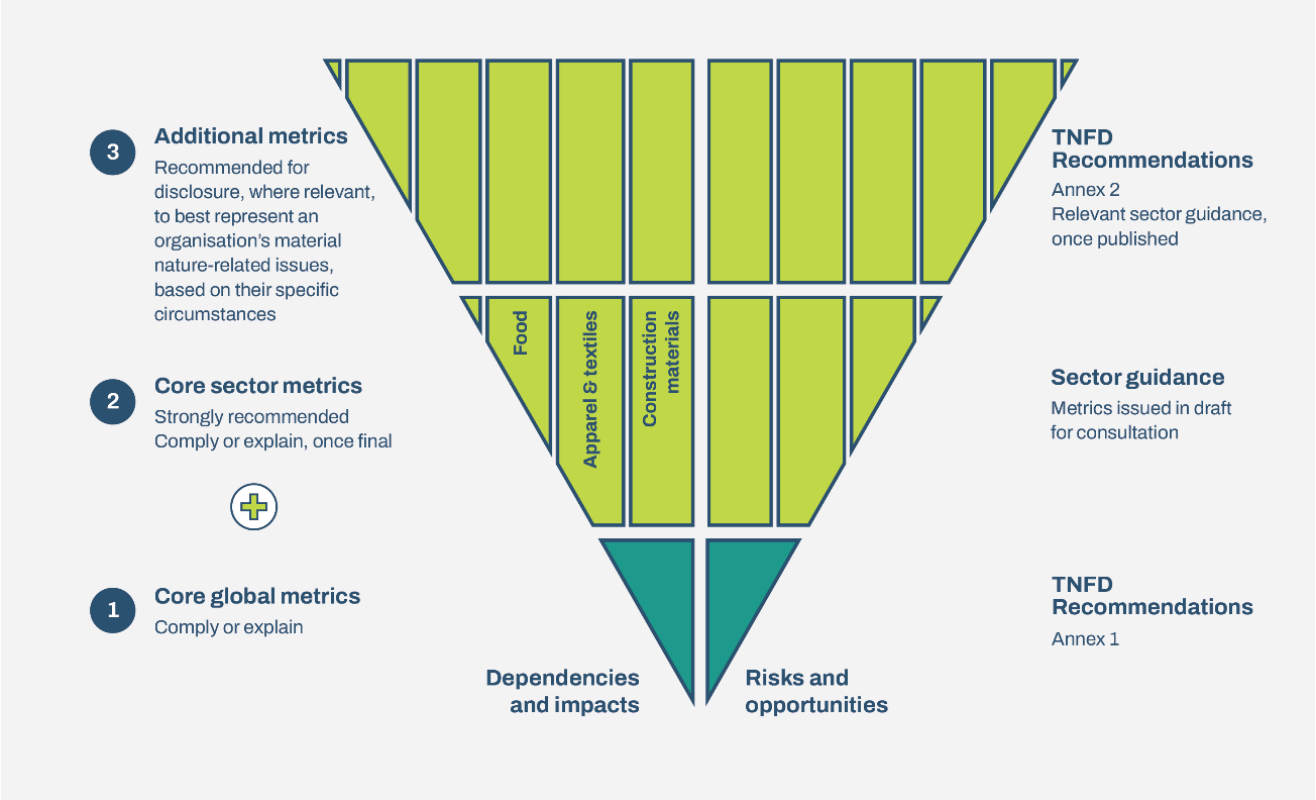


Figure 2: TNFD disclosure metrics architecture signposted to metrics lists



The guidance in Section 3 on the application of the TNFD core global metrics for this sector, as well as the core and additional sector metrics outlined, expand on the disclosure indicators and metrics outlined in Annexes 1 and 2 of the TNFD recommendations. As outlined in the TNFD recommendations, the TNFD has incorporated and sought to build on existing industry standards and disclosure metrics wherever possible to build on current data collection and reporting practices and minimise additional assessment and reporting costs.

1.2. Audience for this guidance

This guidance covers those organisations with business models or value chains in the Sustainable Industry Classification System (SICS) Construction Materials industry (Box 1).[1] These are referred to as 'construction materials organisations' in this guidance.

Box 1 : SICS® industries in the scope of this guidance document

Construction Materials (E&MP - CM)

Under the Sustainable Industry Classification System (SICS®) developed by the Sustainability Accounting Standards Board (SASB), Construction Materials fall under the Extractives and Mineral Processing thematic sector. In this classification:

- Construction materials organisations have global operations and produce construction materials for sale to construction entities or wholesale distributors. These primarily include cement and aggregates, but also glass, plastic materials, insulation, bricks and roofing material. Materials producers operate their own quarries, mining crushed stone or sand and gravel. They may also purchase raw materials from the mining and petroleum industries.[2]

This guidance focuses on cement and aggregates.

The guidance is a supplement to the TNFD's Guidance on the identification and assessment of nature-related issues: The LEAP approach and should be read in conjunction with that guidance. Organisations in the construction materials sectors should also refer to the TNFD biome guidance.

The examples provided in this guidance for the construction materials sector are intended to be illustrative. They are not exhaustive, universally applicable or recommended by the TNFD as examples of measures for all entities within the industry. Each company's context, location and nature-related interactions are unique. The TNFD encourages all companies to consult additional relevant sources, including scientific references and relevant industry standards or best practice guides, and conduct thorough assessments to identify and assess nature-related dependencies, impacts, risks and opportunities specific to their operations and value chains. This guidance aims to support, not replace, a tailored assessment, which will be necessary for each entity.

Table 1: Areas of LEAP with additional guidance for the construction materials sector in this guidance document

Scoping	**Y**						
L1	**Y**	**E1**	**Y**	**A1**	**Y**	**P1**	**Y**
L2	**Y**	**E2**	**Y**	**A2**		**P2**	
L3	**Y**	**E3**		**A3**		**P3**	
L4	**Y**	**E4**		**A4**		**P4**	

[1] SASB (2018) SASB's Sustainable Industry Classification System (SICS).

[2] SASB Standards (2023) Construction Materials.

Note: Companies producing wood-building products are included the building products and furnishings (CG-BF) industry, forestry management industry (RR-FM), and pulp and paper products industry (RR-PP) under the Sustainable Industry Classification System (SICS) and are not included in the SASB Construction Materials standard. Organisations in these industries should refer to the TNFD sector guidance for forestry and paper.

2. Sector-specific LEAP assessment guidance

2.1. Scoping a LEAP assessment

Working hypothesis generation

What are the organisation's activities where there are likely material nature-related dependencies, impacts, risks and opportunities?

In creating initial hypotheses, organisations should bear in mind that nature-related dependencies, impacts, risks and opportunities will vary across the quarry lifecycle and the lifecycle of the products extracted and produced. The scope of analysis for quarries should include the quarry itself but also:

- Other land owned or leased by the organisation on the site, including the non-quarried area;
- Buffer zones;
- Areas of rehabilitation and reserved areas;
- Access roads, conveyor belts and transport routes that may contribute to habitat fragmentation or disrupt animal movement or migration, or disturb ecologically sensitive areas;
- Wider areas linked to the site by ecological processes and environmental features such as rivers and streams.[3]

Scoping should not be limited to extraction from quarries, but also the extraction of other materials – such as sand mining and dredging – manufacturing, and downstream activities such as construction.

Organisations may want to consult existing quarry environmental impact assessments and rehabilitation plans, and product lifecycle analyses to support development of hypotheses for nature-related dependencies, impacts, risks and opportunities.[4]

Value chain considerations when scoping

Construction materials organisations may operate across many different sites and have many different suppliers and consumers across their value chains with significant potential nature-related dependencies and impacts. Construction materials organisations may therefore choose to start with a narrow scope to allow for a manageable starting point, such as a small number of high priority sites and areas of the value chain where material nature-related dependencies, impacts, risks and opportunities are most likely to arise. The LEAP approach is designed as an iterative process in line with established risk management processes and corporate reporting cycles, and organisations should look to expand the breadth and depth of the assessment over time as they gain experience and maturity in applying the process. Further guidance is available in the TNFD guidance on value chains.

Construction materials organisations may find it useful to consider:

- New and any existing effective ways of interacting with upstream and downstream partners along the value chain in order to obtain the required nature-related information; and

[3] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

[4] GCCA (2023) A commitment to biodiversity by the cement and concrete industry.

- Partnering with other construction materials organisations to understand nature-related dependencies, impacts, risks and opportunities within the value chain.

Organisations should also refer to the TNFD sector guidance for the forestry and paper, engineering and construction, and real estate sectors, as well as any other relevant sectors in the value chain.

Goals and resource alignment

Given the current level of capacity, skills and data within the organisation and given the organisational goals, what are the resource (financial, human and data) considerations and time allocations required and agreed for undertaking an assessment?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

2.2. Locate the organisation's interface with nature

This section provides additional considerations to help construction materials sector organisations with the Locate phase of the LEAP approach.

L1: Span of the business model and value chain

Guiding questions

What are our organisation's activities by sector, value chain and geography?

Where are our direct operations?

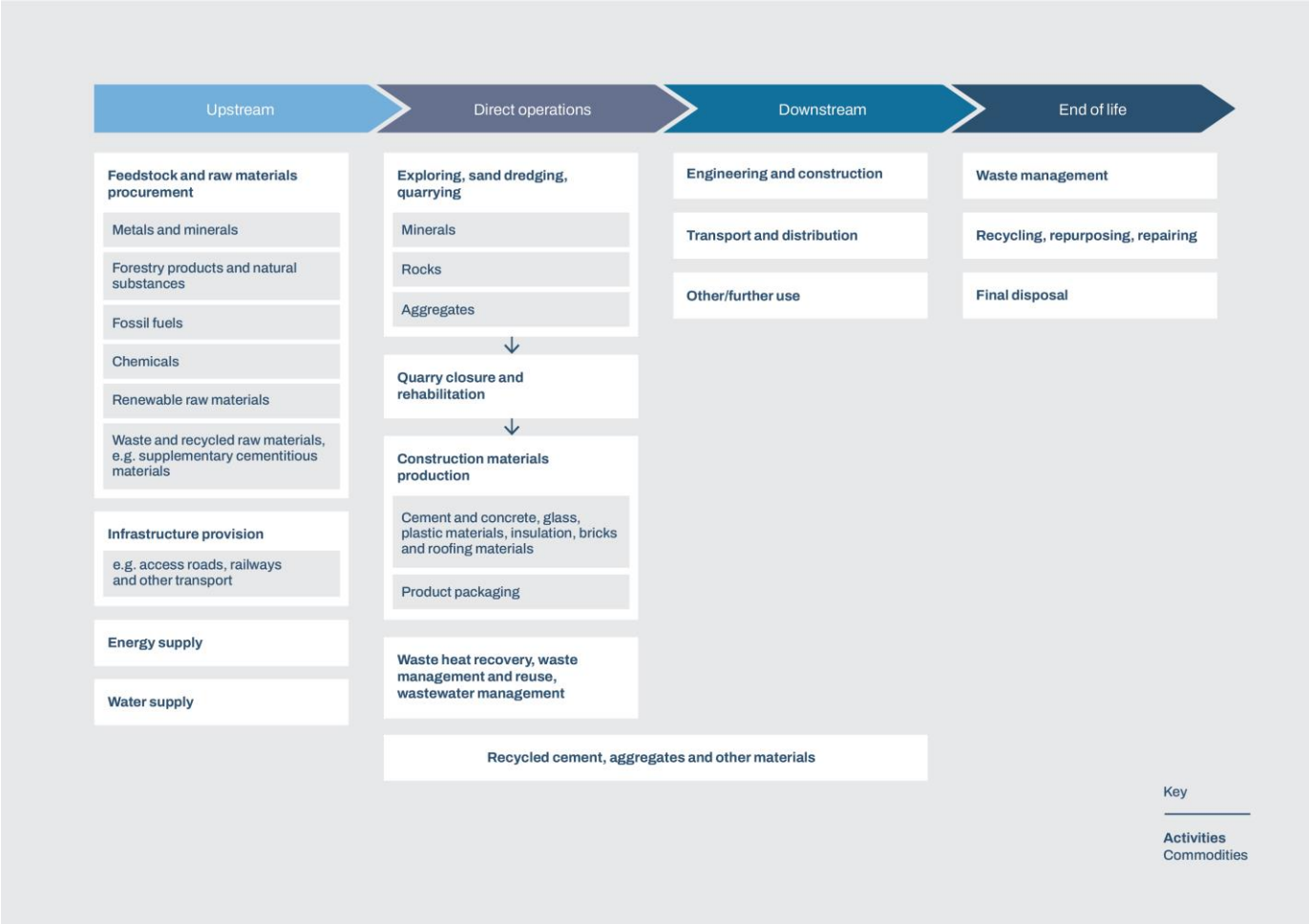
The construction materials value chain

Figure 3 illustrates the typical activities and commodities across the value chain that construction materials organisations should consider as part of their value chain mapping. The TNFD recognises that the activities that are part of direct operations, upstream or downstream for an individual company will vary depending on their specific business.

When mapping out the value chain, organisations should include the full lifecycle of its quarries – including closed and/or exhausted quarries, sites reserved for future use and temporarily dormant quarries[5] – as well as any processing and manufacturing activities in direct operations, and the full lifecycle of the materials produced downstream.

[5] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

Figure 3: Typical business activities in the value chain of the construction materials sector



Locating direct operations

When identifying the location of direct operations, organisations should strive to move beyond point coordinates to polygons of quarries, other material extraction sites and manufacturing plants. Where possible, organisations should also include:

- Notional and ecologically determined buffer zones of at least 500m from the site boundary;[6]
- Areas of rehabilitation and reserved areas;
- Access roads, conveyor belts and transport routes that may contribute to habitat fragmentation or disrupt animal movement or migration, or disturb ecologically sensitive areas;
- Wider areas ecologically connected to the site, for example, through environmental features such as rivers and streams, wider river basins or forest ecosystems as appropriate; and
- The wider landscape, to allow evaluation and assessment of nature-related dependencies, impacts, risks and opportunities within that landscape and comprehensive stakeholder engagement.[7]

[6] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

IBAT and the Species Threat Abatement and Restoration (STAR) metric recommend a 50km buffer area. IBAT (2021) Species Threat Abatement and Restoration (STAR) data layer: Business User Guidance.

Organisations should iterate this work with the Evaluate phase to understand how nature-related dependencies and impacts can arise beyond the site boundary. Box 2 provides further guidance on identifying the area of influence of a site for the purposes of a LEAP assessment.

Box 2: Area of influences

Nature-related dependencies and impacts can arise beyond the boundary of an organisation's site as a result of ecological processes and flows that link the site with the wider landscape and beyond. These linkages result in an 'area of influence' (see Figure 4).

The size of the area will vary depending on the organisation's activities and/or assets, and the biome where it is operating, but will usually be much larger than the site itself. The area will include:

- Locations where the organisation has a direct or indirect positive or negative impact, for example, where the movement of aggregates from the quarry to another location inadvertently introduces invasive species to another ecosystem; and
- Environmental assets on which the organisation directly or indirectly depends, such as the supply of clean water from a river that originates in a lake that is being polluted by the activities of other actors upstream.

Construction materials organisations should pay particular attention to karst formations, where ecological and hydrological connections may be particularly complex,[8] and to sand extraction from rivers, which can alter freshwater and sediment discharge downstream, and affect delta formation.[9]

External factors and cumulative effects should also be considered, for example resulting from the activities of other organisations with overlapping areas of influence, policies and economic conditions generated outside the landscape, land use in neighbouring landscapes and remote physical features (e.g. dams).

Engagement with Indigenous Peoples, Local Communities and affected stakeholders can provide further insights, and organisations may find it useful to refer to the TNFD's Guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders.

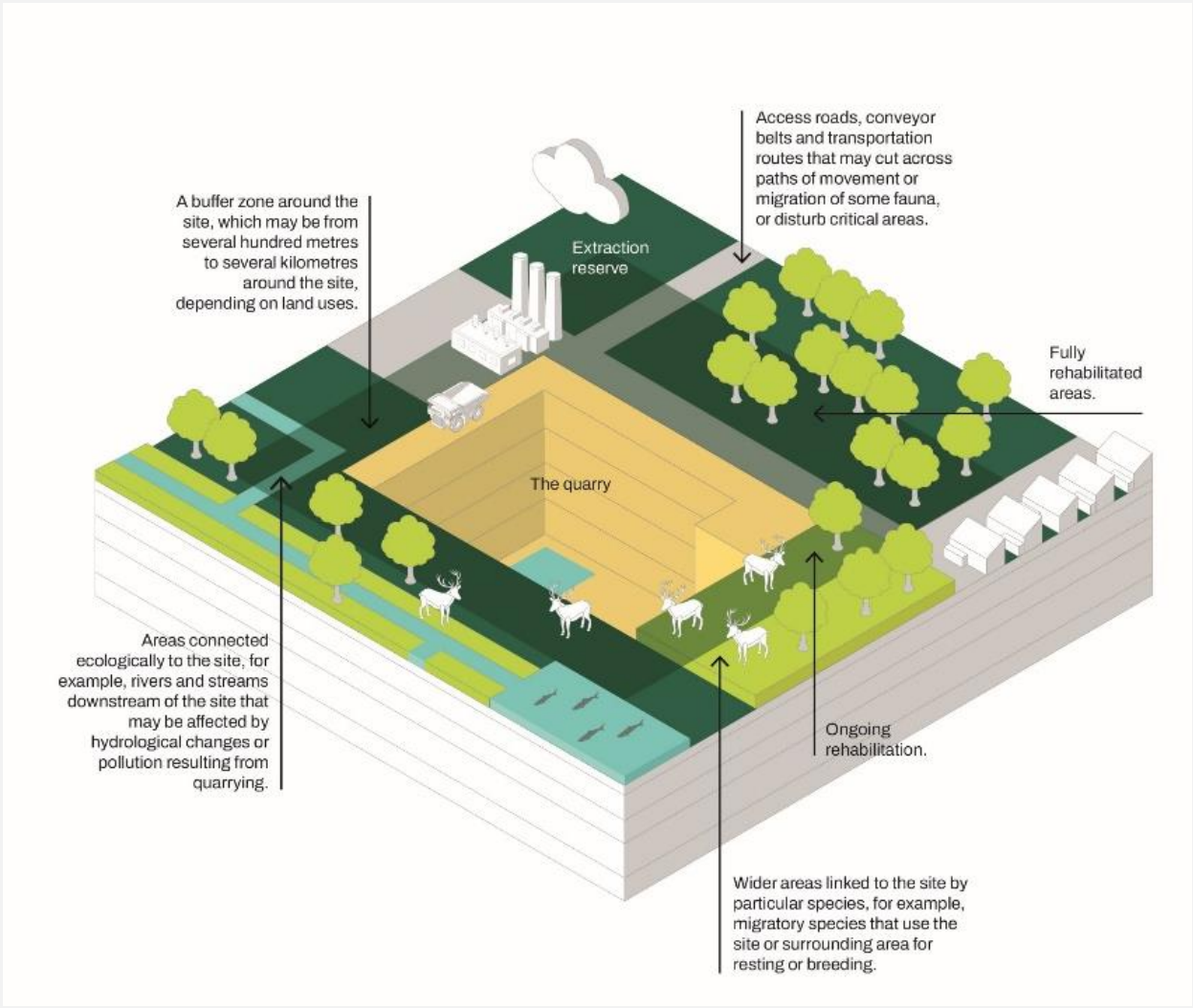
A comprehensive approach to outlining a project's area of influence is included in good practice guidelines such as IFC Performance Standard 6.

[7] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

[8] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

[9] Jordan, C. et al. (2019) Sand mining in the Mekong Delta revisited - current scales of local sediment deficits.

Figure 4: Ecological connections between a quarry site and the wider landscape



Source: IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

L2: Dependency and impact screening

Guiding question

Which of the sectors, value chains and direct operations are associated with potentially moderate and high dependencies and impacts on nature?

In L2, organisations should filter the list of upstream and downstream activities and commodities identified in L1 to prioritise which should be considered for further analysis.

Table 2a, 2b and Table 4a, 4b provide the ENCORE materiality ratings for impact drivers and ecosystem services associated with construction materials activities. Table 3 provides the typical impact drivers associated with construction material commodities identified by SBTN as associated with high impacts on nature. Construction materials organisations should refer to the associated TNFD sector guidance for screening activities in other value chain sectors where available.

Given the low degree of granularity for these screening tools, construction materials organisations may choose other prioritisation criteria linked to likely materiality.

Table 2a: Materiality ratings of ecosystem services the construction materials sector typically depends on (based on ENCORE 2018-2023 data)

Ecosystem service	Materiality rating
Ground water	Very high
Surface water	Very high
Dilution by atmosphere and ecosystems	Low
Mediation of sensory impacts	Low
Water quality	Low

Source: 2018-2023 version of ENCORE.

Note: The ecosystem service classification used by this version of ENCORE, the source of this table, differs from the classification used by TNFD guidance, based on the UN SEEA. A crosswalk is available from UN SEEA.

Table 2b: Materiality ratings of ecosystem services the construction materials sector typically depends on (based on ENCORE 2024 data)

	ISIC group/class	Quarrying of stone, sand and clay	Support activities for other mining and quarrying	Installation of industrial machinery and equipment	Manufacture of non-metallic mineral products n.e.c.	Manufacture of other chemical products
Provisioning services	**Water supply**	High	Medium	Medium	Medium	Medium
	Genetic material	N/A	N/A	N/A	N/A	N/A
	Other provisioning services - Animal-based energy	Low	N/A	N/A	N/A	N/A
	Biomass provisioning	Low	N/A	N/A	N/A	N/A
Regulating & maintenance services	**Solid waste remediation**	ND	ND	ND	Medium	Medium
	Soil and sediment retention	High	Medium	Medium	Low	Medium
	Water purification	Very high	Medium	N/A	Medium	Medium
	Soil quality regulation	N/A	N/A	N/A	N/A	N/A
	Other regulating and maintenance service - Dilution by atmosphere and ecosystems	Medium	Very low	ND	Low	Low
	Biological control	N/A	N/A	N/A	N/A	N/A
	Air Filtration	Very low	Very low	Very low	Very low	Very low
	Flood control	High	Low	Medium	Medium	Medium
	Global climate regulation	High	Low	Very low	Very low	Very low
	Nursery population and habitat maintenance	N/A	N/A	N/A	N/A	N/A
	Noise attenuation	Very low	Very low	Very low	Very low	Very low
	Other regulating and maintenance service - Mediation of sensory impacts (other than noise)	Low	Low	Very low	Very low	Very low
	Local (micro and meso) climate regulation	Low	Very low	Low	Low	Low
	Pollination	N/A	N/A	N/A	N/A	N/A
	Storm mitigation	Medium	Medium	Medium	Medium	Medium
	Water flow regulation	High	Medium	Medium	Medium	Medium
	Rainfall pattern regulation	Very high	High	Very low	Low	N/A
Cultural services	**Recreation related services**	N/A	N/A	N/A	N/A	N/A
	Visual amenity services	N/A	N/A	N/A	N/A	N/A
	Education, scientific and research services	N/A	N/A	N/A	N/A	N/A
	Spiritual, artistic and symbolic services	N/A	N/A	N/A	Very high	N/A

N/A = Non-applicable

ND = No data

Source: ENCORE Partners (Global Canopy, UNEP FI, and UNEP-WCMC) (Unpublished, Expected 2024). ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure. Cambridge, UK: the ENCORE Partners. Available at: https://encorenature.org. DOI: https://doi.org/10.34892/dz3x-y059.

Table 3: Impact drivers associated with construction material commodities

Commodity	Impact drivers
Cement	Land ecosystem use
	GHG emissions
	Water pollutants
	Soil pollutants
	Water use
	Other resource use
Sand (construction grade)	Freshwater ecosystem use
	Ocean ecosystem use
	Water pollutants
	Soil pollutants
Source: SBTN (2023) High Impact Commodity List v1.	

Table 4a: Materiality ratings for impact drivers typically relevant for the construction materials sector (based on 2018-2023 version of ENCORE)

	ISIC group/class	Quarrying of stone, sand and clay	Support activities for other mining and quarrying	Manufacture of other chemical products	Manufacture of non-metallic mineral products n.e.c.	Installation of industrial machinery and equipment
Land/fresh-water/ ocean-use change	**Area of land use**	Medium	Medium	Low	Low	Low
	Area of freshwater use	High	Medium	N/A	Medium	N/A
	Area of seabed use	High	ND	N/A	N/A	Medium
Climate change	**Emissions of GHG**	High	High	Medium	High	Medium
Resource exploitation	**Volume of water use**	Medium	Medium	Medium	Medium	Medium
	Other biotic resource extraction (e.g. fish, timber)	ND	N/A	N/A	N/A	N/A
	Other abiotic resource extraction	Very high	Medium	N/A	N/A	N/A
Pollution/pollution removal	**Disturbances (e.g noise, light)**	High	Very high	Very high	Medium	Very high
	Emissions of non-GHG air pollutants	High	High	Medium	High	Medium
	Emissions of toxic soil and water pollutants	High	Very high	Very high	Very high	Low
	Emissions of nutrient soil and water pollutants	ND	ND	N/A	Medium	N/A
	Generation and release of solid waste	Low	Medium	Medium	Medium	Low
Introduction of invasive alien species		Very low	Low	N/A	N/A	Low

N/A = Non-applicable

ND = No data

Source: ENCORE Partners (Global Canopy, UNEP FI, and UNEP-WCMC) (Unpublished, Expected 2024). ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure. Cambridge, UK: the ENCORE Partners. Available at: https://encorenature.org. DOI: https://doi.org/10.34892/dz3x-y059.

Table 4b: Materiality ratings for impact drivers typically relevant for the construction materials sector (based on 2024 version of ENCORE)

Impact driver	Materiality rating
Land ecosystem use	Very high
Freshwater ecosystem use	High
Ocean ecosystem use	High
GHG emissions	High
Non-GHG air pollutants	Medium
Water pollutants	Medium
Soil pollutants	n/a
Solid waste	High
Disturbances	High
Water use	High
Source: 2018-2023 version of ENCORE.	

N/A = Non-applicable

ND = No data

Source: ENCORE Partners (Global Canopy, UNEP FI, and UNEP-WCMC) (Unpublished, Expected 2024). ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure. Cambridge, UK: the ENCORE Partners. Available at: https://encorenature.org. DOI: https://doi.org/10.34892/dz3x-y059.

L3: Interface with nature

Guiding questions

Where are the sectors, value chains and direct operations with potentially moderate and high dependencies and impacts located?

Which biomes and specific ecosystems do our direct operations, and moderate and high dependency and impact value chain and sectors, interface with?

In this phase, an organisation identifies the locations of activities and commodities in its direct operations and those in the value chain prioritised in L2. It then associates these and the locations of direct operations with biomes and ecosystems.

When identifying locations, organisations should iterate with the Evaluate phase to understand how dependencies and impacts on nature can arise beyond the site boundary, interfacing with other biomes and ecosystems. Organisations should also consider the guidance on locating activities provided under L1 and areas of influence in Box 2, where relevant.

Where individual downstream users cannot be identified, organisations may want to consider analysing the distribution of construction materials across sectors for each market where they operate. This will allow initial identification of potentially high dependency or impact downstream activities for further analysis.

Identification of biomes and ecosystems

Organisations may also refer to the TNFD biome guidance for further guidance when analysing their interfaces with these biomes, particularly the guidance on rivers and streams for organisations with sand dredging in their value chains. Organisations should consider the possibility of interfacing with subterranean ecosystems such as underground rivers and springs.[10]

L4: Interface with sensitive locations

Guiding questions

For our organisation's activities in moderate and high dependency and impact value chains and sectors, which of these are in ecologically sensitive locations?

And which of our direct operations are in sensitive locations?

Table 5 sets out how some of the biomes and ecosystems that construction materials organisations typically interact with may meet the criteria for sensitive locations. Construction materials organisations should consider the wider context around the site when assessing sensitivity. An isolated, small forest on limestone surrounded by farmland may be more important for species than a quarry site in a small part of a larger forest of similar type.[11] Organisations should iterate between the Locate and Evaluate phases to understand the environmental assets beyond the site boundary that the organisation has dependencies and impacts on and may be in sensitive locations.

[10] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

[11] IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS).

Table 5: Considerations for the construction materials industry in identifying sensitive locations

Natural features	Considerations for identifying sensitive locations
Karst ecosystems	Karst ecosystems are characterised by systems of underground streams and caves, enclosed depressions, dry valleys, gorges, prominent rock outcrops and large springs. Biodiversity importance: Karst ecosystems often harbour unique (often endemic) cave fauna and flora12 and so are likely to be classified as of biodiversity importance. The importance for species can be exacerbated by restrictions to those species' ranges as a result of agricultural expansion and intensification. Ecosystem integrity: Agricultural expansion and intensification around karst landscapes can contribute to a decline in ecological integrity in the karst landscape itself.
Rivers and streams	Ecosystem integrity: Sand dredging can contribute to a decline in ecosystem integrity in rivers all the way down to the river delta or estuary as a result of unsustainable sediment extraction. Organisations should consider whether rivers in their value chain are experiencing a rapid decline in integrity and are therefore classed as sensitive.

List of datasets and tools

- Global Lakes and Wetlands database
- IBAT
- UN Biodiversity Lab
- WRI Aqueduct
- WWF Biodiversity Risk Filter
- WWF Water Risk Filter

Further tools are provided in the TNFD guidance on the LEAP approach and the TNFD Tools Catalogue.

[12] IUCN (2014) Biodiversity management in the cement and aggregates sector: Biodiversity Indicator and Reporting System (BIRS).

2.3. Evaluate dependencies and impacts on nature

This section provides additional guidance to help construction materials industry organisations with the Evaluate phase of the LEAP approach.

E1: Identification of environmental assets, ecosystem services and impact drivers

Guiding questions

What are the business processes and activities to be analysed?

What environmental assets, ecosystem services and impact drivers are associated with these business processes, activities and assessment locations?

Guidance for components E1 and E2 is provided together under E2.

E2: Identification of dependencies and impacts

Guiding question

What are our dependencies and impacts on nature?

This section focuses primarily on dependencies and impacts in construction materials organisations' direct operations. Organisations should refer to the relevant TNFD sector guidance for forestry and paper, metals and mining, and construction, engineering and real estate for dependencies and impacts upstream and downstream.

Impacts

Table 6, Table 7 and Table 8 provide examples of negative impact pathways for quarrying, sand extraction and cement manufacturing. These tables describe impacts on different environmental assets, but the organisation will need to consider how these apply to their specific locations and their areas of influence.

Table 6: Examples of negative impact pathways for quarrying

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Land/freshwater/ocean-use change Land ecosystem use: Quarrying requires land clearance and consequent destruction of habitats to allow the development of production and extraction sites. Further indirect land-use change arises from the construction of access roads and other auxiliary infrastructure and the increased access to the area this creates for wider human activities.	*Environmental assets:* Land Terrestrial and subterranean ecosystems *Ecosystem services:* Local biomass provisioning Pollination Biological control Soil and sediment retention Flood mitigation Nursery population and habitat maintenance Local and global climate regulation Genetic materials Cultural services	Terrestrial and subterranean habitats will be altered by the extraction, management and rehabilitation phases of quarrying. This can disrupt ecosystems and ecological functions due to reduced habitat extent, increased erosion and habitat degradation. Land-use change can also cause habitat fragmentation, which impedes species' feeding and reproduction patterns, reducing populations and increasing extinction risk. These changes can have knock-on effects on ecosystem services, including cultural services. Land- use change can lead to the displacement of communities for new asset construction or transportation routes. It may also cause disruption and/or damage to local sacred areas. Consultation with stakeholders from affected communities will highlight these concerns and allow impacts on these resources to be assessed.

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Non-GHG air pollutants: Quarrying activity can create dust pollution.	*Environmental assets:* Atmospheric systems Terrestrial land-based ecosystems Freshwater ecosystems Marine ecosystems *Ecosystem services:* Pollination Biological control Nursery population and habitat maintenance Cultural services	Dust can lead to degradation of the quality of the surrounding atmospheric systems and ecosystems. This can affect local ecosystems by decreasing the quality of land, contaminating plants and affecting the health of animals. This in turn can disrupt ecosystem service provision such as pollination, biological control, nursery population and habitat maintenance and cultural services. Pollution may also lead to the worsening health and living conditions of surrounding local communities. Organisations should consider local air currents to determine which ecosystems might be affected.
Pollution/pollution removal Water pollutants: Discharged water from quarrying processes may have: • Higher temperature; • Increased acidity; • Heavy metals such as arsenic, cobalt, copper, cadmium, lead, silver and zinc contained in excavated rock; • Suspended solids as a result of erosion of exposed earth; and • Other pollutants.	*Environmental assets:* Subterranean freshwater ecosystems Freshwater ecosystems Water resources *Ecosystem services:* Water flow regulation Water supply Water purification Biological control Nursery population and habitat maintenance Cultural services	Changes in water temperature can affect the health of aquatic organisms living in the habitat, support the spread of disease and create the conditions for invasive species. Increased acidity can be harmful to aquatic organisms. Heavy metals can also cause serious health problems for aquatic organisms and the people that consume them. Excessive sediment can clog riverbeds and smother watershed vegetation, wildlife habitat and aquatic organisms.

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Disturbances: Noise and light pollution. Species can be affected by noise and light pollution during routine operation (e.g. extraction processes, movement of vehicles) and if the facilities are lit.	*Environmental assets:* Terrestrial land-based ecosystems *Ecosystem services:* Pollination Biological control Nursery population and habitat maintenance Cultural services	Wildlife may be disturbed by increased human access and noise from blasting and quarry traffic.
Resource use/replenishment Water use: Water is used across the lifecycle of the quarry including for aggregate and sand washing, vehicle cleaning and dust cloud suppression. It is usually extracted either from a local freshwater body or obtained from the quarry dewatering process required to create dry extraction areas.	*Environmental assets:* Subterranean freshwater ecosystems Freshwater ecosystems Water resources *Ecosystem services:* Water flow regulation Water supply Water purification Biological control Nursery population and habitat maintenance Cultural services	Water extraction can lead to the dewatering of aquifers, subterranean freshwater ecosystems and the depletion of other water resources, especially in arid and drought-prone areas. Quarry dewatering may affect the groundwater level. These activities can lead to reduced water flow regulation and increased drought severity and frequency. Such water use affects the supply of water to other users – households, fishing, aquaculture and agriculture – and to nature, with many ecosystem services affected, including water purification, water flow regulation, water supply and recreation-related services.

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Invasive species introduction/removal Introduction of invasive species: Quarries and quarrying can contribute to the establishment of invasive alien plant species through: Changes in the environmental conditions onsite as a result of the quarry itself favouring certain species over others or altering water flows leading to the spread of plant material to new locations; Vehicle movements and movement of materials containing plant material to new locations; and Inappropriate planting of non-native species.	*Environmental assets:* Terrestrial land-based ecosystems Freshwater ecosystems *Ecosystem services:* Pollination Biological control Genetic material Nursery population and habitat maintenance, Cultural services	Change in the structure and function of ecological communities due to the arrival of new species.
Sources: CEMBUREAU: Biodiversity Roadmap; Ekpo, F. (2013) Influence of heavy metals concentration in three common fish, sediment and water collected within quarry environment, Akamkpa L .G. area, cross river state, Nigeria; GCCA (2019) GCCA Sustainability Guidelines for the monitoring and reporting of water in cement manufacturing; Ipeaiyeda, A. R. and Obaje, G. M. (2016) Impact of cement effluent on water quality of rivers: A case study of Onyi river at Obajana, Nigeria; IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS); Safe Drinking Water Foundation: Mining and water pollution; Wałkuska, G. and Wilczek, A. (2010) Influence of Discharged Heated Water on Aquatic Ecosystem Fauna; WEF (2023) Nature Positive: Role of the Cement and Concrete Sector.		

Table 7: Example negative impact pathways for sand extraction from river and marine environments

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Land/freshwater/ocean-use change Freshwater use change: Sand is a key input for cement and concrete production. An estimated 32 to 50 billion tonnes of aggregates (mostly sand, gravel and stones) are extracted every year. Rivers are usually the preferred source.	*Environmental assets:* Freshwater ecosystems Underwater mineral resources *Ecosystem services:* Water flow regulation Biological control Nursery population and habitat maintenance Soil and sediment retention Flood mitigation Cultural services	Dredging rivers lowers the riverbed and surrounding water table. Mining sand in river floodplains can also alter the river's course. When not well managed, this sand extraction: • Destroys habitats, including the delta downstream as sediment flows are disrupted; • Affects aquatic species, with changes to the aquatic species' ability to migrate through rivers that can prevent their reproduction and affect feeding patterns; • Increases the incidence and severity of droughts as streams and tributaries of major rivers dry up as a result of the sediment removal; • Lowers water quality through increased sediment suspension; • Increases erosion; and • Affects downstream communities through reduced access to water, increased water purification costs and reduced fish populations. Overly mined ecosystems can be very slow or even unable to recover, diminishing the availability of mineral resources over the long term.

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Land/freshwater/ocean-use change Ocean-use change: 6 billion tonnes of construction sand are extracted each year from marine and coastal environments.	*Environmental assets:* Marine ecosystems Underwater mineral resources *Ecosystem services:* Biological control Nursery population and habitat maintenance Flood mitigation Cultural services	Marine and coastal sand dredging can: • Increase seawater turbidity; • Alter aquatic nutrient availability; • Contribute the salinisation of freshwater aquifers; • Contribute to coastal erosion, affecting coastal communities and the prospects for constructing coastal defences offshore energy infrastructure.
Pollution/pollution removal Solid waste: Miners dispose of sand mining waste on open land areas and riverbeds.	*Environmental assets:* Terrestrial, freshwater and marine ecosystems *Ecosystem services:* Water flow regulation Nursery population and habitat maintenance Soil quality regulation Water purification Cultural services	Solid waste contributes to the degradation of the environmental assets where it is disposed of and disrupts the ecosystem services those assets provide.

Drivers of nature loss	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Disturbances: Noise pollution.	*Environmental assets* Terrestrial land-based ecosystems Freshwater ecosystems Marine ecosystems	The extraction of sand from rivers and the marine environment can contribute to noise pollution in these ecosystems, affecting species behaviour.
Sources: Katz-Lavigne, S. et al. (2021) Mapping Global Sand: Extraction, research and policy options; UNEP (2022) Sand and Sustainability: 10 strategic recommendations to avert a crisis; UNEP (2023) Marine Sand Watch reveals massive extraction in the world's oceans; WEF (2023) Nature Positive: Role of the Cement and Concrete Sector; WWF (2018) Impacts of sand mining on ecosystem structure, process & biodiversity in rivers.		

Table 8: Example negative impact pathways for cement manufacturing

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Non-GHG air pollutants: Pollutants released during the manufacture of clinker for cement, include: • Sulphur dioxide (SO_2) and nitrogen oxide (NO_x) created by the kiln and drying operations; • Volatile organic compounds (VOCs) from stored gasoline, solvents and other industrial chemicals, and incomplete combustion; and • Dust from the raw mills, the kiln system, the clinker cooler, and the cement mills.	*Environmental assets:* Atmospheric systems Terrestrial and subterranean land-based ecosystems Freshwater and subterranean freshwater ecosystems Marine ecosystems *Ecosystem services:* Local (micro and meso) climate regulation Rainfall pattern regulation Biological control	Non-GHG air pollutants can lead to the degradation of the quality of the surrounding atmospheric systems and ecosystems. Sulphur dioxide (SO_2) and nitrogen oxide (NO_x) are primary contributors to acid deposition, or acid rain. Dust formation can disrupt local ecosystems by decreasing the quality of land, disrupting pollination, contaminating plants and affecting the health of animals. Pollution may also lead to the worsening health and living conditions of surrounding local communities. Organisations should consider local air currents to determine which ecosystems might be affected.

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Water pollutants: Discharged water from manufacturing processes may have: • Temperature changes; • Acidity changes; • Increased suspended solids content; • Metal pollutants (Co, Cd, Cr, Cu, Ni, Pb and Zn); • Increased chemical oxygen demand (COD), which can be above standard for effluent discharge into surface water near cement plants; and • Elevated phosphates and nitrates due to detergents used for washing. All of which can enter waterbodies.	*Environmental assets:* Freshwater and subterranean freshwater ecosystem Water resources Terrestrial and subterranean terrestrial ecosystems *Ecosystem services:* Water flow regulation Water supply Water purification Biological control Nursery population and habitat maintenance, Soil and sediment retention Flood mitigation Cultural services	Changes in water temperature can affect the health of aquatic organisms living in the habitat, support the spread of disease and create the conditions for invasive species. Increased acidity can be harmful to aquatic organisms. Excessive sediment can clog riverbeds and smother watershed vegetation, wildlife habitat and aquatic organisms. Heavy metals can also cause serious health problems for aquatic organisms and the people that consume them.

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Soil pollutants: Extraction activities can result in the pollution of soil, through deposits of cement kiln dust, dioxins and heavy metals.	*Environmental assets:* Terrestrial land-based ecosystems Freshwater ecosystems Marine ecosystems *Ecosystem services:* Water flow regulation Biological control Nursery population and habitat maintenance, Soil and sediment retention Flood mitigation Cultural services	Soil pollutants can cause changes to soil structure and organic content and affect wildlife: • Cement kiln dust can be created when exhaust gas passes through the pulverised material, resulting in a dispersion of gas and particles, including particulate matter (PM) pollutants. Depending on particle size, concentration and exposure time, the presence of toxic substances in PM (such as acids, metals, organic particles and hazardous air pollutants—HAPs) can have a negative impact on human and animal health. • Dioxins are a group of chemically related compounds that are persistent environmental pollutants (POPs). Dioxins can cause reproductive and developmental problems and suppress immune function in animals and humans. Their half-life in the human body is estimated to be 7 to 11 years and long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions. • Heavy metals remain in the soil for long period and alter the soil pH, colour, porosity and natural chemistry, damaging the health of plants and the people animals that feed on them; Soil pollutants may runoff in stormwater and affect freshwater and marine ecosystems and the supply of clean water to downstream communities.

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Resource use/replenishment Water use: Concrete production is responsible for 9% of global industrial water withdrawal or 1.7% of total global water withdrawal. By 2050, 75% of the water demand for concrete production is expected to occur in regions likely to experience water stress. Other than at the quarrying stages, most water withdrawal occurs during the midstream production of products like clinker, cement and concrete. In particular, water is used for cooling equipment and exhaust gases, for wet-process kilns (almost entirely replaced by more efficient dry-process technologies), for aggregate washing and for the manufacturing of concrete.	*Environmental assets:* Subterranean freshwater ecosystems Freshwater ecosystems Water resources *Ecosystem services:* Water flow regulation Water supply Biological control Nursery population and habitat maintenance Cultural services	Water use can lead to the dewatering of aquifers, subterranean freshwater ecosystems and the depletion of other water resources, especially in arid and drought-prone areas. Additionally, quarry dewatering may have an impact on the groundwater level, affecting freshwater ecosystems. This can lead to reduced water flow and increased drought severity and frequency. Such water use affects the supply of water to other users – households, aquaculture and agriculture – and to nature, with many ecosystem services impacted such as water flow regulation, water supply and recreation-related services.

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Resource use/replenishment Use of non-renewable natural resources: Non-renewable resources to produce cement and concrete include: limestone, shale, clay, hard crushed rock, sand and gravel. Global aggregate production is currently estimated at 40–45 billion tonnes, with more than 50 billion tonnes of sand extracted globally every year.	*Environmental assets:* Terrestrial land-based ecosystems Mineral and energy resources Underground mineral and energy resources Freshwater ecosystems *Ecosystem services:* Water flow regulation Biological control Nursery population and habitat maintenance Soil and sediment retention Flood mitigation Cultural services	Environmental services affected by extraction of non-renewable natural resources include soil and sediment retention, flood mitigation, water flow regulation and nursery population and habitat maintenance.

Impact drivers	Example environmental assets and ecosystem services affected	Description of impact
Pollution/pollution removal Disturbance: Noise and light pollution. Noise emissions occur throughout the whole cement manufacturing process, particularly from heavy machinery chutes and hoppers; any operations involving the crushing and milling of raw materials, as well as fuels, clinker production; exhaust fans; blowers; and duct vibrations.	*Environmental assets:* Terrestrial land-based ecosystems *Ecosystem services:* Pollination Biological control Nursery population and habitat maintenance, Cultural services	Species can be disturbed by noise and light pollution, with impacts on ecosystem services.
Sources: Bakri, A. Y. et al. (2022) Cement Kiln Dust (CKD) Potential Beneficial Applications and Eco-Sustainable Solutions; Briffa, J. et al. (2020) Heavy metal pollution in the environment and their toxicological effects on humans; Ciobanu, C. et al. (2021) Dust Emission Monitoring in Cement Plant Mills: A Case Study in Romania; GCCA (2019) GCCA Sustainability Guidelines for the monitoring and reporting of water in cement manufacturing; Gupta et al. (2020) Particulate matter and elemental emissions from a cement kiln; Ipeaiyeda, A. R. and Obaje, G. M. (2016) Impact of cement effluent on water quality of rivers: A case study of Onyi river at Obajana, Nigeria; IUCN (2014) Biodiversity management in the cement and aggregates sector: Integrated Biodiversity Management System (IBMS); Mayes, W. M. et al. (2008) Hydrogeochemistry of Alkaline Steel Slag Leachates in the UK; Panagoda, S. S. et al. (2023) Cement Manufacturing Process and Its Environmental Impact; UNEP (2022) Sand and Sustainability: 10 strategic recommendations to avert a crisis; WEF (2023) Nature Positive: Role of the Cement and Concrete Sector; WHO (2023) Dioxins.		

Dependencies

Table 9: Examples of dependency pathways for the construction materials sector

Business activity	Environmental asset and ecosystem services depended on	Description of dependencies
Quarrying; sand mining	*Environmental assets:* Underwater mineral and energy resources Marine ecosystems Land Terrestrial and subterranean terrestrial ecosystems Mineral and energy resources Water resources Freshwater ecosystems *Ecosystem services:* Water supply Biological control Soil and sediment retention Flood mitigation Water flow regulation Rainfall pattern regulation Local and global climate regulation Solid waste remediation Storm mitigation Water purification Air filtration Noise attenuation	The construction materials sector is centred on the extraction of mineral resources from the environment, so has a high dependency on the natural processes that create these resources. An organisation should particularly pay attention to its dependency on sand production, which is being extracted at unsustainable rates in many locations, notably China and India. Extraction operations are further supported by provisioning services such as the supply of clean water. Ecosystems surrounding sites also protect operations from natural hazards such as floods and storms, and help to stabilise the surrounding soil, supporting operations and reducing the risk of landslides. Quarrying is also associated with the production of various pollutants and disturbances, as discussed in Table 6. Construction materials organisations in turn depend on ecosystems to dilute these byproducts to protect the local environment, communities and workers.

Business activity	Environmental asset and ecosystem services depended on	Description of dependencies
Cement manufacturing	*Environmental assets:* Underwater mineral and energy resources Terrestrial and subterranean terrestrial land-based ecosystems Mineral and energy resources Water resources Freshwater and subterranean freshwater ecosystems *Ecosystem services:* Water supply Water flow regulation Water purification Rainfall pattern regulation	Cement production requires a supply of clean water as the binding ingredient for the hydration process. If ecosystems are degraded, or water across the catchment area is extracted at an unsustainable rate, the supply of this clean water may be disrupted. Where water is sourced from third party providers, that organisation's dependencies on water resources and water-related ecosystem services should also be analysed.
Sources: ENCORE Partners (unpublished, expected 2024). ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure; Katz-Lavigne, S. et al. (2021) Mapping Global Sand: Extraction, research and policy options; University of Illinois Urbana-Champlain: Scientific principles.		

Tables 2a and 2b in the guidance for the Locate phase in this document also provide a list of ecosystem services typically depended on by the construction materials industry. Organisations should note that materiality may vary for individual production processes across the value chain, commodities, and geographical contexts.

External factors

Organisations are recommended also to take into account potential external factors that may affect the availability of environmental assets and ecosystem services on their sites. Climate change is likely to be of particular relevance, contributing to a higher frequency of extreme weather events, such as droughts and floods, and affecting the wider ecosystem condition, for example, through longer-term changes to rainfall patterns and lowering of water tables. These influence the provisioning and regulating ecosystem services that the construction materials sector depends on, such as soil and sediment retention and water supply.

Organisations should refer to the TNFD's biome guidance for more examples of ecosystem services that may be present in the locations where the organisation is operating.

E3: Dependency and impact measurement

Guiding questions

What is the scale and scope of our dependencies on **nature?**

What is the severity of our negative impacts on nature? What is the scale and scope of our positive impacts on nature?

Organisations should refer to the metrics in Section 3 for guidance on what indicators and metrics to use in measuring dependencies and impacts.

E4: Impact materiality assessment

Guiding question

Which of the identified impacts are material?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

2.4. Assess nature-related risks and opportunities

This section provides additional considerations to help construction materials industry organisations with the Assess phase of the LEAP approach.

A1: Risk and opportunity identification

Guiding question

What are the corresponding risks and opportunities for our organisation?

Risks

Table 10 provides a list of illustrative nature-related physical and transition risks for the construction materials industry.

Table 10: Illustrative nature-related risks in the construction materials sector

Risk type		Illustrative risk in the construction materials sector	Magnitude indicator
Physical, transition or systemic-type risk	Risk category		
Physical	Acute	Increased risk of damage from floods, storms and landslides if protective terrestrial ecosystems are degraded. Increased habitat rehabilitation costs if soil quality is too degraded. The accidental spillage of oil upstream contaminates the water body that the organisation depends on. Wildfires, tropical cyclones, extreme heat and other extreme weather events damaging infrastructure or interrupting business activities.	Increase in operational costs due to interruption of, or reduction in, productivity of operations/supply chain. Increase in closure and rehabilitation costs due to degradation in soil quality and insufficient material balance. Cost of write-offs and early retirement of existing business assets. Increased insurance costs.

Risk type		Illustrative risk in the construction materials sector	Magnitude indicator
Physical, transition or systemic-type risk	**Risk category**		
Physical	Chronic	Declining water supply and/or water quality as a result of the organisation's activities, those of others in the watershed and climate change. Declining sand supply as a result of unsustainable dredging in rivers/areas/marine areas. Disruption of operations by scarcity and increased cost of raw materials and freshwater.	Cost of disruption to operations and increase in the cost of water management and control. Increase in insurance costs resulting from natural disasters. Decline in value of business assets due to lack of availability of natural resources.
Transition	Reputational	Changes in sentiment towards the organisation/brand due to competition for natural resources (e.g. water, land), impacts on nature and/or failure to meet expected stakeholder community expectations (e.g. nature no net loss, failure to meet rehabilitation and closure expectations, or late life divestments). As protections increase, the discovery of rare species onsite, or rare species moving onto a site, may disrupt operational activities. Changes in recreational value of water body following sand dredging.	Downward revisions to business growth forecasts due to inability to gain new land access. Cost of operational interruptions due to community conflict or unexpected nature protection activity. Reduction in revenue due to reduced brand value. Failure to attract and retain staff.

Risk type		Illustrative risk in the construction materials sector	Magnitude indicator
Physical, transition or systemic-type risk	**Risk category**		
Transition	Policy	As countries start implementing the Kunming-Montreal Global Biodiversity Framework targets, the amount of land placed under protection mechanisms will rise, which will lead to a reduction in possible new areas to explore for quarrying and in a decrease in permitting. There may also be increased restrictions on access to remote areas where remaining reserves are located. Tighter regulations may for instance mean that the discovery of an important, previously undetected cave system may require a halt in operations, more inspections and surveys, or a location change. Organisations may refer to National Biodiversity Strategies and Action Plans (NBSAPs) to identify areas that may become protected in the future.	Increased cost of damage payouts (e.g. fines, penalties, compensation, license revocation) caused by environmental incidents or non-compliance. Cost of additional habitat regeneration following introduction of biodiversity offset schedule to support government no-net loss or nature-positive initiatives. Increased costs and reduction in revenue due to interruption of operations/supply chain as sites for suppliers are limited. Costs related to the loss of operating areas. Increased timeframes for new projects, permits and land access. Loss of operating area due to collective land rights claims by Indigenous Peoples and Local Communities.

Opportunities

Nature-related opportunities are activities that create positive outcomes for organisations and nature through positive impacts or mitigation of negative impacts on nature. Illustrative examples of nature-related opportunities are outlined in Table 11 below.

Table 11: Illustrative nature-related opportunities for the construction materials sector

Opportunity type	Illustrative opportunity in the construction materials sector	Magnitude indicator
Markets	Opportunities for organisations to engage in emerging natural capital markets.	Increase in revenues.

Opportunity type	Illustrative opportunity in the construction materials sector	Magnitude indicator
Resource efficiency	Reduce water consumption by replacing wet process technology kilns with dry process kilns.[13]	Reduction in water costs.
Products and services	New products that are designed for disassembly to allow for reuse of materials after building deconstruction.[14]	Revenue from new products as market shifts towards more circularity for materials.
	Replace virgin raw materials through the reuse and repurposing of waste and loss into alternative products (e.g. recycled concrete aggregates, recycled powder and recycled construction demolition waste).[15]	Cost reductions.
	Certification of sustainable products.	Revenue from such products.
	Use of owned or managed natural assets to create or enhance ecosystem services that may be monetised (e.g. natural flood risk management).	Increase in revenue payments for ecosystem services.
Reputational capital	Increase in consumer brand loyalty and enhanced social licence to operate though actions such as transparent biodiversity management plans and focus on circular economy.	Increase in revenue.
Ecosystem protection, restoration and regeneration	Conservation (e.g. through the creation of temporary habitats during the quarry lifecycle). Investment in natural flood management activities upstream of quarries/extraction areas/roads to prevent flooding of the organisation's assets. Investment in nature restoration in areas surrounding sites to improve connectivity. Implement fragmentation mitigation measures (e.g. wildlife overpasses, underpasses, wildlife-friendly culverts and canopy bridges) onsite. Integrated multi-stakeholder action at land/seascape/river basin/jurisdictional/sector scale. Manage and rehabilitate a site in such a way that species present in the past may be encouraged to recolonise.	Increase in species populations. Increase in ecosystem extent and condition. Increased public access to green space.

[13] GCCA (2019) Sustainability guidelines for the monitoring and reporting of water in cement manufacturing.

[14] WEF and BCG (2023) Scaling Low-Carbon Design and Construction with Concrete: Enabling the Path to Net-Zero for Buildings and Infrastructure; GCCA Design for Disassembly.

[15] Villagrán-Zaccardi, Y. A. et al. (2022) Complete re-utilization of waste concretes – Valorisation pathways and research needs.

A2: Adjustment of existing risk mitigation and risk and opportunity management

Guiding questions

What existing risk and opportunity management processes and elements are we already applying?

How can risk and opportunity management processes and associated elements (e.g. risk taxonomy, risk inventory and risk tolerance criteria) be adapted?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

A3: Risk and opportunity measurement and prioritisation

Guiding question

Which risks and opportunities should be prioritised?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

A4: Risk and opportunity materiality assessment

Guiding question

Which risks and opportunities are material and therefore should be disclosed in line with the TNFD recommended disclosures?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

2.5. Prepare to respond and report

This section provides additional considerations to help construction material industry organisations with the Prepare phase of the LEAP approach.

P1: Strategy and resource allocation plans

Guiding question

What risk management, strategy and resource allocation decisions should be made as a result of this analysis?

Table 12 presents illustrative priority and transformative actions that construction materials sector organisations may want to consider based on the risks identified in the Assess phase. All actions have been categorised by the corresponding impact driver and classified according to SBTN's AR3T framework (Figure 5), based on TNFD's interpretation of SBTN's AR3T framework, (pending alignment with future development of SBTN's Step 4 guidance): avoid and reduce negative impacts; restore and regenerate; transformation of business models, products, services, markets and investments; and contributing to needed systemic change inside and outside value chains.

Figure 5: SBTN's AR3T framework

In preparing to respond, organisations should:

- Consider the potential actions across all their sites – including inactive quarries and office sites – and across the quarry lifecycle, including scope to create temporary habitats;
- Consider where there is a need to accelerate innovation to meet nature goals, including a rethinking of business models, circular economy opportunities, and making more use of nature-based solutions to manage on-site risks such as flooding and water quality issues; and
- Apply the mitigation hierarchy (Box 3), working towards no net loss, and in the best case, a net gain for nature.

Organisations should also refer to best practices for biodiversity management plans, quarry rehabilitation plans and procurement, including:

- Quarry biodiversity management:
  - GCCA Sustainability Guidelines for quarry rehabilitation and biodiversity management;
  - BirdLife Europe and Central Asia's Extractive Sector Species Protection Code of Conduct;
- Water management:
  - GCCA Sustainability Guidelines for the monitoring and reporting of water in cement manufacturing;
- Circular economy:
  - GCCA Policy Document on Circular Economy;
  - GCCA Sustainability Guidelines for co-processing fuels and raw materials in cement manufacturing;
- Cross-cutting:
  - WEF Nature Positive: Role of the Cement and Concrete Sector.

Box 3: The mitigation hierarchy

The mitigation hierarchy requires that an organisation follow a series of essential and sequential steps over the project's lifecycle. Organisations should maximise the actions in the first step before proceeding to action under the second, and so forth. The actions are:

1. Avoid creating impacts, for example, through careful spatial placement of infrastructure, or timing of construction;
2. Minimise the impacts that are unavoidable, by reducing their duration, intensity or extent;
3. Rehabilitate/restore the ecosystem after exposure to impacts, trying to return the area to a state as close as possible to how it was before the impacts took place; and
4. Offset: The organisation may wish to compensate further for any residual adverse impacts after the full implementation of the previous three steps of the mitigation hierarchy. Nature offsetting is an emerging topic and organisations should refer to best practices, such as those being prepared by the International Advisory Panel on Biodiversity Credits.

Quarry rehabilitation can contribute significantly to mitigating residual impacts and in many cases will be able to deliver no net loss, in which case it can be sufficient alone, without the need for compensation projects or offsets. Organisations should refer to the GCCA Sustainability guidelines for quarry rehabilitation and biodiversity management for guidance on applying the mitigation hierarchy in the construction materials sector.

Source: The Biodiversity Consultancy: Net positive and the mitigation hierarchy; GCCA (2020) GCCA Sustainability Guidelines for quarry rehabilitation and biodiversity management.

Table 12: Illustrative priority and transformative actions for the construction materials sector mapped to the AR3T Framework

Impact driver/de-pendency	Example of responses to impacts on nature and associated risks	Global frameworks alignment	SBTN action framework (AR3T)				
			Avoid	Reduce	Rege-nerate	Restore	Trans-form
Land-use change	Avoid ecologically sensitive areas, particularly protected areas, as well as areas likely to become protected under countries' updated National Biodiversity Strategies and Action Plans (NBSAPs). Instead, focus development in already modified habitats such as brownfield or intensively farmed areas.	SBTN Interim Targets GBF – Target 3 SDG 15 EU Article 6(4) Habitats Directive 92/43/EEC					
	Adopt a biodiversity management plan; restore and regenerate nature by introducing innovative and nature-based solutions such as temporary habitats; and as long as the site is owned or managed by the company, commit to improving biodiversity through habitat restoration and reinstatement (adopt quarry rehabilitation plans) after clearance/decommissioning.	GBF – Targets 2, 3, 11, 12 SDG 15					
	Regularly review assessments of biodiversity risks on existing sites using, for example, rapid biodiversity surveys.	SDG 15					
	Support developments of nature-based solutions for water quality and flood risk management in river catchments containing the organisation's operations. Support other nature restoration projects in your organisation's areas of influence.						

Impact driver/de-pendency	Example of responses to impacts on nature and associated risks	Global frameworks alignment	SBTN action framework (AR3T)				
			Avoid	Reduce	Rege-nerate	Restore	Trans-form
	Implement fragmentation mitigation measures (e.g. wildlife overpasses, underpasses, wildlife-friendly culverts and canopy bridges) to support connectivity.						
	Promote pollinators on site by creating/providing nectar and pollen-rich habitats, species-rich grassland, nesting and overwintering habitats, and ponds with shallow edges during temporary and permanent rehabilitation activities; construction of green roofs and walls; and avoiding the use of insecticides.	SDG 15					
Resource use: water use	Implement a sustainable water management plan, prioritising regions of water stress. Actions may include continuous, systematic or periodic water monitoring; water risk assessments; and minimisation of freshwater withdrawals in water-stressed areas or during drought periods.	GRI 303 GBF Target 11 Integrated Water Resources Management (UNEP) SDG 6 Water Framework Directive (EU)					

Impact driver/de-pendency	Example of responses to impacts on nature and associated risks	Global frameworks alignment	SBTN action framework (AR3T)				
			Avoid	Reduce	Rege-nerate	Restore	Trans-form
	Maximise recovery of process water (e.g. water reuse/recycling, closed loops), collecting, quantifying and mapping on-the-ground water use and mitigation policies already in place. Create artificial wetlands to reduce water withdrawal and improve water quality. Harvest rainwater. Partner with other local actors to share water resources (e.g. using discharges from other businesses operating in the vicinity of cement and concrete plants, as well as wastewater from local communities).	SDG 6					
	Adopt less water-intensive processes and improve the water efficiency of production processes.	SDG 6					
	Implement water replenishment programmes and conservation/restoration of water species affected by water withdrawals.	SDG 6 Net Positive Water Impact – CEO Water Mandate					
Resource use: other	Avoid dredging sand from rapidly degrading or already degraded rivers/areas/marine areas.	TNFD					

Impact driver/de-pendency	Example of responses to impacts on nature and associated risks	Global frameworks alignment	SBTN action framework (AR3T)				
			Avoid	Reduce	Rege-nerate	Restore	Trans-form
	Prioritise co-processing where possible. For example, in cement kilns, use alternative fuels, alternative raw materials such as industrial ashes and by-products, as well as supplementary cementitious materials in production processes. Innovate in recycling the sector's own waste streams.	SDG 12					
	Design construction materials structures for reuse.	SDG 12					
	Improve the thermal efficiency in manufacturing processes through the modernisation of kilns and pioneering new concepts such as hydrogen, as well as by integrating new technologies such as Waste Heat Recovery (WHR) facilities in cement plants.						
	Improve traceability across the value chain.						

Sources: CEMBUREAU (2022) Biodiversity roadmap; GCCA (2019) Sustainability Guidelines for co-processing fuels and raw materials in cement manufacturing; GCCA (2020) Sustainability Guidelines for quarry rehabilitation and biodiversity management; GCCA (2021) The GCCA 2050 Cement and Concrete Industry Roadmap for Net Zero Concrete; GCCA (2024) Policy Document on Circular Economy; WEF (2023) Nature Positive: Role of the Cement and Concrete Sector.

P2: Target setting and performance management

Guiding question

How will we set targets and define and measure progress?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

P3: Reporting

Guiding question

What will we disclose in line with the TNFD recommended disclosures?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

P4: Presentation

Guiding question

Where and how do we present our nature-related disclosures?

As for all components, refer to the Guidance on the identification and assessment of nature-related issues: The LEAP approach.

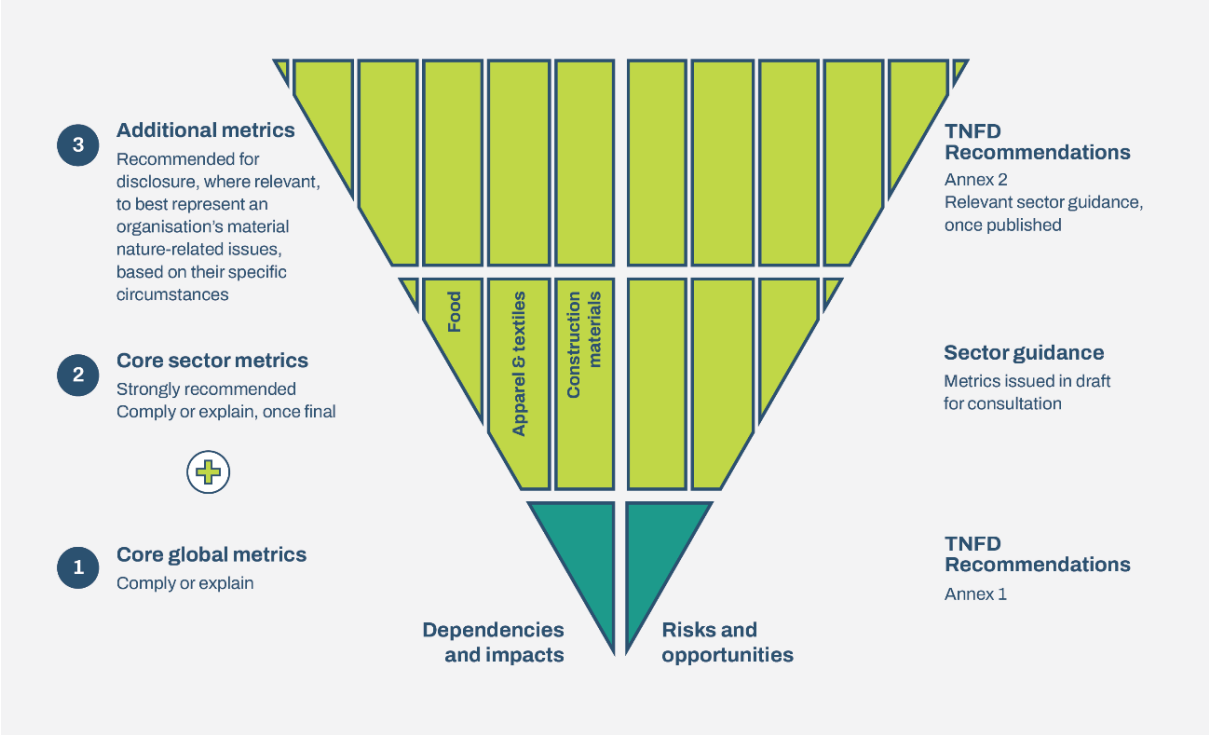
3. Sector-specific disclosure metrics and related guidance – Construction materials

Sector-specific metrics form an important part of the TNFD's measurement architecture (see Figure 6). This reflects the diversity of business models across value chains and their interface with nature across and within sectors. Sector-specific metrics help financial institutions to compare organisations within the same sector, which often face similar nature-related issues.

This section provides the proposed TNFD sector-specific metrics for the construction materials sector. It includes:

- Guidance on the application of the core global disclosure indicators and metrics to the construction materials sector (Section 3.1); and
- Core and additional disclosure indicators and metrics for the construction materials sector (Sections 3.2 and 3.3).

Figure 6: TNFD disclosure measurement architecture



Where available, the TNFD's recommended metrics for disclosure draw from a range of existing standards and frameworks including the IFRS Sustainability Disclosure Standards, Sustainability Accounting Standards Board (SASB) Standards, GRI Standards, the CDP disclosure platform, the Kunming-Montreal Global Biodiversity Framework and other relevant UN frameworks, ESRS and others. A number of organisations, including standard-setting organisations, continue to work on identifying relevant sector-level assessment and reporting metrics. The Taskforce recommends that report preparers stay engaged with year-on-year progress on these developments and implement the latest definitions within their risk management processes and disclosures. The TNFD is working closely with standard-setting organisations and others and will periodically update this guidance on recommended sector metrics for disclosure in line with these ongoing initiatives.

Organisations in the construction materials sector should refer to Annex 1 of the TNFD Recommendations for further information on the core global disclosure metrics. As outlined in the TNFD Recommendations, core global disclosure metrics should be reported on a comply or explain basis, with the exception of the placeholder metrics.

Where organisations are unable to report against any of the core global metrics, they should provide a short explanatory statement as to why they have not reported those metrics. An organisation should report on the core global disclosure metrics unless:

- It has not been identified as relevant and material to the organisation, e.g. not relevant to business activities or the location the organisation is operating in, or not found to be a material issue for the organisation; or
- It has been identified as relevant and material, but the organisation is unable to measure it due to limitations with methodologies, access to data or because the information is commercially sensitive. In this case, organisations should explain how they plan to address this in future reporting periods.

Companies should report on the same basis for the core sector disclosure metrics outlined in Section 3.2.

Organisations are also encouraged to draw on the TNFD additional sector disclosure indicators and metrics outlined in Section 3.3 and any other relevant metrics to represent most accurately the organisation's nature-related dependencies, impacts, risks and opportunities.

3.1. Guidance on the application of the core global disclosure metrics

This section provides guidance, where relevant, on how to apply the TNFD core global disclosure metrics in the construction materials sector. If no further sector specific guidance is provided, organisations should refer to the core global disclosure metrics.

As outlined above, core global disclosure metrics should be reported on a comply or explain basis following the guidance for the construction materials sector where provided.

For the placeholder indicators on invasive alien species and the state of nature, the TNFD encourages organisations to consider and report against these indicators where possible, but are not expected on a comply or explain basis. There are not yet widely accepted metrics for these indicators, but the Taskforce recognises their importance, and will continue to work with knowledge partners to develop further guidance on these metrics.

Table 13: Proposed guidance on the application of the core global disclosure metrics

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
	GHG emissions	Refer to IFRS S2 Climate-related Disclosures.	No further sector specific guidance. Refer to the core global metric guidance.	GRI 101 Biodiversity (2024)
C1.0	Total spatial footprint	Total spatial footprint (km^2) (sum of): • Total surface area controlled/managed by the organisation, where the organisation has control (km^2); • Total distributed area (km^2); and • Total rehabilitated/restored area (km^2).	When reporting the land spatial footprint under this core global disclosure metric for quarrying activities, an organisation should include land owned, leased or managed in the exploration, development and production, or quarry/mine closure, and post-closure project phases. Organisations should refer to other relevant TNFD sector guidance for reporting downstream spatial footprints, in particular the engineering and construction guidance.	TNFD

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C1.1	Extent of land/ freshwater/ocean-use change	Extent of land/freshwater/ocean-use change (km^2) by: • Type of ecosystem,[16] and • Type of business activity.	In reporting this core global disclosure metric for ecosystem use change associated with quarrying, the extent of land/freshwater/ocean ecosystem use change (km2) should cover the gross area disturbed in the reporting period and should be broken down by area disturbed in each phase: • exploration; • development and production; • quarry closure; and • post-closure project phases. Land restoration and temporary habitat creation should be reported separately under extent of land/freshwater/ocean ecosystem conserved or restored. Organisations should refer to other relevant TNFD sector guidance for ecosystem use change downstream, in particular the engineering and construction guidance. An organisation may provide information additional to the IUCN Global Ecosystem Typology (GET) to define the type of ecosystem they refer to, such as regional or local classifications.	TNFD

[16] When disclosing on ecosystem types, refer to the International Union for Conservation of Nature Global Ecosystem Typology.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C1.1	Extent of land/ freshwater/ocean-use change	Extent of land/freshwater/ocean ecosystem conserved or restored (km^2), split into: • Voluntary; and • Required by statutes or regulations.	In reporting this core global disclosure metric, an organisation should distinguish the extent conserved or restored within its value chain and beyond its value chain. An organisation should also report land that is temporarily restored or any temporary habitats created. An organisation should report area conserved and restored separately, if data is available.	GRI 101 Biodiversity (2024), Disclosure 101-6; SASB Standard (2023) Disclosure EM-CM-160a.2
C1.1	Extent of land/ freshwater/ocean-use change	Extent of land/freshwater/ocean ecosystem that is sustainably managed (km^2) by: • Type of ecosystem,[17] and • Type of business activity.	No further sector specific guidance. Refer to the core global metric guidance.	TNFD

[17] When disclosing on ecosystem types, refer to the International Union for Conservation of Nature Global Ecosystem Typology.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.0	Pollutants released to soil split by type	Pollutants released to soil (tonnes) by type, referring to sector-specific guidance on types of pollutants.	In reporting this core global disclosure metric, an organisation should include pollutants released to soil that include any cement kiln dust, metal pollutants (mercury (Hg), cadmium (Cd), thallium (Tl), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), Zinc (Zn) and Vanadium (V)), toxins and any other types of soil pollutants released by the organisation.	GRI 303 Water and Effluents (2018), Disclosure 303-4; ENCORE

C2.1	Wastewater discharged	Volume of water discharged (m^3), split into: • Total • Freshwater; and • Other.[18] Including: • Concentrations of key pollutants in the wastewater discharged, by type of pollutant, referring to sector-specific guidance for types of pollutants; and • Temperature of water discharged, where relevant.	Reporting of water discharged under the core global disclosure metric should additionally be broken down by destination: • Surface water; • Groundwater; • Seawater; and • Third-party water, and the volume of this total sent for use to other organisations. As well as broken down by source: • Point source discharge; and • Non-point source discharge. For each site, the organisations should consider disclosing the following pollutants: • pH; • TSS (Total Suspended Solids); • TDS (Total Dissolved Solids); • Metal pollutants (mercury (Hg), cadmium (Cd), thallium (Tl), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), Zinc (Zn) and Vanadium (V)); • TPH (Total Petroleum Hydrocarbons); and • BOD (Biochemical Oxygen Demand). The organisation should describe the methodology used to calculate said concentrations as well as the dates and/or frequency of measurement for each pollutant, and whether the emission is a one-off occurrence or continuous.	SASB Standard (2023) Disclosure EM-CM-150a.1; GRI (2022) GRI Standards Glossary

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.2	Waste generation and disposal	Weight of hazardous and non-hazardous waste generated by type (tonnes), referring to sector-specific guidance for types of waste. Weight of hazardous and non-hazardous waste (tonnes) disposed of, split into: • Waste incinerated (with and without energy recovery); • Waste sent to landfill; and • Other disposal methods. Weight of hazardous and non-hazardous waste (tonnes) diverted from landfill, split into waste: • Reused; • Recycled; and • Other recovery operations.	Types of waste to report under this core global disclosure metric include: • Slags; • Dusts; • Sludges; • Used oil; • Other solid wastes that meet the TNFD definition of waste.	TNFD

[18] Freshwater: (≤1,000 mg/L Total Dissolved Solids). Other: (>1,000 mg/L Total Dissolved Solids). Reference: GRI (2018) GRI 303-4 Water discharge.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.3	Plastic pollution	Plastic footprint as measured by total weight (tonnes) of plastics (polymers, durable goods and packaging) used or sold broken down into raw material content.[19] For plastic packaging, percentage of plastics that is: • Reusable; • Compostable; • Technically recyclable; and • Recyclable in practice and at scale.	No further sector specific guidance; refer to the core global disclosure metric.	TNFD

[19] Raw material content: % of virgin fossil-fuel feedstock; % of post-consumer recycled feedstock; % of post-industrial recycled feedstock; % of virgin renewable feedstock.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.4	Non-GHG air pollutants	Non-GHG air pollutants (tonnes) by type: • Particulate matter $PM_{2.5}$ and/or PM_{10}); • Nitrogen oxides (NO_2, NO and NO_3); • Volatile organic compounds (VOC or NMVOC); • Sulphur oxides (SO_2, SO, SO_3, SO_x); and • Ammonia (NH_3).	Additional pollutants to report under this core global disclosure metric include: • Carbon monoxide (CO); • Dioxins/furans, including but not limited to the sum of the 17 congeners of polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) that contain chlorine; and • Heavy metals (includes mercury (Hg), cadmium (Cd), thallium (Tl), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Nl) and vanadium (V)); and • Airborne dust.	GCCA (2019); SASB Standard (2023) Disclosures IF-RE-140a.1., IF-RE-140a.2., and IF-RE-140a.3; GRI 303 (2019) Disclosure 303-4, GRI G4 (2014) Construction & Real Estate Disclosures EN8-EN9

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C3.0	Water withdrawal and consumption from areas of water scarcity	Water withdrawal and consumption[20] (m^3) from areas of water scarcity, including identification of water source.[21]	In reporting this core global disclosure metric, an organisation should include: • Total freshwater (≤1000 mg/l of Total Dissolved Solids) withdrawal, including from natural open sources such as rivers, lakes, natural ponds, streams, creeks; from groundwater (wells, boreholes, water below soil surface); from municipal and/or from third parties; from quarry dewatering used in operations; • Total non-freshwater (>1000 mg/l of Total Dissolved Solids) withdrawal, including from sources of high salinity or pollutants; and • Harvested rainwater: Volume of precipitation (rainwater or snowmelt) that is collected onsite (e.g. settling ponds, inactive quarry area that has not yet reached the groundwater table). Water from quarry dewatering that is not used should be reported separately. An organisation should differentiate withdrawal from groundwater sources that are recharged and non-recharged.	TNFD; GRI G4 (2014) Real Estate & Construction Disclosure EN1; SBTN High Impact Commodity list

[20] Water consumption is equal to water withdrawal less water discharge. Reference: GRI (2018) GRI 303-5.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C3.1	Quantity of high-risk natural commodities sourced from land/ ocean/freshwater	Quantity of high-risk natural commodities[22] (tonnes) sourced from land/ocean/ freshwater, split into types, including proportion of total natural commodities.	Commodities to report under the core global disclosure metric include: • sand; • limestone; • chalk marl; • silica correctives; • alumina and ferrous oxide; • natural gypsum; • pozzolan; • primary aggregates; and • coal.	TNFD; GRI G4 (2014) Real Estate & Construction Disclosure EN1; SBTN High Impact Commodity list

[21] Surface water; groundwater; seawater; produced water; third-party water. Reference: GRI (2018) GRI 303-3.

[22] Users should refer to the Science Based Targets Network (SBTN) High Impact Commodity List (HICL), species listed as vulnerable, endangered or critically endangered on the IUCN red list, and species listed in appendices I, II and III to CITES.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
		Quantity of high-risk natural commodities[23] (tonnes) sourced under a sustainable management plan or certification programme, including proportion of total high-risk natural commodities.	Commodities to report under the core global disclosure metric include: • sand; • limestone; • chalk marl; • silica correctives; • alumina and ferrous oxide; • natural gypsum; • pozzolan; • primary aggregates; and • coal.	TNFD
C4.0	Placeholder indicator: Measures against unintentional introduction of invasive alien species (IAS)[24]	Proportion of high-risk activities operated under appropriate measures to prevent unintentional introduction of IAS, or low risk designed activities.	No further sector specific guidance; refer to the core global disclosure metric.	TNFD

[23] Users should refer to the Science Based Targets Network (SBTN) High Impact Commodity List (HICL), species listed as vulnerable, endangered or critically endangered on the IUCN red list, and species listed in appendices I, II and III to CITES.

[24] Due to the measurement of levels of invasive species for organisations being a developing area, the chosen indicator focuses on whether an appropriate management response is in place for the organisation. The additional sets of metrics contain measurement of the level of invasive species within an area. The TNFD intends to do further work with experts to define 'high-risk activities' and 'low-risk designed activities'.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C5.0	Placeholder indicator: Ecosystem condition	For those organisations that choose to report on state of nature metrics, the TNFD encourages them to report the following indicators, and to refer to the TNFD additional guidance on measurement of the state of nature in Annex 2 of the LEAP approach: • Level of ecosystem condition by type of ecosystem and business activity; and • Species extinction risk. There are a number of different measurement options for these indicators. The TNFD does not currently specify one metric as there is no single metric that will capture all relevant dimensions of changes to the state of nature and a consensus is still developing. The TNFD will continue to work with knowledge partners to increase alignment.	No further sector specific guidance; refer to the core global disclosure metric.	TNFD
	Placeholder indicator: Species extinction risk		No further sector specific guidance; refer to the core global disclosure metric.	TNFD

3.2. Core sector disclosure indicators and metrics

The proposed TNFD core sector disclosure metrics for the construction materials sector are outlined below. The TNFD recommends that these metrics be disclosed by all report preparers in the sector on a compliance or explain basis.

Table 14: Proposed core sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric No.	Indicator	Core sector metrics	Source
State of nature	Ecosystem extent and condition	CM.C1.0	Change in fragmentation due to linear infrastructure	Length (km), footprint (km2), number of lanes, planned traffic volume, and surface or material type of upgraded and/or new linear infrastructure (e.g. roads, rails, powerlines, canals, pipelines, fences) built: • In sensitive locations, by sensitive location criteria met, stating the ecosystem type; and • In other areas, stating the ecosystem type(s). Number of completed wildlife crossing structures or other fragmentation mitigation methods per kilometre of linear infrastructure, including: • Number with verified wildlife use; and • Length, width and/or height (underpasses only) of crossing structures. Crossing structures include underpasses, overpasses, canopy bridges. Other fragmentation mitigation efforts may include retrofits of existing culverts, fencing and jump-outs.	TNFD
Impact driver	Pollution/pollution removal	CM.C2.0	Volume of spills	Volume of spills of diesel, paints, solvents and toxic chemicals (m3), by national or company spill classification scheme and by type of ecosystem affected.	GRI 303-4; ENCORE

3.3. Additional sector disclosure indicators and metrics

The proposed TNFD additional sector disclosure metrics for the construction materials sector are outlined below. The TNFD encourages all report preparers in the sector to draw on these and any other relevant metrics where relevant to best represent an organisation's material nature-related dependencies, impacts, risks and opportunities.

Table 15: Proposed additional sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric No.	Cross-sector indicator	Additional sector metrics	Source
Impact Driver	Pollution/pollution removal	CM.A2.0	Invasive alien species management	Proportion (%) of materials sold that have been checked for invasive alien species.	TNFD
Impact driver	Pollution/pollution removal	CM.A2.1	Light pollution	Contribution to light pollution, measured, for example, by: • Number and proportion (%) of outdoor lights by backlight, uplight and glare (BUG) rating; • Number and proportion (%) of outdoor lights above 2700K; • Total outdoor lighting (lumen and lumen/ha); • Total (m^2) and proportion (%) of area with nighttime lighting; and/or • Number and proportion (%) of outdoor lights that are kept on at night; and number and proportion (%) of outdoor lights that are and are not dimmed at night, by degree of dimming.	IUCN (2023) Urban Nature Indexes, TNFD

Metric category	Metric subcategory	Metric No.	Cross-sector indicator	Additional sector metrics	Source
Impact driver	Pollution/pollution removal	CM.A2.2	Noise pollution	Contribution to noise pollution, measured, for example, by: • Average noise level and/or frequency (dB, Hz) across the 2-hour periods centred on sunrise and sunset before work on the site started (baseline), and during operations, on-site and/or in the nearest noise-sensitive habitat to the most significant noise source; and/or • Average noise level and/or frequency across the day (dB, Hz), before the work on the site started (baseline), and during operations, on-site and/or in the noise-sensitive habitat nearest the most significant noise source; and/or • Average noise level and/or frequency (dB, Hz) before work on the site started (baseline), and at the noisiest period of the day during the operations, on-site and/or in the noise-sensitive habitat nearest the most significant noise source; and/or • Number of incidents where noise level exceeded local regulatory or international standards.	TNFD; GRI 101
Impact driver	Resource use/replenishment	CM.A3.0	Water replenishment	Total volume of water (m3) that has been sustainably supplied, purified and/or conserved in the same watershed where the freshwater was withdrawn. This includes volume of water from watershed protection and restoration projects, from water access and sanitation to community projects and from water efficient agriculture and water efficient irrigation practices.	TNFD

Metric category	Metric subcategory	Metric No.	Cross-sector indicator	Additional sector metrics	Source
Response	Dependency, impact, risk and opportunity management: Changes to nature (dependency and impact): mitigation hierarchy steps	CM.A23.0	Circularity of material use	Proportion of materials used that are recycled and reused input materials by significant categories of raw materials, renewable materials and manufactured products (%); or Share of total mass of materials, products and components/systems used that have been reused, repurposed or remanufactured, either from existing infrastructure on-site being demolished, refurbishment, fit-out or from other buildings, third parties etc. (%).	GRI: G4-EN2 Percentage of materials used that are recycled input materials UK Green Building Council (2023)
Response	Dependency, impact, risk and opportunity management: Value chain	CM.A22.0	Value chain certification	Proportion of materials sold for which there is an Environmental Product Declaration (EPD) meeting any applicable industry standards.	TNFD

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5. Glossary

In addition to the concepts and definitions provided in the TNFD glossary, the table below outlines concepts detailed in this guidance. The TNFD glossary will be updated with these definitions once the construction materials industry guidance is finalised, based on market consultation and feedback.

Table 16: Concepts and definitions

Concept	Definition
Dewatering of aquifers	Dewatering is the process of removal of any water that accumulates in earthwork excavations or below ground structures, as a result of, for example: • Intersecting aquifers; • Seepage of soil water/groundwater; or • Storm events or rainfall (including surface water runoff). Adapted from the US Environmental Protection Agency (2021) Water quality.
Biodiversity management plan	A Biodiversity Management Plan (BMP) is a risk management tool that covers the whole life of a quarry. It is a site-specific document that focuses on identifying, evaluating and conserving/enhancing all relevant aspects of biodiversity as well as prioritise values of biodiversity and other forms of land use that do not endanger the conservation of biodiversity. Given the dynamic nature of biodiversity, a BMP should be considered a living document, and reviewed and updated periodically. Source: GCCA (2020) Sustainability Guidelines for quarry rehabilitation and biodiversity management.
Buffer zone	The prime purpose of a buffer zone is to insulate areas where biodiversity conservation is the primary objective from potentially damaging external influences, and particularly from those caused by inappropriate forms of land use. Source: Bennet, G. and Mulongoy, K. J. (2006) Review of experience with ecological networks, corridors and buffer zones.
Quarry rehabilitation plan	A practical site-specific document developed and used by the site management team for organising the rehabilitation works. The Quarry rehabilitation plan is aligned with the mine plan and follows the principles, objectives and stages, as outlined in the respective Guideline. Rehabilitation plan is referred to also as restoration plan or reclamation plan. Source: GCCA (2020) Sustainability Guidelines for quarry rehabilitation and biodiversity management.

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