tnfd.global

Draft sector guidance

Engineering, construction and real estate

June 2024
Open for consultation and feedback

SICS® industries:
Engineering and construction services (IF-EN)
Home builders (IF-HB)
Real estate (IF-RE)
Real estate services (IF-RS)

Taskforce on Nature-related Financial Disclosures

Contents

1. INTRODUCTION 4

1.1. The purpose of this guidance 4

1.2. Audience for this guidance 6

2. SECTOR-SPECIFIC LEAP ASSESSMENT GUIDANCE 8

2.1. Scoping a LEAP assessment 8
Value chain considerations when scoping 9

2.2. Locate the organisation's interface with nature 11
L1: Span of the business model and value chain 11
L2: Dependency and impact screening 12
L3: Interface with nature 16
L4: Interface with sensitive locations 16

2.3. Evaluate dependencies and impacts on nature 18
E1: Identification of environmental assets, ecosystem services and impact drivers 18
E2: Identification of dependencies and impacts 18
E3: Dependency and impact measurement 30
E4: Impact materiality assessment 32

2.4. Assess nature-related risks and opportunities 33
A1: Risk and opportunity identification 33
A2: Adjustment of existing risk mitigation and risk and opportunity management 41
A3: Risk and opportunity measurement and prioritisation 41
A4: Risk and opportunity materiality assessment 41

2.5. Prepare to respond and report 42
P1: Strategy and resource allocation plans 42
P2: Target setting and performance management 48
P3: Reporting 48
P4: Presentation 48

3. SECTOR-SPECIFIC DISCLOSURE METRICS AND RELATED GUIDANCE – ENGINEERING, CONSTRUCTION AND REAL ESTATE 49

3.1. Proposed guidance on the application of the core global disclosure metrics 51

3.2. Proposed core sector disclosure indicators and metrics 64

3.3. Proposed additional sector disclosure indicators and metrics 66

4. REFERENCES 69

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 engineering, construction and real estate 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 engineering, construction and real estate 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 engineering, construction and real estate 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

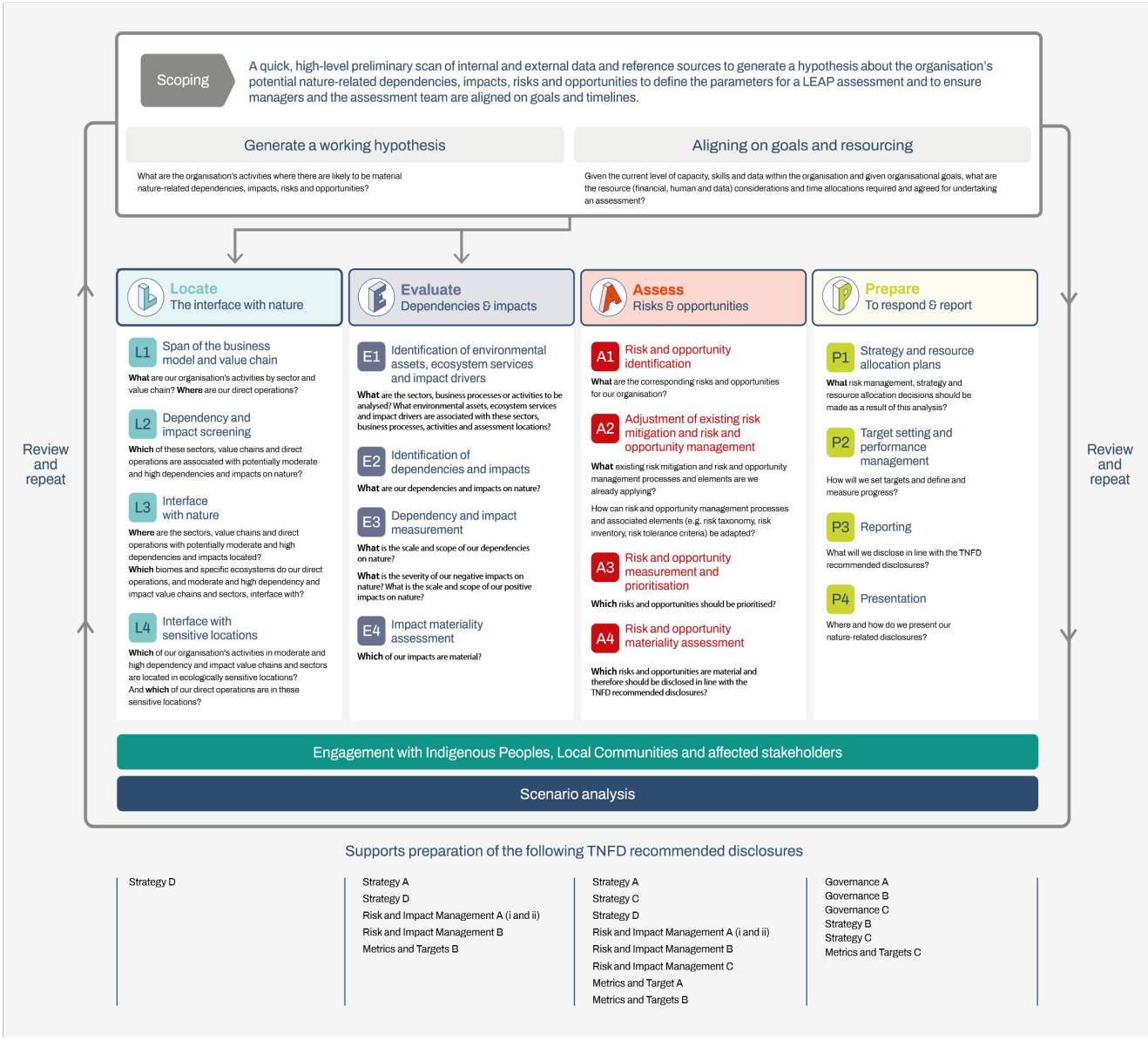
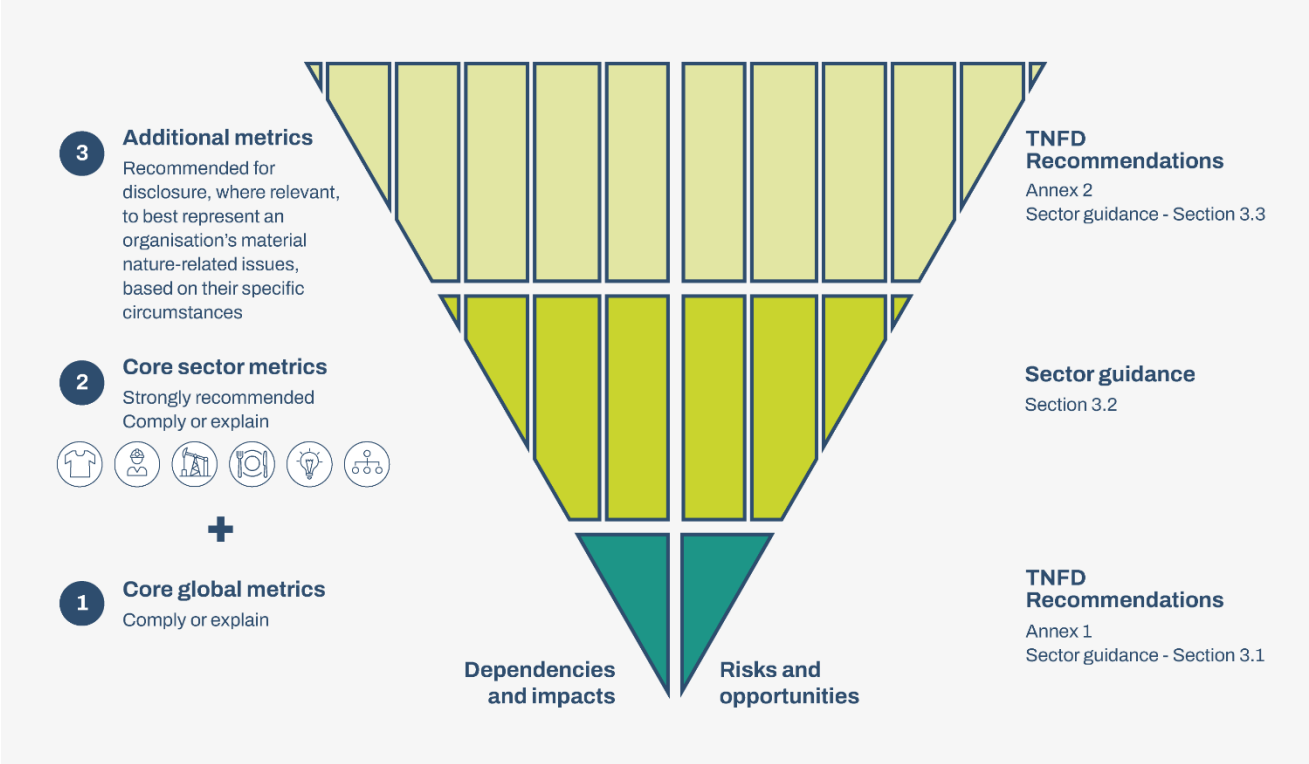


Figure 2: TNFD disclosure metrics architecture signposted to metrics lists



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. 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) Engineering & Construction Services, Home Builders, Real Estate and Real Estate Services industries.[1] These are referred to as 'engineering, construction and real estate organisations' in this guidance.

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

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

Engineering & Construction Services (IF-EN)

Home Builders (IF-HB)

Real Estate (IF-RE)

Real Estate Services (IF-RS)

This 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.

The examples provided in this guidance for the engineering, construction and real estate industry 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 engineering, construction and real estate industries in this guidance document

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

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 to be material nature-related dependencies, impacts, risks and opportunities?

In scoping the assessment, an organisation in the engineering, construction and real estate sector should consider which parts of the sector it operates in, both across the asset lifecycle (Table 2) and built environment systems (Table 3). These classifications can help guide the analysis of dependencies and impacts on nature. They are not mutually exclusive; they interact with each other.

Table 2: Engineering, construction and real estate sector asset lifecycle

Construction materials extraction and production	Strategic planning	Site selection	Design and materials selection	Construction	Operation, management and maintenance[2]	Demolition
Source: Adapted from Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.						

Table 3: Built environment systems

System	Definition
Buildings	Built structures for human habitation, work or cultural use, including all human-made constructions and materials, and the open (green) space(s) on site.
Urban infrastructure	All buildings and supporting infrastructure that underpin cities or towns, such as private and public construction; transport, sanitation and sewage systems; land areas; and telecommunications equipment installed in this urban matrix.
Transport infrastructure	The underlying system of public works designed to facilitate movement, consisting of fixed installations, including roads, railways, airways, waterways, canals, pipelines, stations and terminals. It excludes the use of the infrastructure such as cars, trucks and public transport.

[2] The operational phase of energy assets is covered by the TNFD electric utilities and power generators sector guidance.

System	Definition
Marine and coastal infrastructure	Infrastructure in marine and coastal environments, including offshore infrastructure (such as windfarms and drilling platforms), nearshore developments (such as land reclamation, artificial islands and aquaculture farms) and coastal infrastructure (such as dykes and other storm protection structures).
Source: WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system. See TNFD Glossary for original sources for these and other definitions of key concepts in this sector guidance.	

Value chain considerations when scoping

Engineering, construction and real estate 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. Engineering, construction and real estate organisations may therefore choose to start with a narrow scope to create 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.

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?

Aims

An organisation should consider how it aims to use the LEAP assessment. The LEAP assessment could be useful at all stages of the asset lifecycle.

An organisation could aim to use a LEAP assessment to influence project selection and design in the early stages of the project's lifecycle, and to influence management decisions in-year as nature-related dependencies, impacts, risks and opportunities evolve over time. It could also inform an organisation's decision on whether to involve itself in a project or not.

An analysis of dependencies, impacts, risks and opportunities at the design stage of the wider infrastructure system, and for individual assets, can help to ensure they are managed effectively and avoid locking in infrastructure projects and systems with adverse impacts or elevated risks. It also maximises the potential to use nature-based solutions to complement grey infrastructure. Considering infrastructure as a system of systems, informed by a LEAP assessment, allows trade-offs and synergies between different projects to achieve the most efficient allocation . Conversely, failure to consider nature-related issues at the outset and on an ongoing basis can increase maintenance and replacement costs.[3]

Data and stakeholders

The organisation should consider what existing nature, water or biodiversity strategies it has in place and what data are already collected as part of these policies and for regulatory compliance. This should include data collected from materials suppliers (e.g. Environmental Product Declarations or Materials Passports) as part of regulatory approvals

[3] UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

(e.g. Environmental Impact Assessments), and from other sustainability and supply chain engagement that may already provide information key to the LEAP approach.[4]

Key internal stakeholders will also need to be engaged, including members of the development, asset and portfolio management, procurement and sustainability teams.[5]

[4] Better Buildings Partnership (BBP) et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies.

[5] Better Buildings Partnership (BBP) et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies.

2.2. Locate the organisation's interface with nature

This section provides additional considerations to help engineering, construction and real estate organisations with the Locate phase of the LEAP approach.

L1: Span of the business model and value chain

Guiding questions:

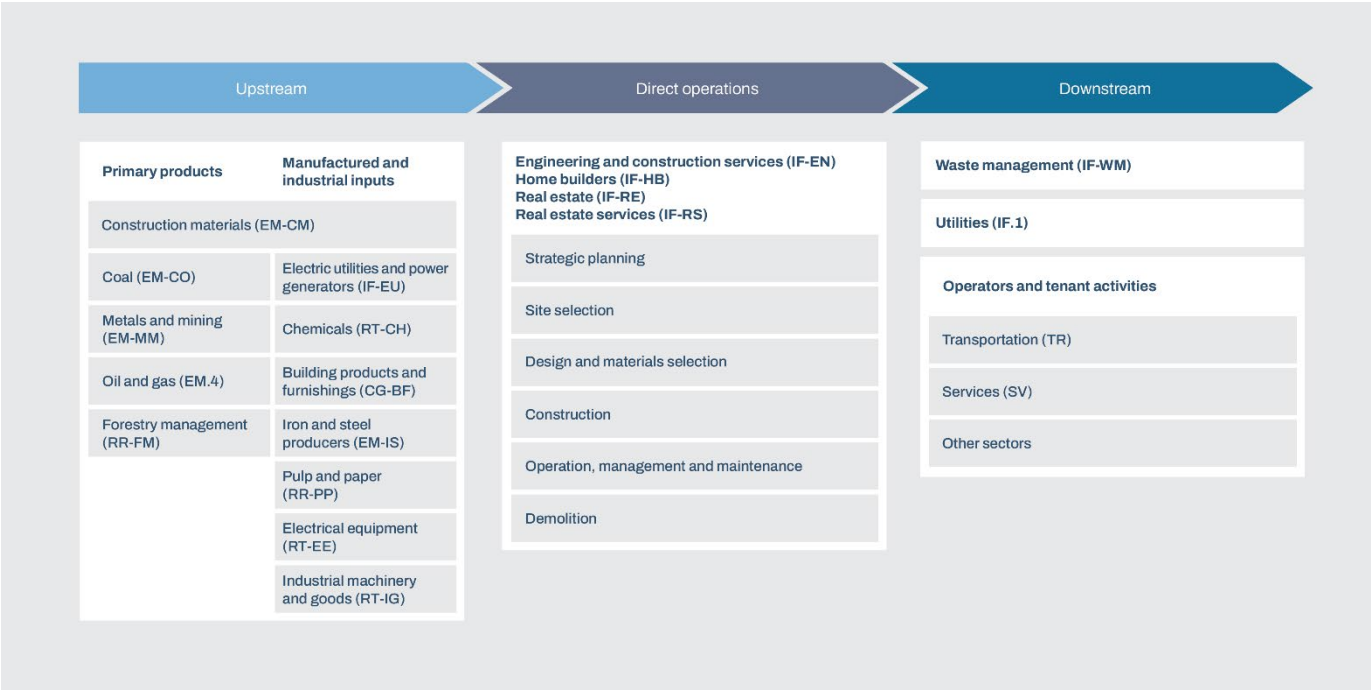
What are our organisation's activities by sector, value chain and geography?

Organisations in the engineering, construction and real estate sector should build on the analysis of where they sit in the built environment system to consider their full value chain. This should start by considering:

- The sectors in the upstream value chain and the typical tenants or operators of the assets created;
- The activities in which the organisation engages across the lifecycle of a building or infrastructure asset; and
- The commodities used to create the buildings and infrastructure assets the organisation is involved with. The organisation may want to focus particularly on commodities in the SBTN High Impact Commodity List and other standards such as the SASB Standards and the Living Building Challenge Red List of materials, including aluminium, copper, gypsum, iron, lead, sand, timber, brick, cement, concrete, carpet, glass, insulation products, rubber and steel.

Figure 3 provides examples of the other sectors that engineering, construction and real estate sectors typically interact with. Individual organisations may only operate in part of this value chain and sectors listed as direct operations may for some companies be upstream or downstream if they only participate in one part of the building lifecycle.

Figure 3: Typical industries in the value chain of the engineering, construction and real estate sector



An organisation should also list the projects and assets it is involved with (including everything contributing towards development, to ownership and operation). In principle, any project could be in scope, regardless of the lifecycle stage of the project or asset (including sites proposed for future development, under active development, or under ongoing management) or the size of the organisation's contribution to the project, the degree of control over the project or asset or its design, or the amount of time the organisation was on the site.

It is important to start with a broad list of sites. In order to understand dependencies and impacts in the Evaluate phase, an organisation should consider the cumulative impacts of all organisations, such as other contractors, who have been or are operating in the location or are interacting with the asset throughout its lifecycle. Given all the organisations that contribute to a single project that is, in turn, part of a wider system of infrastructure, it will not always be meaningful to isolate the contribution of one organisation. Nevertheless, it may be possible to differentiate the risks and opportunities to an individual organisation in the Assess phase. Understanding how the organisation sits within the wider set of organisations involved will be important to assess this.

For each of the assets and projects identified, the organisation should consider which sectors, value chains and commodities are associated with them. Where possible, this should include the sectors represented by tenants, or typically represented by tenants, if not known.[6]

Where are our direct operations?

Organisations should be able to delineate clearly the locations of the projects and assets in their direct operations that are in scope of the analysis, normally with polygons (e.g. GIS shape files with longitude and latitude coordinates or postcodes mapped using GIS tools, such as ArcGIS, QGIS or Google MyMap).

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?

Having mapped out the organisation's value chain and identified the locations of sites with which the organisation is involved, it should look to identify where there are potentially moderate and high dependencies and impacts.

In this sector, the organisation should prioritise:

- Sites in the value chain where there are activities highlighted as likely to be associated with elevated dependencies or impacts. The ENCORE materiality ratings in Tables 4 and 5 may be a useful reference for this;
- Sites in the direct operations that are using the Living Building Challenge Red List of materials;
- Value chains of commodities on the SBTN High Impact Commodity List and in the SASB sector standards, including aluminium, copper, gypsum, iron, lead, sand, timber, brick, cement, concrete, carpet, glass, insulation products, rubber and steel; and
- The activities of value chain partners in sectors highlighted as likely to be associated with elevated dependencies or impacts on nature. Again, the ENCORE materiality ratings in Tables 4 and 5 may be a useful reference for this.

Where an organisation is using timber, it should review the WWF Wood Risk tool to identify whether any timber value chains should be investigated further.

[6] BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies.

Table 4: Materiality ratings of ecosystem services in the engineering, construction and real estate value chain (based on ENCORE 2024 data)

Ecosystem services functionality		Steam and air conditioning supply	Remediation activities and other waste management services	Building completion and finishing	Construction of buildings	Construction of other civil engineering projects	Construction of roads and railways	Construction of utility projects	Demolition and site preparation	Electrical, plumbing and other construction installation activities	Other specialized construction activities	Real estate activities on a fee or contract basis	Real estate activities with own or leased property	Architectural and engineering activities and related technical consultancy	Specialized design activities
Provisioning services	**Other provisioning services**	N/A	N/A	N/A	Very low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Biomass provisioning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Water supply	High	Medium	Low	Medium	Medium	Medium	Medium	Low	Low	Medium	Very low	Very low	Low	Low
	Genetic material	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Regulating & maintenance services	**Solid waste remediation**	Low	Very high	ND	Very low	ND	ND	ND	ND	ND	Very low	N/A	N/A	N/A	Very low
	Soil and sediment retention	Very low	N/A	Medium	High	High	High	High	Medium	Medium	Medium	Medium	Medium	Medium	Very low
	Water purification	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	N/A	N/A	N/A	N/A
	Soil quality regulation	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Other regulating and maintenance service	Very low	Medium	N/A	Low	Low	Low	Low	Low	N/A	Very low	N/A	N/A	N/A	N/A
	Biological control	N/A	Very low	ND	ND	ND	ND	ND	ND	ND	ND	N/A	N/A	ND	ND
	Air Filtration	Very low	Very low	N/A	Very low	Very low	Very low	Very low	Very low	Very low	Very low	N/A	N/A	N/A	N/A
	Flood mitigation	Very low	Medium	Medium	Medium	High	High	Medium	Low	Medium	Medium	Very low	Very low	Very low	Very low
	Climate regulation	Very low	ND	ND	Medium	Medium	Medium	Medium	Medium	Very low	Very low	Very low	Very low	Very low	ND
	Nursery population and habitat maintenance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Noise attenuation	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low
	Other regulating and maintenance service	N/A	N/A	ND	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low

Ecosystem services functionality		Steam and air conditioning supply	Remediation activities and other waste management services	Building completion and finishing	Construction of buildings	Construction of other civil engineering projects	Construction of roads and railways	Construction of utility projects	Demolition and site preparation	Electrical, plumbing and other construction installation activities	Other specialized construction activities	Real estate activities on a fee or contract basis	Real estate activities with own or leased property	Architectural and engineering activities and related technical consultancy	Specialized design activities
	Local (micro and meso) climate regulation	Low	ND	ND	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
	Pollination	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Storm mitigation	Very low	Medium	Medium	Medium	High	High	Medium	Low	Medium	Medium	Low	Low	Low	Low
	Water flow regulation	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Low	Medium	Medium	Very low	Very low	Very low	Very low
	Rainfall pattern regulation	Medium	Medium	Very low	Very high	Very high	Very high	Very high	Very high	Very high	Very high	N/A	N/A	N/A	N/A
Cultural services	**Recreation related services**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Very high
	Visual amenity services	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Very high	Very high	N/A	Very high
	Spiritual, artistic and symbolic services	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Very high

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 5: Materiality ratings for impact drivers typically relevant for the engineering, construction and real estate value chain (based on 2024 version of ENCORE)

Drivers of nature change	Impact drivers	Steam and air conditioning supply	Remediation activities and other waste management services	Construction of buildings	Construction of other civil engineering projects	Construction of roads, railways	Other specialised construction activities	Building completion and finishing	Construction of utility projects	Demolition and site preparation	Electrical, plumbing and other construction installation activities	Real estate activities on a fee or contract basis	Real estate activities with own or leased property	Architectural and engineering activities and related technical consultancy	Specialised design activities
Land, freshwater and ocean use change	Land ecosystem use	ND	Medium	Low	Low	Low	Low	ND	Low	Low	Low	Low	Low	Medium	Medium
	Freshwater ecosystem use	Very low	ND	Medium	Very high	Medium	Medium	N/A	Very high	Medium	Low	N/A	N/A	N/A	N/A
	Ocean ecosystem use	N/A	ND	Medium	Medium	Medium	Medium	N/A	Medium	Medium	Medium	N/A	N/A	N/A	N/A
Climate change	Greenhouse gas (GHG) emissions	Very high	High	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Very low	Very low	Very low	Very low
Pollution/pollution removal	Non-GHG air pollutants	Very high	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Very low	Very low	Very low	Very low
	Emissions of toxic soil and water pollutants	Very low	Medium	High	High	High	High	High	High	High	Medium	Low	Low	Very low	Very low
	Emissions of nutrient soil and water pollutants	N/A	Medium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND
	Solid waste	High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Very low	Very low	Very low	Very low
	Disturbances	N/A	High	Very high	Very high	Very high	Very high	Medium	Very high	Very high	Medium	Low	Low	Very low	Very low
Resource use/replenishment	Water use	Medium	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Invasive alien species introduction/removal	Introduction of invasive alien species	N/A	Medium	Low	Low	Low	Low	Low	Low	Low	Low	N/A	N/A	N/A	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.

L3: Interface with nature

Guiding questions:

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

Organisations looking to identify the locations of the sources of their inputs should refer to the TNFD value chains guidance for further support on prioritisation and the degree of traceability required.

A first step may be to investigate the identities of the value chain partners and the extent of their operations, before locating specific sites, if necessary, with increasing precision (country, region, landscape), as appropriate.[7]

Trade data, environmental product declarations and materials passports can also help to map the likely countries of origin of materials.

Where primary data are not available, life cycle analysis data may provide insight into typical impacts associated with materials of interest, including downstream issues, such as the eventual impacts of disposal.

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

Organisations should refer to the TNFD biome guidance for further guidance when analysing their interfaces with these biomes. The guidance on urban and industrial ecosystems may be of particular interest to real estate sector organisations.

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?

Building on the assessments undertaken in L1 to L3, an organisation should assess whether activities are geographically located in ecologically sensitive locations:

- Anywhere in its direct operations; and
- In its assessed moderate and high dependency and impact value chains and sectors.

For locations in direct operations, some of the information may already have been identified through environmental impact assessments and regulatory processes at the inception of the project. Where this is not available – for example due to the age of the asset – a fresh assessment may be needed. As set out in the TNFD guidance on the LEAP approach, proximity to ecologically sensitive locations can be assessed remotely, using a range of datasets and interactive mapping tools, many of which are open access.

Organisations should iterate between the Evaluate and Locate phases to understand how each site might interface with sensitive locations outside the site boundary (e.g. through ecological connections such as water flows). The organisation may want to start with an arbitrary buffer zone, refining this over time as interconnections between different ecosystems and the ultimate sources of dependencies and locations of impacts are identified.

[7] BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies.

List of datasets and tools

Other than those already mentioned, the UKGBC's Embodied Ecological Impacts - Materials Map and supporting information can support a high-level screening of nature interfaces, highlighting hotspots for the extraction of a range of key construction materials.

2.3. Evaluate dependencies and impacts on nature

This section provides additional guidance to help engineering, construction and real estate 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?

The built environment is responsible for around 30% of all biodiversity loss across the globe,[8] the construction, maintenance and demolition of buildings is responsible for 40% of the solid waste produced in developed countries[9] and the construction of infrastructure is the main driver of resource use in emerging economies.[10]

When analysing dependencies and impacts on nature, an organisation should take account of the cumulative impacts of all the organisations involved in the design, construction and management of the asset over its lifecycle, and the dependencies at each stage. This holistic approach will provide a comprehensive understanding of the risks and opportunities that the organisation faces in the Assess phase.

An organisation should assess the situation on the site before the project started, be that brownfield or natural habitat, as the baseline for assessing the impacts of a project. Part of this assessment should include the ability of the ecosystem to absorb the impacts from the asset throughout its lifecycle or to continue to provide the ecosystem services on which the asset depends. Much of this information may already be available through environmental impact assessments. Projects on sites that have already been altered from their natural states will tend to have lower impacts, but may also be more vulnerable to the disruption of ecosystem services. Locating a project close to other infrastructure – above and below ground, or along development corridors – will tend to reduce the impacts on habitat connectivity and other aspects of nature. Developments in ecologically sensitive areas (as identified in L4) may have larger impacts and dependencies on nature, and compensating for such impacts may be more difficult.[11]

---

[8] Hamida, M. B., Jylhä, T., Remøy, H., and Gruis, V. (2022) Circular building adaptability and its determinants – A literature review. International Journal of Building Pathology and Adaptation. In Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.

[9] Bringezu, S., J. et al. (2017) Assessing global resource use: A systems approach to resource efficiency and pollution reduction.

[10] Oberle, B. et al. (2019) Global Resources Outlook 2019: Natural resources for the future we want.

[11] UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

Ecosystem degradation around the site can threaten the infrastructure if it leads to disruption to ecosystem services that the infrastructure depends on, leaving it exposed to increased risk, for example, of flooding, landslides, wildfires and other disasters and accidents. These can be exacerbated further by the effects of climate change and changes to ecosystem service provision elsewhere. For example, a disaster affecting other parts of the infrastructure system, or nature loss contributing to public health and/or economic crises, may lead to a reduction in demand for the infrastructure. An organisation assessing a project needs to consider how the project itself and the wider system around it may disrupt these ecosystem services and how nature might be protected and restored to ensure continued ecosystem service provision.[12]

The analysis should be considered on a landscape or ecosystem scale across relevant jurisdictions, taking account of the ecological linkages across locations. This is particularly important for dependencies and impacts on ecosystem services such as water supply and for impacts on migratory species whose ranges and habitats extend across borders and can be particularly affected by interruptions to habitat connectivity.[13]

Table 6 provides example negative impact pathways, Table 7 provides example positive impact pathways, and Table 8 provides example dependency pathways for the engineering, construction and real estate sector throughout the asset lifecycle.

[12] UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

[13] UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

Impacts

Table 6: Example negative impacts

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.1	Upstream	Sourcing of building materials	**Resource use/replenishment and others** (see TNFD construction materials guidance).	See TNFD construction materials guidance.	See TNFD construction materials guidance.
I.2	Construction	Land clearance for infrastructure and urbanisation	**Land, freshwater and ocean use change** Land ecosystem use: This is a major impact driver for this sector. The urban land area is projected to increase by 1.2 million km^2 by 2030, tripling the area in the year 2000.[14]	*Environmental assets* Land Terrestrial ecosystems	Land use change for development diminishes and fragments habitats, undermining the ecosystem services those habitats provide. Loss and fragmentation of habitat can separate animal populations from food and water sources, disrupt migration routes and limit the species' reproductive potential by dividing populations. Fragmentation is particularly an issue for linear infrastructure such as roads and railways, but applies to all types of development. General degradation of habitat can reduce regulating ecosystem services on which the development depends, for example increasing risks of flooding, landslides and storm damage.

[14] Seto, K. et al. (2012) Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.3	Construction	Creation of sealed surfaces	**Land, freshwater and ocean use change** Land ecosystem use: Buildings and the application of hard surfacing to land, such as for roads or parking.	*Environmental assets* Land Terrestrial ecosystems *Ecosystem services* Water supply Local climate regulation Water flow regulation	Buildings and sealed surfaces in cities can increase temperatures locally, affecting local species populations and human health. This can have knock-on impacts from increased energy use to air quality, and further impacts on health. It can also disrupt other ecosystem services such as water flow regulation and flood mitigation, while lack of soil permeability can affect water resources as aquifers are not recharged.
I.4	Construction	Various building processes	**Pollution/pollution removal** Water and soil pollutants: Chemical spills and accumulation of waste.	*Environmental assets* Marine, terrestrial and freshwater ecosystems Subterranean terrestrial and freshwater ecosystems Land and water resources Cultivated biological resources *Ecosystem services* Soil quality regulation Cultural services	Chemical spills can pollute waterways and the soil, changing the chemical make-up of the habitat, harming local species populations and undermining the provision of ecosystem services to local communities, such as soil quality maintenance and water purification. Accumulation of construction and other waste – including hazardous waste – can lead to the contamination of the soil. Construction of landfill sites is the most notable example of where this may occur.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.5	Construction	Construction machinery	**Pollution/pollution removal** Disturbances: Construction noise.	*Environmental assets* Marine, terrestrial and freshwater ecosystems *Ecosystem services* Genetic material Biomass provisioning Cultural services	Noise from construction machinery can affect human health and also disrupt local wildlife. The impact on wildlife may be particularly significant at times of the day important for animal communication, such as around dawn and dusk. This can disrupt reproduction, leading to declines in populations.
I.6	Construction	Various	**Resource use/replenishment** Water use: Construction processes can include significant water use extracted directly from marine and freshwater ecosystems or obtained indirectly through third party suppliers.	*Environmental assets* Marine and freshwater ecosystems Water resources *Ecosystem services* Water supply	Water extraction can lead to a decline in the extent and quality of the remaining water resources – affecting wildlife populations – and, where water is scarce, competition for water with other users.
I.7	Construction	Construction vehicle traffic	**Invasive alien species introduction/removal** Introduction of invasive alien species: Vehicles can spread plant pathogens and invasive species.	*Environmental assets* Terrestrial ecosystems *Ecosystem services* Genetic material Biomass provisioning Cultural services	Pathogens disrupt local species populations, leading to the degradation of location habitats, increasing costs for property managers who have to clear the species, or undermining local farmers' crop yields.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.8	Construction/real estate management	Landscaping	**Invasive alien species introduction/removal** Introduction of invasive alien species: Planting of non-native species on landscaped areas can inadvertently lead to problems with invasive species if these plants – or animals that have travelled with them – spread beyond the site.	*Environmental assets* Terrestrial ecosystems Marine ecosystems Freshwater ecosystems	Invasive alien species can displace native species and disrupt ecosystems, as well as increase costs for land managers who have to remove them.
I.9	Infrastructure operation	Ongoing management	**Invasive alien species introduction/removal** Introduction of invasive alien species: Linear infrastructure such as roads, railways and canals can facilitate the distribution of invasive alien species.	*Environmental assets* Terrestrial ecosystems Marine ecosystems Freshwater ecosystems	Invasive species can disrupt local ecosystems, increasing competition for established species and so increasing their extinction risk. This can have an eventual impact on the ecosystem services provided by that ecosystem.
I.10	Real estate management	Ongoing management	**Land, freshwater and ocean use change** Land ecosystem use: If habitats created as part of the construction process, and those surrounding the assets, are not well managed they can continue to degrade as a result of the disruption associated with being next to the asset.	*Ecosystem assets* Land Terrestrial ecosystems	The ongoing degradation of habitats can lead to the degradation of the ecosystems. This can have an eventual impact on the ecosystem services provided by that ecosystem.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.11	Real estate management	Tenant activities	**Pollution/pollution removal** Water and air pollutants, solid waste: Users of real estate produce pollutants to water, soil and air (e.g. sewage, particulate matter from heating and transport) and solid waste (e.g. packaging, food waste).	*Environmental assets* Atmospheric systems Marine ecosystems Land Terrestrial ecosystems Water resources Freshwater ecosystems	Urban growth leads to congestion, contributing to air pollution, and increased generation of waste, which if poorly managed, can pollute the air, water and soil. This can affect local species and human health. Impacts on water may be managed by treatment before release, including by third party sewerage companies. Understanding the effectiveness of this treatment is important to understand the magnitude of any impact.
I.12	Real estate management	Tenant activities	**Resource use/replenishment** Water and other resource use: Users of real estate consume water and other resources.	*Environmental assets* All *Ecosystem services* Genetic material Biomass provisioning Pollination Nursery population and habitat maintenance Soil quality regulation Cultural services	Unsustainable use of water can lead to declines in the state of the water bodies where the water is drawn from. This can undermine the provision of ecosystem services to others who use the water bodies, as well as the resilience of the species and other ecosystems that depend on the water body.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
I.13	Demolition	Demolition	**Land, freshwater and ocean use change** Land ecosystem use: Demolition changes the land use and structures on the land.	*Environmental assets* Terrestrial ecosystems	Demolition can lead to the loss of habitats that have developed over time around the infrastructure. This can lead to a loss of, or disruption to, species populations that live in the area.
I.14	Demolition	Demolition	**Pollution/pollution removal** Water and soil pollutants; solid waste: Failure to manage demolition waste well can lead to pollution.	*Environmental assets* Land Water resources Terrestrial, freshwater and marine ecosystems	Demolition generates significant amounts of waste. Some will escape immediately into the wider area as dust, for example. The remainder needs to be processed – and preferably reused or recycled – to avoid contributing further to the contamination of water and soil that can affect human health – increasing costs for other users of the assets – and disrupt local wildlife populations. The size of impacts will be related to the materials in the building. Organisations should particularly consider whether the building contains any toxic or other hazardous waste. For example, those listed in the Living Building Challenge Red List of materials.

Source: Adapted from Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper; WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

Positive impacts

Table 7: Example positive impacts

	Asset lifecycle stage	Business activity	Driver of nature change	Example environmental assets and ecosystem services affected	Description
I.15	Construction	Green space creation	**Land, freshwater and ocean use change** Land ecosystem use: Green space creation and landscape restoration. Building of animal crossing points for linear infrastructure and joining up urban green spaces.	*Environmental assets* Land Terrestrial ecosystems Atmospheric systems *Ecosystem services* Biomass provisioning Soil and sediment retention Flood mitigation Local climate regulation Storm mitigation Air filtration Noise attenuation Cultural services	Green spaces can boost human health and wellbeing and community cohesion. Greenery can also support air quality through improved filtration, mitigate the urban heat island effect and help to mitigate floods and storms and soil erosion. Green space can also support local species by providing habitat and improving connectivity between habitats.
I.16	Construction	Land decontamination	**Pollution/pollution removal** Soil pollutant removal: Decontaminating land to make it usable.	*Environmental assets* Land Terrestrial ecosystems	Building on brownfield sites often requires remediation or decontamination of the soil to make it usable. This represents an improvement to the natural environment, with the potential for improved ecosystem service provision around the asset.

	Asset lifecycle stage	Business activity	Driver of nature change	Example environmental assets and ecosystem services affected	Description
Source: Adapted from Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.					

Dependencies

Table 8: Example dependencies

	Business activity	Environmental assets and ecosystem services depended on	Description
D.1	Sourcing of building materials	*Environmental assets* Underwater mineral and energy resources Cultivated biological resources Mineral and energy resources *Ecosystem services* Biomass provisioning Other provisioning services	See TNFD construction materials guidance.

	Business activity	Environmental assets and ecosystem services depended on	Description
D.2	Construction	*Environmental assets* Water resources *Ecosystem services* Water supply Water flow regulation	Construction depends on a reliable supply of water, including surface water and precipitation.[15]
D.3	Construction	*Environmental assets* Land	The sector relies on the availability of land for development. This may be scarce where projects are near valuable habitats as legal protections tighten and social constraints on expansion increase.[16]
D.4	Real estate management	*Environmental assets* Marine, terrestrial and freshwater ecosystems Land *Ecosystem services* Soil and sediment retention Flood mitigation Storm mitigation	Vegetation and coastal ecosystems like mangroves and dunes mitigate risks of natural hazards including floods and storms and protect against landslides or soil erosion.

[15] WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

[16] WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

	Business activity	Environmental assets and ecosystem services depended on	Description
D.5	Real estate management	*Environmental assets* Marine, terrestrial and freshwater ecosystems *Ecosystem services* Local climate regulation	Healthy ecosystems help to mitigate the urban heat island effect, reducing cooling costs and improving the wellbeing of users of the urban space.
D.6	Real estate management	*Environmental assets* Land Terrestrial ecosystems *Ecosystem services* Air filtration Noise attenuation Cultural services	Ecosystem services provided by urban green and blue space can help create an attractive, healthy environment for potential tenants and buyers.
D.7	Real estate management	*Environmental assets* Water resources *Ecosystem services* Water supply Water purification Water flow regulation	Operations of real estate assets depends on a regular supply of clean water for tenants or potential buyers. This may come via a water utility, but they in turn will depend on their own access to water resources.

Source: Adapted from Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper; WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

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?

An organisation should look to estimate a dependency or impact over the lifecycle of the asset, during the reporting period and forecast for the remainder of the asset's lifespan. Understanding each of these allows an evaluation of how the situation has evolved since the initial plans were drawn up, the emerging risks and opportunities (in the Assess phase) and whether the management approach needs to change to manage the dependencies and impacts (in the Prepare phase).

The analysis should start with an assessment of the state of nature in the location before the asset was constructed and the expected impacts over its lifetime. Information may be available from environmental impact assessments and other reports produced to support regulatory approvals. Assessment should include any positive impacts or efforts to protect ecosystem services, through for example ecosystem protection, restoration or regeneration.

The organisation should consider whether the aspects of nature captured in the initial environmental impact assessment are still the right priorities. For example, there may have been changes in the status of certain species populations in the area since the infrastructure was built.

If the project is still at the design phase, the organisation should consider whether all the dependencies and impacts on nature are being captured and if there is an appropriate measurement and monitoring framework in place. Some jurisdictions have regulated metrics in place to assess changes in the state of nature as a result of a projects. The UK government's Statutory Biodiversity Metric (Box 2) is one example. This and similar metrics can also be applied more widely, either for internal assessment, or disclosure as an additional metric in the TNFD metrics architecture.

The analysis of the initial impact of the project should include assessments of the impact on connectivity and fragmentation, including:

- Whether the project is in a sensitive location, particularly if it crosses animal migration routes or the habitat of threatened species;
- The presence of wildlife crossings, elevated walkways, tunnels and green bridges; and
- The presence of acoustic and visual barriers to mitigate disturbances to wildlife.

The organisation should then consider the current state of the dependencies and impacts, including the state of nature, during the reporting period. Potential metrics for assessing impact drivers are listed in Section 3. Assessment of the state of nature could include populations of key species; the extent to which impact mitigation measures – such as crossing points – are being used; and the success of restoration efforts to maintain and improve environmental assets and ecosystem services. Wildlife and plant monitoring can make use of movement sensors, camera traps at crossing points, direct counts of certain species or satellite assessment of the degree of greenery.

Finally, an organisation should review the forecast dependencies and impacts for the remainder of the asset's lifespan. This includes an understanding of any external factors identified that may have changed since the asset was initially constructed. For example, the impacts of climate change on the availability of water or the ability of the natural ecosystem to mitigate flood risks.

Box 2: Biodiversity net gain in England

New developments in England are required to achieve 10% biodiversity net gain. This means that a development must result in more or better-quality natural habitat than there was before the development.

The legislation establishes a standardised metric for assessing the value of a habitat before and after development, depending on its size, quality, location and type. A development must work with an ecologist to calculate the number of biodiversity "units" that are on site before the development and that are needed to replace the units of habitat lost and to achieve a 10% gain.

The metric measures all types of terrestrial habitat, including grassland, hedgerows, lakes, woodland and watercourses such as rivers and streams. It ascribes a value to the habitat based on its size, condition, strategic significance and type.

For the habitats created or enhanced to achieve the 10% net gain, the formula also takes account of the difficulty of creation or enhancement, the time it takes a habitat to reach its target condition and the distance from the habitat lost as a result of the development.

Through site selection and layout, developers should avoid or reduce any negative impact on biodiversity onsite. To achieve the 10% net gain, they can first create or enhance new habitat onsite. If the developer cannot achieve all the biodiversity net gain onsite, they can deliver it through a mixture of onsite and offsite activity. Developers can either make offsite biodiversity gains on their own land outside the development site or buy offsite biodiversity units on the market. If developers cannot achieve onsite or offsite biodiversity net gain, they must buy statutory biodiversity credits from the government. This should be a last resort. The government will use the revenue from the sale of biodiversity credits to invest in habitat creation. Developers can combine all three options, but must follow the steps in order.

Offsite habitat creations and enhancements, as well as significant onsite habitats, must be legally secured for 30 years.

Source: DEFRA (2024) Calculate biodiversity value with the statutory biodiversity metric; DEFRA (2024) Understanding biodiversity net gain.

The priority should be measuring the dependencies and impacts on nature of individual projects, but an organisation may also wish to aggregate its impact drivers during the reporting period. In doing so, an organisation should distinguish the impact drivers it directly causes – e.g. the land cleared by the organisation or occupied by the components of the infrastructure built by the organisation – from the cumulative impact drivers of other organisations also involved in a project, to the extent possible. Both should be measured in order to give a full picture of the organisation's impact: it will often not be meaningful to allocate the different aspects of a piece of infrastructure to individual contributors. For example, if one organisation has built a railway and another has built the fencing alongside it, it is not meaningful to allocate the fragmentation to one organisation or the other.

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.

List of datasets and tools

The following tools can help organisations in the engineering, construction and real estate sectors with the Evaluate phase of LEAP:

- Environmental DNA (eDNA) assessments and monitoring

2.4. Assess nature-related risks and opportunities

This section provides additional considerations to help engineering, construction and real estate 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?

Table 9 and Table 10 provide examples of the sorts of nature-related risks and opportunities for an organisation that may arise from dependencies and impacts on nature identified in the Evaluate phase.

Table 9: Illustrative nature-related risks and opportunities arising from impacts for the engineering, construction and real estate sector

Asset lifecycle stage	Impact		Risk/opportunity	Classification
All		General	**Risk:** Increased nature monitoring costs to understand and manage impacts over the building lifecycle.	Transition: Policy, market, reputational
			Opportunity: Increased recognition of circular economy strategies like building reuse.	Sustainability performance: Sustainable use of natural resources
			Opportunity: Early and ongoing engagement with Indigenous People, Local Communities and stakeholders to inform designs and projects.	Sustainability performance: Sustainable use of natural resources
			Opportunity: Greater protection of cultural value and cultural boundaries, be that a site or site features.	Sustainability performance: Ecosystem protection, restoration and regeneration
Construction	I.1	Impacts associated with production of building materials.	**Risk:** Increased investor requests for reporting on nature-related risks upstream, potentially with a particular focus on timber from native forests or that host endangered species.	Transition: Market
			Risk: Increased demand from customers and investors for timber and other materials that are certified to a certain sustainability standard.	Transition: Market
			Risk: Limits on access to and increased cost of high impact supply chain products, or products from habitats associated with threatened species due to additional regulatory requirements or customer demands. For example, the Australian state of Victoria has banned logging of old-growth forest.	Transition: Policy, market

Asset lifecycle stage	Impact		Risk/opportunity	Classification
			Opportunity: Increased demand for properties made with low impact, low toxicity, circular materials.	Business performance: Products and services
			Opportunity: Using construction materials more efficiently will lower construction costs and lower the asset's embedded impacts on nature.	Business performance: Resource efficiency
			Opportunity: Increased use of recycled or biodegradable materials.	Sustainability performance: Sustainable use of natural resources
			Opportunity: Shift in materials away from those associated with the highest impacts on nature and towards those with cultural and nature-related co-benefits.	Sustainability performance: Sustainable use of natural resources
			Opportunity: Indigenous and local suppliers and materials are sought and incorporated in projects.	Sustainability performance: Sustainable use of natural resources
			Opportunity: Recognition of traditional land use rights in planning and developments, including supporting ecological and cultural preservation.	Sustainability performance: Ecosystem protection, restoration and regeneration
	I.2	Land clearance, habitat fragmentation and degradation.	**Risk:** Increased regulation on building design, locations, etc. to meet GBF and other targets, restricting ability to clear land for new sites and increasing costs (e.g. required rerouting of infrastructure or densification of urban areas).	Transition: Policy
			Risk: Land previously banked and approved for development sees additional protections applied, restricting the planned habitat clearance.	Transition: Policy

Asset lifecycle stage	Impact		Risk/opportunity	Classification
			Risk: Developments require additional habitat compensation measures as investor, customer, tenant and community expectations change.	Transition: Market
			Risk: Negative associations of the company with high degrees of land conversion and habitat degradation lead to limited access to new sites.	Transition: Reputational
			Opportunity: Buffer zones with restored habitats created around built environments.	Sustainability performance: Ecosystem protection, restoration and regeneration
	I.3	Sealed surfaces increasing temperatures and flood risk, and reducing recharge of water resources.	**Risk:** Increased local temperatures; rates and severity of flooding, storm damage and landslides; disruption to access to water resources for construction projects and tenants.	Physical: Acute and chronic
	I.4	Contaminated soil and water from spills and waste accumulation.	**Risk:** Increased pollution remediation and waste disposal requirements; costs of fixing past inappropriate waste disposal.	Transition: Policy
			Risk: Negative associations of the company with poor management of polluting substances limits access to new sites.	Transition: Reputational
			Risk: Retrospective litigation for toxification of water or soil as a result of poor management.	Transition: Liability
	I.5	Noise disruption to wildlife.	**Risk:** Increased noise monitoring and management costs as interest increases in limiting impact on nature.	Transition: Policy, market
			Risk: Association of the company with poor noise management limits access to new sites.	Transition: Reputational

Asset lifecycle stage	Impact		Risk/opportunity	Classification
	I.6	Depletion of water resources.	**Risk:** Increased investment required in water efficiency measures to address demands to reduce water use.	Transition: Policy, market
			Risk: Association of the company with poor water management limits access to new sites.	Transition: Reputational
			Opportunity: Installation of water efficiency measures may save costs.	Business performance: Resource efficiency
	I.7	Disruption to ecosystems due to vehicles spreading of plant pathogens.	**Risk:** Increased vehicle cleaning costs to mitigate potential spread of pathogens.	Transition: Policy, market
			Risk: Association of the company with poor control on spread of invasive alien species limits access to new sites.	Transition: Reputational
Construction/real estate management	I.8	Disruption to ecosystems due planting of non-native species on landscaped areas.	**Risk:** Potential requirement to have more diverse, local plants, which may increase initial purchase and ongoing maintenance costs, particularly if these plants are less resilient to climate change.	Transition: Policy, market
			Risk: Association of the company with poor choices of plants in landscaping projects limits access to new sites.	Transition: Reputational
			Risk: Litigation for clearance costs of invasive alien species introduced to others' sites.	Transition: Liability
Infrastructure operation	I.9	Disruption to ecosystems due to introduction invasive alien species by linear infrastructure users.	**Risk:** Reduced use of the infrastructure as users face increased costs to avoid spreading invasive alien species, reducing potential revenue from infrastructure construction.	Transition: Policy, market
Real estate management	I.10	Ongoing habitat degradation on and around sites.	**Risk:** Increased maintenance costs as a result of regulation or tenant expectations.	Transition: Policy, market
			Risk: Association of the company with poor habitat maintenance limits access to new sites and deters potential tenants.	Transition: Reputational

Asset lifecycle stage	Impact		Risk/opportunity	Classification
	I.11	Contamination of air, water bodies and soil due to congestion, improper sewage treatment and improper disposal of waste.	**Risk:** Increased regulation of water pollution increases sewerage prices.	Transition: Policy
			Risk: Association of the company with poor pollution management reduces interest from potential tenants.	Transition: Reputational
	I.12	Depletion of water resources.	**Risk:** Areas of water scarcity see increased restriction on water use or competition for the water that is available, pushing up prices.	Transition: Policy, market
			Opportunity: Adopt micro-irrigation practices for landscaped area to reduce water use and costs while maintaining plant health.	Business performance: Resource efficiency
Demolition	I.13	Destruction of built environment habitats.	**Risk:** Increased interest in preservation of habitats shifts interest to more building rehabilitation and renovation and away from demolition.	Transition: Policy, market, technology
	I.14	Contamination of water bodies and soil due to improper waste management.	**Risk:** Association of the company with poor pollution management limits access to demolition contracts.	Transition: Reputational
Construction	I.15	Green space creation, improving environmental quality and protection from floods, storms and soil erosion, as well as providing amenity value.	**Opportunity:** Increased demand for properties with access to green space.	Business performance: Markets
	I.16	Soil decontamination to enable building.	**Opportunity:** Rehabilitating sites, removing waste and pollution so that the site is safe for development and also providing benefits to the surrounding environment.	Sustainability performance: Ecosystem protection, restoration and regeneration

Asset lifecycle stage	Impact	Risk/opportunity	Classification
Source: Adapted from BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies; Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper; WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.			

Table 10: Illustrative nature-related risks and opportunities arising from dependencies for the engineering, construction and real estate sector

Asset lifecycle stage	Dependency		Risk/opportunity	Classification
Construction	D.1	Sourcing of building materials	**Risk:** Limits on access to and increased cost of high impact supply chain products, or products from habitats associated with threatened species due to faltering ecosystems slowing their production.	Physical: Chronic
	D.2	Water supply	**Risk:** Risk of disruption to access to water as the water cycle is disrupted by climate change and other actors' withdrawals, holding up construction.	Physical: Chronic
			Opportunity: Installation of water efficiency measures may save costs.	Business performance: Resource efficiency
	D.3	Land availability	**Risk:** Tighter land protection for at-risk species, including tougher planning rules for sites near endangered species or high-value ecology, limits sites available for development and increases costs.	Transition: Policy
			Risk: Land that was previously banked for future development may now contain protected or threatened species as a result of other changes in the state of nature or reclassification of species, requiring pauses in construction.	Transition: Policy
Real estate management	D.4	Protection from floods, storms, landslides and soil erosion	**Risk:** Landslides, storm damage and flooding due to loss of protective ecosystems, both as a result of wider degradation and the company's actions (e.g. habitat conversion, soil sealing).	Physical: Acute

Asset lifecycle stage	Dependency		Risk/opportunity	Classification
			Risk: Soil erosion undermining foundations of assets as a result of loss of ecosystems that retain the soil, increasing maintenance costs and reducing asset value and usability.	Physical: Chronic
			Opportunity: Engineering companies may be able to develop new products and services integrating nature and ecosystem services to – at least in part – substitute for grey infrastructure, for example for flood and storm protection and prevention of soil erosion.	Business performance: Products and services.
	D.5	Mitigation of urban heat island	**Risk:** Increased cooling costs as habitat degradation and hard surfacing exacerbates urban heat island effect.	Physical: Chronic
			Opportunity: Increased demand for properties with access to green space and therefore moderated temperature and reduced operating costs.	Business performance: Resource efficiency
	D.6	Benefits of green and blue space to air quality, noise mitigation and cultural value	**Risk:** Reduced value of urban assets due to pollution or lack of green space deterring potential tenants and buyers.	Physical: Chronic
			Opportunity: Increased demand for properties with access to green space.	Business performance: Products and services
			Risk: Increased costs to fund onsite and offsite revegetation and regeneration or other nearby green or blue urban regeneration due to customer and regulatory demands.	Transition: Policy, market
	D.7	Water supply	**Risk:** Risk of disruption to access to water as the water cycle is disrupted by climate change and other actors' withdrawals.	Physical: Chronic

Source: Adapted from BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies; Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper; WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

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 engineering, construction and real estate 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 11 provides examples of risk and impact mitigation measures that engineering, construction and real estate organisations may want to consider. Further mitigation measures can be found in sector standards such as BREEAM, Envision, FAST, GRESB, IFC Performance Standards, LEED, SITES and SuRe.

Some solutions will require collaboration with governments, local landowners and managers, residents and Indigenous Peoples and Local Communities in order to transform the built environment system and collectively manage environmental assets.

Organisations should apply the mitigation hierarchy to any actions. This is defined as:

- **Avoid**: Measures taken to avoid creating impacts from the outset (including direct, indirect and cumulative impacts), such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
- **Reduce or minimise**: Measures taken to reduce the duration, intensity and/or extent of impacts (including direct, indirect and cumulative impacts) that cannot be completely avoided, as far as is practically feasible.
- **Rehabilitate/Restore**: Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/or minimised.
- **Offset:** Measures taken to compensate for any significant residual, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss or preferably a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity.
- **Compensation**: Measures to recompense, make good or pay damages for loss of biodiversity caused by a project that falls short of achieving no net loss or a net gain. This may occur if conservation actions have been planned to achieve no net loss, losses and gains of biodiversity have been quantified or there is no mechanism is in place for long term implementation. This may also be relevant in situations where it is impossible to offset the impacts or compensation payments are used for training, capacity building, research or other outcomes that will not result in measurable conservation outcomes on the ground.[17]

Organisations should also apply the proximity principle to any habitat restoration actions. This means that onsite gains should be prioritised. Only where these have been exhausted or are unachievable should offsite local enhancements be considered, continuing to prioritise actions as near to the development sites as possible.[18] Some

[17] BBOP. The mitigation hierarchy; SBTN. Step 4. Act.

[18] Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.

jurisdictions have statutory methods in place to manage the implementation of the mitigation hierarchy and to achieve net gain.

Across all these, organisations should consider opportunities to transform their business model and to drive changes to underlying systems to address drivers of nature loss more generally.[19]

Organisations may also find it useful to refer to the management and mitigation strategies and actions for various asset lifecycle stages in Table 11. This maps a non-exhaustive list of actions in this sector against relevant risk/impact and TNFD's interpretation of SBTN's AR3T framework, (pending alignment with future development of SBTN's Step 4 guidance), which covers mitigation hierarchy principles when determining responses to identified nature-related issues.

Figure 4: The SBTN AR3T framework

[19] SBTN. Step 4. Act.

Table 11: Illustrative priority and transformative actions for the engineering, construction and real estate sector mapped to the AR3T framework

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
All	Risks associated with increased nature reporting and monitoring costs.	Collaborate with initiatives to develop centralised nature-related datasets, incorporating spatial data, traditional land uses and standardised measurement methods.			
Construction	Risks associated with dependencies and impacts in the supply chain.	Maximise reuse and recycling of construction materials.			
		Prioritise re-use and retrofitting of building and infrastructure over demolition.			
		Adopt circular economy practices for new builds and renovations.			
		Design to maximise the lifetime of new buildings and infrastructure.			
		Embed nature-related criteria within procurement strategies and materials briefs to influence upstream behaviours.			
		Minimise use of high impact commodities where suitable alternatives are available.			
		Assess, monitor and regulate the supply chain to avoid illegal logging.			
		Avoid timber from forests of high ecological value.			
	Risks and impacts associated with land use change and habitat loss.	Avoid development in sensitive locations. Prioritise development on land of limited natural value.			
		Minimise further habitat conversion through development of infill sites, densification and building on previously converted areas.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
		Work to protect the ecological and biodiversity value of habitats on and adjacent to sites, during and post-construction.			
		Where impacts on habitats or wildlife are unavoidable, commit to actions and strategies to achieve measurable positive outcomes for biodiversity. Deliver net gains for biodiversity via on-site action wherever possible. Only consider offsite actions once on-site options are exhausted, and for value chain impacts.			
		Establish and maintain landscape corridors, ecological connections and animal crossings for linear infrastructure. Prioritise strategically significant locations (e.g. in line with government nature connectivity plans).			
	Risks and impacts associated with pollution and construction waste.	Introduce waste reduction measures.			
		Adopt pollutant management best practices.			
		Seek to ensure nutrient neutrality for all new developments.			
	Risks and impacts associated with noise.	Adopt noise control best practices.			
		Invest in new technologies with lower noise impacts.			
	Risks and impacts associated with access to and use of water.	Introduce water efficiency measures.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
Construction/ Infrastructure operation	Risks and impacts associated with spread of invasive alien species and pathogens.	Adopt best practices to limit spread of invasive species and pests.	■		
Construction/ real estate management	Risks and impacts associated with introduction of non-native plants.	Integrate more diverse, native species into landscaping. Avoid potentially invasive species.	■		
Real estate management	Risks and impacts associated with habitat degradation and ecosystem service loss around sites.	Invest in the protection, conservation, regeneration and restoration of surrounding ecosystems to maintain ecosystem service provision.		■	
		Invest in urban green space to moderate the urban heat island effect.		■	
		Create new urban green and blue spaces to create ecosystem services for all.		■	
	Risks and impacts associated with waste and pollution.	Improve water treatment facilities.	■		
	Risks and impacts associated with access to and use of water.	Introduce water efficiency measures and rainwater harvesting.	■		
		Work with tenants to reduce water demands.	■		
Demolition	Risks and impacts associated with habitat losses.	Adapt business practices to preserve habitats where possible.			■

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
	Risks and impacts associated with pollution and waste.	Adopt best practices for pollution management.	■		
All – Business transformation options.		Screen for priority habitats and consider impacts on nature at the design stage.	■		■
		Consider nature-based solutions as an alternative or complement to grey infrastructure, e.g. for flood risk mitigation.		■	■
		Consider initial and ongoing impacts on nature at the design stage, and build in mitigation measures.	■		■
		Collaborate with Indigenous People, Local Communities and stakeholders, and engage the local community and neighbours to minimise local development impacts.	■		■
		Promote tougher planning rules for sites near endangered species or high-value ecology.	■		■

Source: BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies; Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper; WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system.

P2: Target setting and performance management

Guiding question:

How will we set targets and define and measure progress?

Section 3 includes metrics that organisations may find useful to define and measure progress. Organisations may wish to refer to the target-setting methods developed by the Science Based Targets Network.

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.

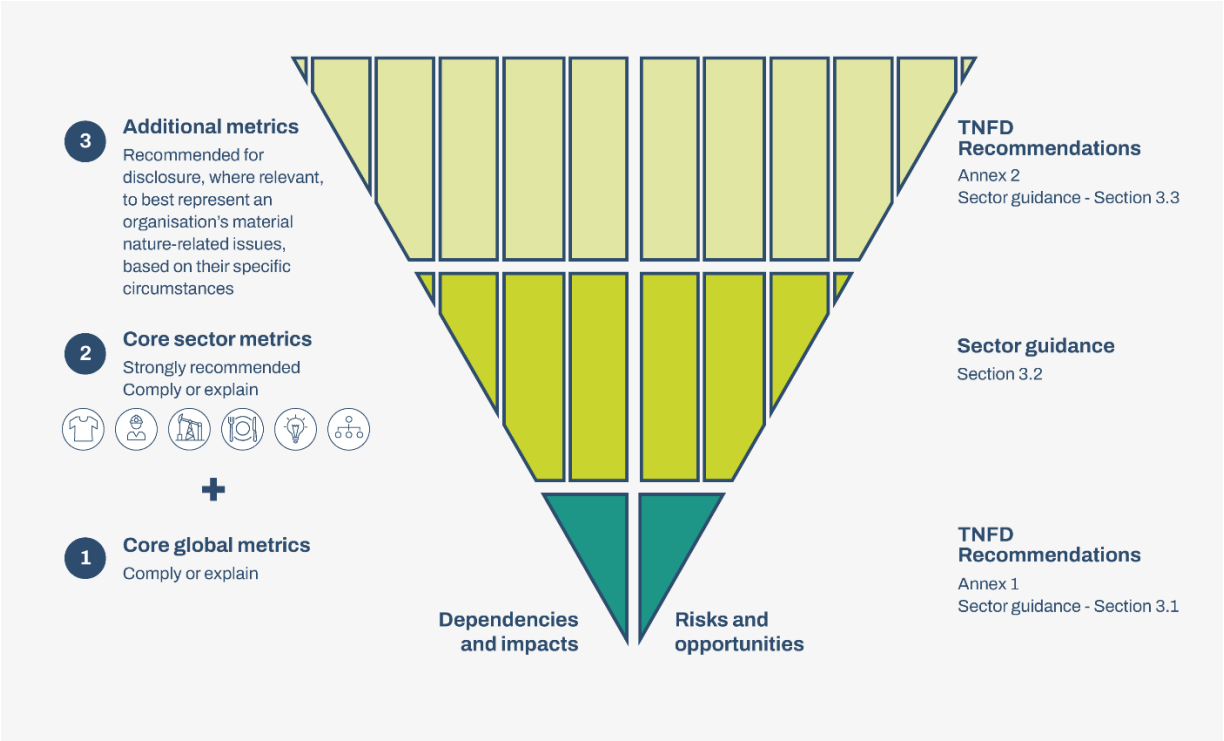
3. Sector-specific disclosure metrics and related guidance – Engineering, construction and real estate

Sector-specific metrics form an important part of the TNFD's measurement architecture (see Figure 5). 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 engineering, construction and real estate sector. It includes:

- Guidance on the application of the core global disclosure indicators and metrics to the engineering, construction and real estate sectors (Section 3.1); and
- Core and additional disclosure indicators and metrics for the engineering, construction and real estate sectors (Sections 3.2 and 3.3).

Figure 5: 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 engineering, construction and real estate sectors 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. Proposed 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 engineering, construction and real estate 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 engineering, construction and real estate 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 12: 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 Disclosure Standard.	No further sector specific guidance. Refer to the core global metric guidance.	TNFD
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).	Spatial footprint under this core global disclosure metric should include land owned, leased or managed.	GRI 101 (2024) Disclosures 101-5, 101-7 and 101-2

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[20], and • Type of business activity.	**Engineering and construction services; Home builders** Land-use change reported under the core global disclosure metric should distinguish land-use changes by the land use before the development started: brownfield sites, undeveloped land, farmland, wetland etc. **Real estate; Real estate services** No further sector specific guidance. Refer to the core global disclosure metric. 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.	SASB Standard (2023) Disclosure EM-CM-160a.2; GRI 101 (2024) Disclosure 101-6; Adapted from SITES v2 Rating System for Sustainable Land Design and Development

[20] 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 between conservation and restoration of area: • Owned, leased or managed; and • Beyond value chain mitigation. An organisation should additionally report changes that do not meet the definition of conserved or restored, such as area of land that has been decontaminated. [21] An organisation should report area conserved and restored separately, if data is available.	TNFD
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,[22] and • Type of business activity.	In reporting this core global disclosure metric, an organisation should refer to how the TNFD definition of sustainably managed has been interpreted in practice, including any standards adhered to and certifications applied.	TNFD

[21] An organisation may also refer to the IUCN Restoration Intervention Typology for Terrestrial Ecosystems.

[22] 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.	**Engineering and construction services; Home builders** No further sector specific guidance. Refer to the core global disclosure metric. **Real estate; Real estate services** Pollutants to report under this core global disclosure metric include: • Pesticides used in landscaped areas by toxicity hazard level (either extremely hazardous, highly hazardous, moderately hazardous, slightly hazardous, or unlikely to present an acute hazard); • Chemical nitrogen fertilisers used in landscaped areas by source (tonnes of nitrogen); and • Mineral phosphorus fertilisers used in landscaped areas by source (tonnes of phosphorus).	TNFD

C2.1	Wastewater discharged	Volume of water discharged (m^3), split into: • Total • Freshwater; and • Other.[23] 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.	**Engineering and construction services; Home builders** When reporting this core global disclosure metric for construction projects, an organisation should break down discharges by: • The volume from point sources and the volume from non-point sources; and • Destination (surface water, groundwater, seawater, or third parties (e.g. the sewerage network, other users)). Organisations should include an estimate or measurement of unintended discharges, including water not accounted for across withdrawal, consumption and discharge, and by type of discharge, to the extent known. Pollutants to report under this core global disclosure metric should include concrete washwater and per- and polyfluorinated substances (PFAS). **Real estate; Real estate services** When reporting this core global disclosure metric for properties under management, an organisation should include: • The floor area (m2 and % of total) for which the organisation has discharge data and the volume discharged from that area; • For the area for which there are discharge data: o the volume of wastewater discharged without treatment;	GRI 303 (2019) Disclosure 303-4; ENCORE

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
			○ the volume treated on-site or by the organisation elsewhere; and ○ the volume discharged to a third party for treatment (e.g. the municipal sewerage company); • The destination (surface water, groundwater or seawater) of wastewater discharged untreated and the destination (surface water, groundwater, seawater, or third parties) of wastewater treated on-site or by the organisation elsewhere; and • For the volume treated on-site or by the organisation elsewhere, and the volume discharged untreated if available: the concentrations of dissolved solids and suspended solids, and the temperature where relevant. Pollutant calculations should be based on an average over the reporting period.	

[23] 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
C2.2	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.	**Engineering and construction services; Home builders** Types of waste to consider reporting under the core global disclosure metric may include slags, dusts, sludges, used oil, soil, contaminated soil, paper, glass, plastics, metals, mixed demolition waste and other solid waste that meet the TNFD definition of waste. Different waste types should be reported separately where relevant. **Real estate; Real estate services** When reporting the core global metric for properties under management, an organisation should report the floor area (m^2 and % of total) for which the organisation has waste data and the quantity of waste from that area.	SASB Standard (2023) Disclosure EM-CM150a.1 ; GRI (2022) GRI Standards Glossary

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.[24] For plastic packaging, percentage of plastics that is: • Reusable; • Compostable; • Technically recyclable; and • Recyclable in practice and at scale.	**Engineering and construction services; Home builders** Reporting of the core global metric should include plastic building materials used. **Real estate; Real estate services** No further sector specific guidance. Refer to the core global metric guidance.	TNFD
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).	**Engineering and construction services; Home builders** When reporting the core global metric, an organisation should additionally include emissions of individual CFCs. Where total emissions of air pollutants are not routinely measured, an organisation may instead report the concentrations of the pollutants in the air on the site relative to a pre-development baseline. **Real estate; Real estate services** No further sector specific guidance. Refer to the core global metric guidance.	TNFD

[24] 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
C3.0	Water withdrawal and consumption from areas of water scarcity	Water withdrawal and consumption[25] (m^3) from areas of water scarcity, including identification of water source.[26]	**Engineering and construction services; Home builders** In reporting the core global metric, an organisation should disclose known or metered water withdrawal, in addition to listing non-metered sources. The organisation should report the total volume of water withdrawn from the following sources: greywater, blackwater, treated wastewater, desalination plans, groundwater (recharged and non-recharged), surface water, harvested rainwater, and other potable and non-potable water sources. This should cover all water purchased and sourced but may include itemisation of water allocated to other parties as the end user. **Real estate; Real estate services** In reporting the core global metric, an organisation should include for water withdrawal: • The area (m^2 and % of total) of floor area, plus external asset area, for which water withdrawal data have been obtained; • Water withdrawal for the area for which there are data; and • The source of that water: surface water, groundwater (recharged and non-recharged), seawater, produced water, third party water, greywater, blackwater, treated wastewater, desalination plants, harvested rainwater and other potable and non-potable water sources.	GRI 303 (2019) Disclosure 303-4; GRI G4 (2014) Real Estate & Construction Disclosures EN8-EN9; SASB Standard (2023) Disclosures IF-RE-140a.1., IF-RE-140a.2., IF-RE-140a.3

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[27] (tonnes) sourced from land/ocean/ freshwater, split into types, including proportion of total natural commodities.	**Engineering and construction services; Home builders** Commodities to report under the core global disclosure metric include: • Natural commodities: aluminium, copper, gypsum, iron, lead, sand and timber; and • Manufactured commodities: brick, cement, concrete, carpet, glass, insulation products, rubber and steel. **Real estate; Real estate services** No further sector specific guidance. Refer to the core global metric guidance.	GRI G4 (2014) Real Estate & Construction Disclosure EN1; SBTN High Impact Commodity list

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

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

[27] 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
C3.1	Quantity of high-risk natural commodities sourced from land/ ocean/freshwater	Quantity of high-risk natural commodities[28] (tonnes) sourced under a sustainable management plan or certification programme, including proportion of total high-risk natural commodities.	**Engineering and construction services; Home builders** Commodities to report under the core global disclosure metric include: • Natural commodities: aluminium, copper, gypsum, iron, lead, sand and timber; and • Manufactured commodities: brick, cement, concrete, carpet, glass, insulation products, rubber and steel. Certification schemes for timber may include the Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC); and Sustainable Forestry Initiative (SFI). 'Controlled Wood', 'Controlled Sources' or 'SFI Fiber Sourcing' are excluded from this definition. **Real estate; Real estate services** No further sector specific guidance. Refer to the core global metric guidance.	GRI G4 (2014) Real Estate & Construction Disclosure EN1; SBTN High Impact Commodity list

[28] 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
C4.0	Placeholder indicator: Measures against unintentional introduction of invasive alien species (IAS)[29]	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 metric guidance.	
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	No further sector specific guidance. Refer to the core global metric guidance.	

[29] 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
	Placeholder indicator: Species extinction risk	• 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 metric guidance.	

3.2. Proposed core sector disclosure indicators and metrics

The proposed TNFD core sector disclosure metrics for the engineering, construction and real estate sector are outlined below. These metrics are recommended by the TNFD to be disclosed by all report preparers in the sector on a comply or explain basis.

Table 13: Proposed core sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric no.	Indicator	Core sector disclosure indicator or metric	Sources
Impact Driver	Land/freshwater/ocean-use change	EH.C1.0	Change in fragmentation due to linear infrastructure	**Engineering and construction** 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

Metric category	Metric subcategory	Metric no.	Indicator	Core sector disclosure indicator or metric	Sources
Impact driver	Pollution/pollution removal	EH.C2.0 RE.C2.0	Spills	Volume of spills of diesel, paints, solvents, and toxic chemicals, and wastewater discharges that exceed local regulatory or international standards (m3), by national or company spill classification scheme, where relevant, and by type of ecosystem affected, with reference to the standard adhered to.	GRI 303-4; ENCORE
Impact driver	Resource use/replenishment	RE.C3.0	Manure and compost use	**Real estate; Real estate services** Manure and compost input to landscaped area (t).	TNFD

3.3. Proposed additional sector disclosure indicators and metrics

The proposed TNFD additional sector disclosure metrics for the engineering, construction and real estate 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 14: Proposed additional sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric no.	Cross-sector indicator	Additional sector disclosure indicator or metric	Sources
Impact driver	Land-use change	EH.A1.0 RE.A1.1	Green space creation	Green space created. Potential measures could include: • Green plot ratio; • Urban greening factor; • Area of green space created (m2); • Planted area (m2); • Area of tree planting (m2); • Number of trees planted; • Surface area of a building on which plants are planted, including vertical area (m2); and • Share of area above threshold for normalised difference vegetation index. Reports of greenspace created should include: • Proportion (%) of plant species that are native to the ecoregion (number of specimens as a proportion of total); and • Proportion (%) of green space created that overlaps with national or local ecosystem connectivity plans, where such plans exist, with reference to the plan adhered to.	Ong (2003); The Ecology Consultancy (2017); IUCN Urban Nature Indexes; HTT Tokyo Green Building Program for New Buildings

Metric category	Metric subcategory	Metric no.	Cross-sector indicator	Additional sector disclosure indicator or metric	Sources
Impact driver	Pollution/pollution removal	EH.A2.0 RE.A2.0	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 (m2) 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
Impact driver	Pollution/pollution removal	EH.A2.1	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 the construction period started (baseline), and during the construction project, 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 construction period started (baseline), and during the construction project, 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 the construction period started (baseline), and at the noisiest period of the day during the construction project, 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

Metric category	Metric subcategory	Metric no.	Cross-sector indicator	Additional sector disclosure indicator or metric	Sources
Response	Dependency, impact, risk and opportunity management: Changes to nature (dependency and impact): mitigation hierarchy steps	EH.A23.1 RE.A23.1	Invasive alien species management	Area of land owned, controlled, managed or leased with invasive alien species present during reporting period (km^2). Proportion (%) of this area with the invasive alien species under effective management. Area of land owned, controlled, managed or leased cleared of invasive alien species during reporting period (km^2).	TNFD; ESRS E4 Biodiversity and ecosystems; GRI 101
Response	Dependency, impact, risk and opportunity management: Changes to nature (dependency and impact): mitigation hierarchy steps	EH.A23.0 RE.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 for the new build/refurbishment/fit-out that have been reused, repurposed or remanufactured, either from the building undergoing demolition, refurbishment, fit-out or from other buildings, third parties etc. (%).	GRI: G4-EN2; UK Green Building Council (2023)
Response	Dependency, impact, risk and opportunity management: Value chain	EH.A22.0	Value chain certification	The proportion (%) of materials used that are covered by environmental product declarations and other credible environmental labels, by material and environmental product declaration or label standard.	TNFD

4. References

BBOP (n.d). The mitigation hierarchy. Business and Biodiversity Offsets Programme. Forest Trends, Washington, D.C.

BBOP (2018) Business Planning for Biodiversity Net Gain: A Roadmap. Business and Biodiversity Offsets Programme. Forest Trends, Washington, D.C.

BBP et al. (forthcoming, 2024) Guidance note for TNFD application for commercial real estate companies. Better Buildings Partnership, Brookfield Properties, Greengage Environmental.

Bringezu, S. et al. (2017) Assessing global resource use: A systems approach to resource efficiency and pollution reduction. International Resource Panel, United Nations Environment Programme.

DEFRA (2024) Calculate biodiversity value with the statutory biodiversity metric. Department for Environment, Food & Rural Affairs.

DEFRA (2024) Understanding biodiversity net gain. Department for Environment, Food & Rural Affairs.

Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.

Hamida, M. B., Jylhä, T., Remøy, H., and Gruis, V. (2022) Circular building adaptability and its determinants – A literature review. International Journal of Building Pathology and Adaptation. In Green Building Council Australia (2024) A nature roadmap for the built environment: Discussion paper.

Oberle, B. et al. (2019) Global Resources Outlook 2019: Natural Resources for the Future We Want. International Resource Panel, United Nations Environment Programme.

SASB (2018) SASB's Sustainable Industry Classification System (SICS). Sustainability Accounting Standards Board.

SBTN. Step 4. Act. Science Based Targets Network.

Seto, K. et al. (2012) Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences, 109(40), 16083–16088.

UNEP (2021) International Good Practice Principles for Sustainable Infrastructure. United Nations Environment Programme.

WBCSD (2023) Roadmap to Nature Positive: Foundations for the built environment system. World Business Council for Sustainable Development.

Taskforce on Nature-related
Financial Disclosures

tnfd.global