Additional sector guidance
Engineering, construction and real estate

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Version 1.0

SICS® industries:
Engineering & Construction Services (IF-EN)
Home Builders (IF-HB)
Real Estate (IF-RE)
Real Estate Services (IF-RS)

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T N F D Taskforce on Nature-related Financial Disclosures

Contents

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 sectors (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

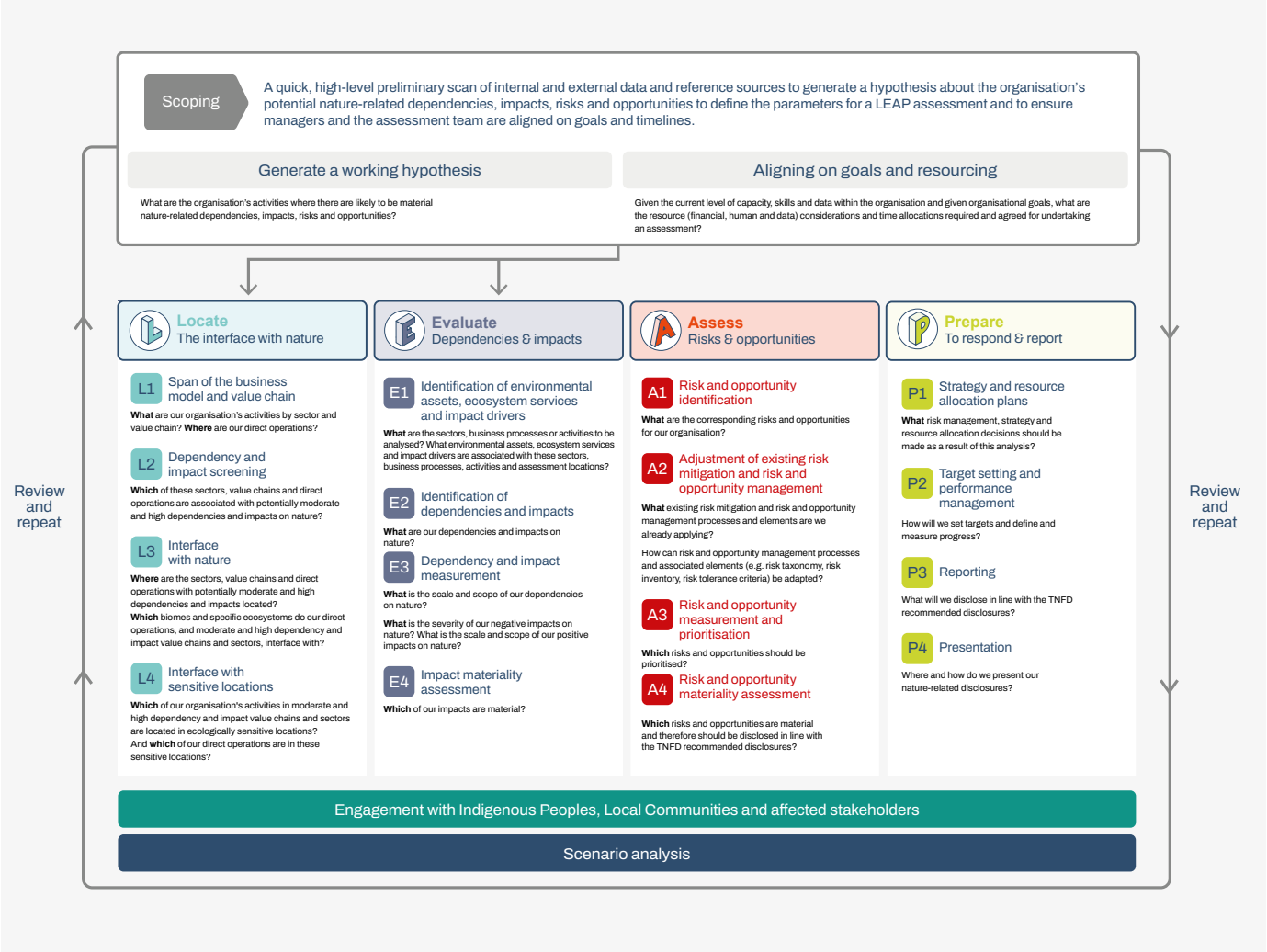
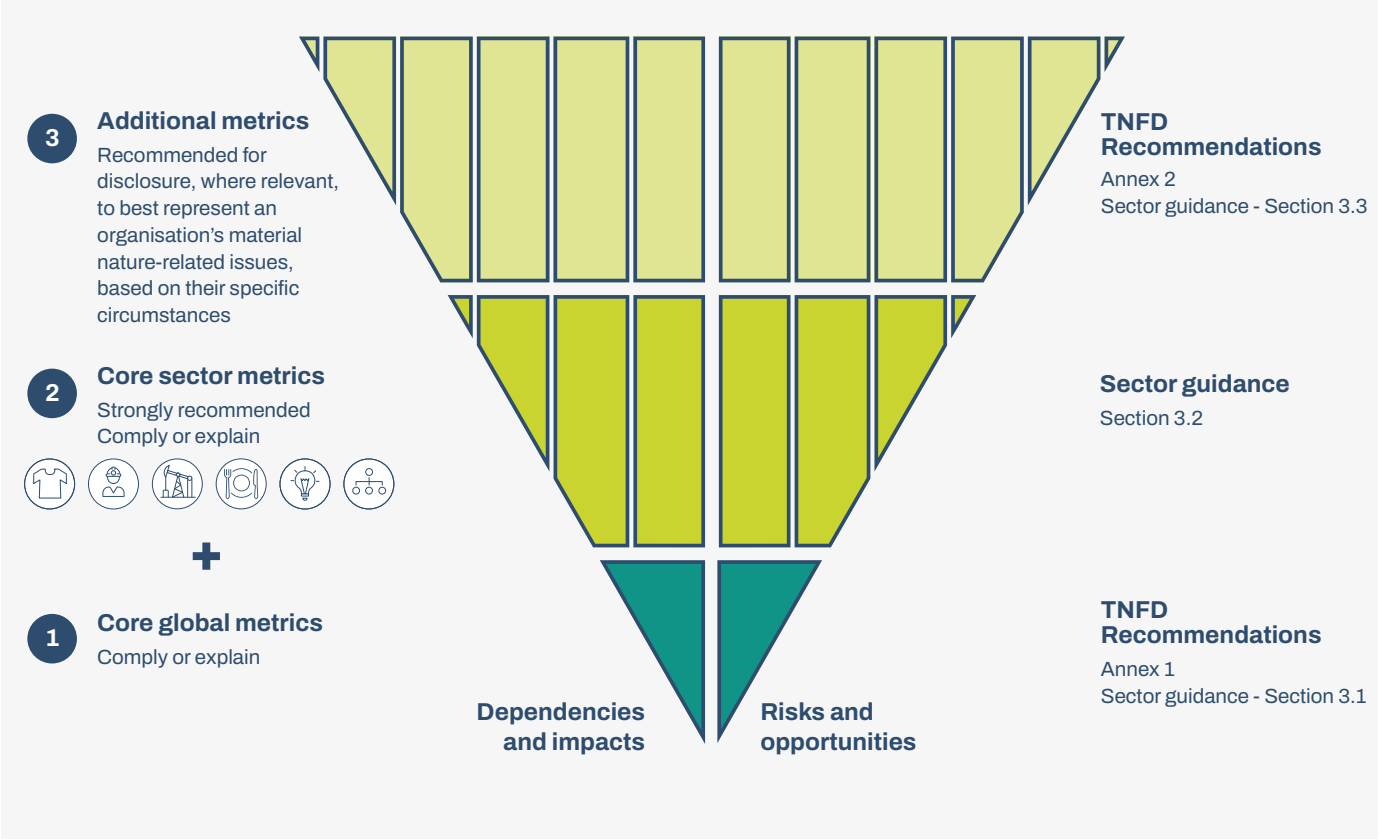


Figure 2: TNFD disclosure metrics architecture signposted to metrics lists



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 (Box 1).[1] These are referred to as 'engineering, construction and real estate organisations' in this guidance.

1 SASB (2018) 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. Organisations may also find it useful to consult the TNFD's Guidance on biomes, particularly the chapter on urban and industrial ecosystems, and Guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders.

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 organisations 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 to 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 organisation.

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?

The engineering, construction and real estate industries cover a wide range of activities and contexts. 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). An organisation should also consider whether it is involved with sites developed within the urban area (i.e. brownfield) or converted from other land uses (i.e. greenfield). 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	Demolition
Note: The operational phase of energy assets is covered by the TNFD electric utilities and power generators sector guidance.						

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.
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 the TNFD Glossary *for original sources for these and other definitions of key concepts in this sector guidance.*

Value chain considerations when scoping

An engineering, construction and real estate organisation may operate across many different sites and have many different suppliers and consumers across its value chain with significant potential nature-related dependencies and impacts. An engineering, construction and real estate organisation may therefore choose to start with a narrow scope to create a manageable starting point for the assessment. This could be a small number of high-priority sites or 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 an organisation should expand the breadth and depth of the assessment over time as it gains 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

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

Efforts to analyse dependencies, impacts, risks and opportunities at the design stage of the wider infrastructure system to the extent possible, and for individual assets, can help to ensure that nature-related issues are managed effectively and avoid locking in infrastructure projects and systems with adverse impacts on nature or elevated nature-related 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 from different projects to be balanced against one another to achieve a more efficient allocation of infrastructure investment. Conversely, failure to consider nature-related issues at the outset and on an ongoing basis can increase maintenance and replacement costs.[2]

Applying LEAP to management actions can further embed effective long-term management of nature-related issues. A LEAP assessment might also inform an organisation's decision on whether to involve itself in a project or not.

Data and stakeholders

The organisation should consider what existing nature, water, biodiversity or climate 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 (e.g. Environmental Impact Assessments), and from other sustainability and supply chain engagement that may already provide information key to the LEAP approach.[3]

Key internal stakeholders will also need to be engaged, including members of the development, asset and portfolio management, procurement and sustainability teams.[4]

2 UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

3 BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework.

4 BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework.

2.2. Locate the organisation's interface with nature

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

L1 L1: Span of the business model and value chain

Guiding questions:

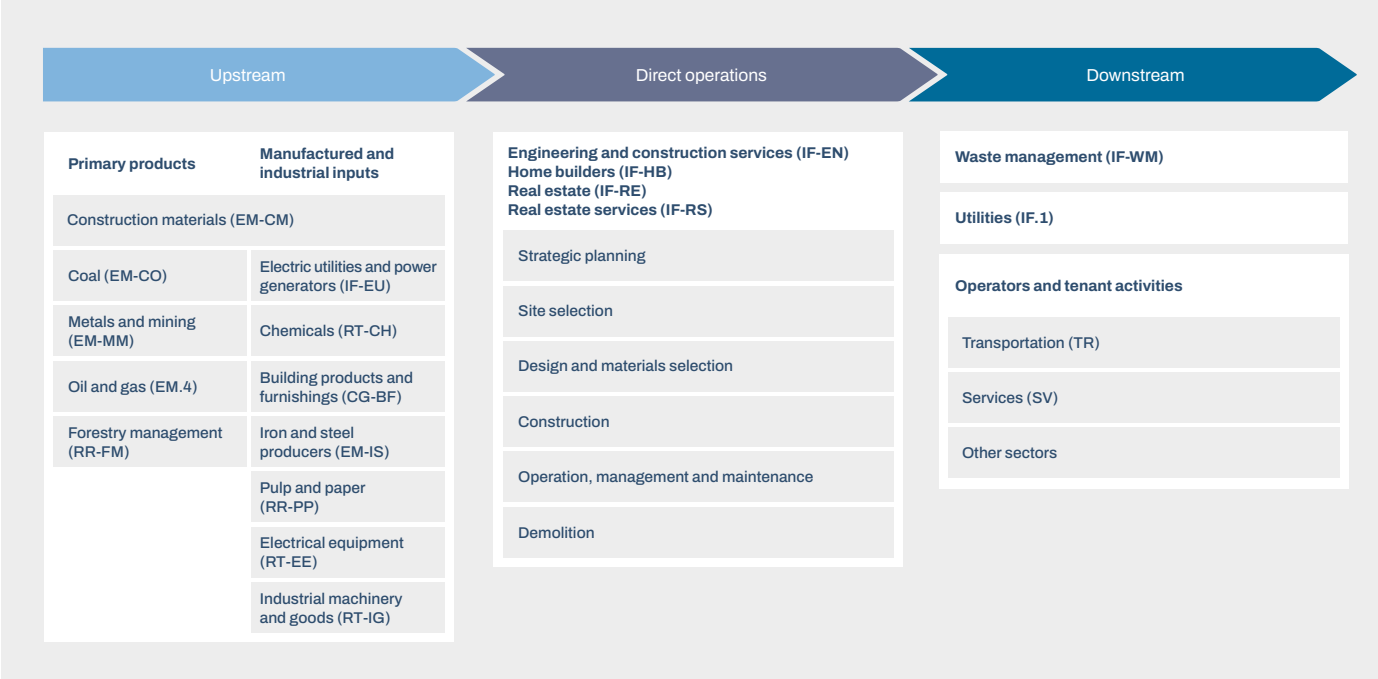
What are our organisation's activities by sector, value chain and geography?

An organisation in the engineering, construction and real estate sector should map out its full value chain, building on the analysis of its position in the built environment system that was carried out in the Scoping phase. This should start by considering:

- The sectors in the upstream value chain (e.g. construction materials) and, downstream, 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 Science Based Targets Network (SBTN) High Impact Commodity List and other standards such as the SASB Standards, 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. An organisation should refer to the TNFD guidance for other relevant sectors when analysing upstream and downstream activities.

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



An organisation should list the projects and assets it is involved with (including where it is contributing towards development, ownership or operation). This could include sites proposed for future development, under active development, or under ongoing management, where the organisation is just one of many contributors, has limited degree of control over the project or asset or its design or was only on-site for a small amount of time.

It is important to start the assessment with a broad list of sites, including where an organisation may only have a small role, and to understand how that organisation's contributions relate to the wider activity on the site. This is because the assessment of the dependencies and impacts on a site may not always be easily divisible across actors and the nature of the organisation's role might affect the risks and opportunities that the organisation is exposed to. An organisation will then in L2 prioritise sites for deeper analysis that are most likely to be associated with material dependencies, impacts, risks and opportunities.

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.[5]

Where are our direct operations?

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

5 BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework.

L2 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 its value chain and identified the locations of sites with which the organisation is involved, the organisation should identify where there are potentially moderate and high dependencies and impacts.

The organisation may prioritise:

- Sites in the value chain where there are activities highlighted as likely to be associated with elevated dependencies or impacts, with reference to the ENCORE materiality ratings in Tables 4 and 5 as appropriate;
- Sites in the value chain that are using or that contain substances listed in the Living Building Challenge Red List of materials, in relevant regulatory standards and conventions, or by international organisations;[6]
- Value chains of commodities on the SBTN High Impact Commodity List and in the SASB 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 with reference to the ENCORE materiality ratings in Tables 4 and 5 and on the ENCORE database as appropriate.

Where an organisation is using timber, it may find it helpful to review the WWF Wood Risk tool to identify whether any timber value chains should be investigated further. Tools such as Bioscope may further help prioritisation across supply chains.

An organisation using the ENCORE ratings to inform prioritisation should consider their applicability to the site in question, bearing in mind that ENCORE ratings refer to global sector averages.

An organisation may wish to further narrow the list of sites for deeper analysis, particularly in early iterations of LEAP, reflecting the resources available. An organisation should try to focus on sites most likely to be associated with material dependencies, impacts, risks and/or opportunities.

6 For example, the EU's REACH Regulation (EC 1907/2006) and CMR substances as listed under category 1A, 1B and 2 in EU Regulation EC 1272/2008; Australia's Industrial Chemicals Environmental Management Standard (IChEMS); chemicals listed by the Internal Agency for Research on Cancer (IARC) of the World Health Organization class 1 and 2a, by the Rotterdam Convention and by the Stockholm Convention on Persistent Organic Pollutants (POPs).

Table 4: Materiality ratings of ecosystem services the engineering, construction and real estate value chain typically depends on

Ecosystem services		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 specialised 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	Specialised design activities
Provisioning services	**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
	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
	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
Regulating and 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

Ecosystem services		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 specialised 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	Specialised design activities
Regulating and maintenance services	**Dilution by atmosphere and ecosystems**	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
	Mediation of sensory impacts (other than noise)	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		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 specialised 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	Specialised design activities
Regulating and maintenance services	**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, UNEP-WCMC) (2024) ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure.

Table 5: Materiality ratings for impact drivers typically relevant for the engineering, construction and real estate value chain

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
	Toxic soil and water pollutants	Very low	Medium	High	High	High	High	High	High	High	Medium	Low	Low	Very low	Very low
	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

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
Pollution/ pollution removal	**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, UNEP-WCMC) (2024) ENCORE: Exploring Natural Capital Opportunities, Risks and Exposure.

L3 L3: Interface with nature

Guiding questions:

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

An organisation identifying the locations of the sources of its inputs should refer to the TNFD value chains guidance for further support on prioritisation and the degree of traceability required. Trade data, environmental product declarations and materials passports can help to map the likely countries of origin of materials. Where primary data are not available, life cycle analysis data and databases such as Exiobase and Trase may provide insight into typical sources of materials of interest.[7]

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

An organisation should refer to the TNFD guidance on biomes for further information when analysing its interfaces with biomes. The chapter on urban and industrial ecosystems may be of particular interest.

L4 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 the activities and sites that were identified for further analysis in L2 are geographically located in ecologically sensitive locations.

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, referring to the guidance in the LEAP approach.

7 BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework.

An organisation should iterate with the Evaluate phase to understand interfaces with potentially sensitive locations outside the site boundary. An organisation may want to start the analysis considering different buffer zones[8] and build up an understanding of ecological connections with surrounding habitats such as water flows over iterations and as the ultimate sources of dependencies and locations of impacts are identified.

An organisation should refer to the TNFD guidance on biomes for further information on the features of the biomes where it operates that might lead locations to be classified as sensitive. The chapter on urban and industrial ecosystems may be of particular interest.

An organisation should also work with other actors in the landscape, river basin or seascape to understand the sensitivity of the location, including for delivery of ecosystem services. The TNFD guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders may provide further support.

8 An appropriate initial buffer zone for assessment will depend on the nature of the site but should be 500m as a minimum. The guidance on how to use the Species Threat Abatement and Restoration (STAR) metric recommends applying "a sufficiently large buffer (e.g. 50km) around the perimeter of an Area of Interest."

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 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 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,[9] the construction, maintenance and demolition of buildings is responsible for 40% of the solid waste produced in developed countries[10] and the construction of infrastructure is the main driver of resource use in emerging economies.[11]

This guidance focuses on the direct operations of the engineering, construction and real estate sectors. An organisation should refer to the TNFD guidance for other relevant sectors and TNFD guidance on value chains when analysing upstream and downstream activities, including the activities of tenants and operators of infrastructure.

Scope of analysis

Each phase of an infrastructure or real estate asset's lifecycle will include many actors, and the dependencies and impacts of the project or asset – and associated risks and opportunities – will relate to each of them differently and not necessarily in proportion to the organisation's involvement.

9 Hamida, M. B. et al. (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.

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

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

For example:

- If one contractor has built a railway and another has built the fencing alongside it, both contractors have contributed to the fragmentation of the habitat, but it is not clear how that fragmentation would be allocated between them; and
- The decisions of an engineering company responsible for specifying and constructing a new warehouse will affect the immediate dependencies and impacts that take place during its involvement in the project – i.e. the construction phase – but also over the lifecycle of the building, as the design decisions now may have a substantial influence on the magnitude of those future dependencies and impacts and how they can be managed.

In light of this challenge, an organisation working on an infrastructure or real estate project or asset and undertaking a LEAP analysis should try to describe the dependencies and impacts of the project or asset aggregated across actors, both in the reporting period and over the asset's lifecycle. This holistic approach is needed in order to provide a comprehensive understanding of the risks and opportunities that the organisation faces in the Assess phase.

An organisation may not always have information about others' actions, particularly those that might create dependencies and impacts in the future, although documentation such as environmental impact assessments and planning approvals may provide some insights. An organisation could consider scenarios for different future outcomes for the project to further its understanding of potential dependencies and impacts. When referring to past documentation of dependencies and impacts, an organisation should consider whether the aspects of nature captured remain the right priorities for the organisation to consider. For example, changes in local preferences and in the state of nature could influence the dependencies and impacts that should be analysed.

The analysis should be ideally, where possible, 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.[12] An organisation should, where possible, engage with other actors in the landscape, river basin or seascape to understand the implications of the changes in the state of nature and ecosystem services caused by the project or asset's impacts and to understand the resilience of the dependencies. The TNFD guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders may provide further support.

Importantly, the fact that a project – or the asset at the time of its construction – has or had government authorisation or was commissioned by the government does not mean that an organisation does not need to consider the dependencies or impacts of the project in its analysis. The project or asset's dependencies and impacts could still be material for reporting,

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

including generating financially material risks and opportunities for the organisation in the future.

Impacts

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 ideally include the resilience of the ecosystem to the impact drivers from the asset throughout its lifecycle. This information may be available through environmental impact assessments and other government authorisation documents.

Projects on sites that have already been altered from their natural states (e.g. in urban areas) will tend to have lower additional 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.[13]

Table 6 provides example negative impact pathways and Table 7 provides example positive impact pathways.

Dependencies

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.[14]

Table 8 provides example dependency pathways for the engineering, construction and real estate sector throughout the asset lifecycle. An organisation should also refer to TNFD biome guidance for further guidance on ecosystem service provision by biome. The chapter on urban and industrial ecosystems may be of particular interest.

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

14 UNEP (2021) International Good Practice Principles for Sustainable Infrastructure.

Table 6: Example negative impact pathways

	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: Destruction of existing habitats to make space for construction. The urban land area is projected to increase by 1.2 million km^2 by 2030, tripling the area in the year 2000.[15]	*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, and noise, as well as loss of visual amenity services.

15 Seto, K. C. 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. Loss of plant life in the ecosystem can lead to increased flooding and storm damage. 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.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
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.
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.

	Asset lifecycle stage	Business activity	Driver of nature change	Environmental assets and ecosystem services affected	Description
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 introducing new disease 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 because of the disruption associated with being next to the asset.	*Ecosystem assets* Land Terrestrial ecosystems	The ongoing degradation of habitats can lead to an eventual impact on the full variety of 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. See TNFD water utilities sector guidance.
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 disrupting local wildlife populations. The size of impacts will be related to the materials in the building. An organisation 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, in relevant regulatory standards and conventions, or by international organisations.

Sources: 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 7: Example positive impact pathways

	Asset lifecycle stage	Business activity	Driver of nature change	Example environmental assets and ecosystem services affected	Description
I.15	Construction	Green and blue space creation	**Land, freshwater and ocean use change** Land ecosystem use: Green and blue 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 and blue spaces can boost human health and wellbeing and community cohesion. Such sites 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 and blue space can also support local species by providing habitat and improving connectivity between habitats.

	Asset lifecycle stage	Business activity	Driver of nature change	Example environmental assets and ecosystem services affected	Description
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.
I.17	Real estate management	Green space maintenance	**Land, freshwater and ocean use change** Land use change	*Environmental assets* Terrestrial ecosystems	Green space on-site can be managed to improve habitat for local species, for example by introducing a diverse variety of native plant species and by designing green spaces on-site to connect other habitats outside the site boundary.
I.18	All	Clearance of invasive alien species	**Invasive alien species introduction/removal**	*Environmental assets* Terrestrial, freshwater and marine ecosystems	Indicate locations of existing invasive vegetation species on-site and address removal and control of invasive alien species.

Sources: Ellen MacArthur Foundation (2024) Building Prosperity: unlocking the potential of a nature-positive, circular economy for Europe*; Green Building Council Australia (2024)* A nature roadmap for the built environment: Discussion paper*; Ministry of Land, Infrastructure, Transport and Tourism (2024)* Green Transformation for Sustainable Urban Development*; UIC Energy Resources Center, Stantec (no date)* Solar Pollinator Vegetation Implementation Manual*; USGBC (2024)* LEED v5 Rating System: Building design and construction: New construction*; Utility Arborist Association Environmental Stewardship Committee (2021)* Managing Compatible Vegetation for Targeted Species and Biodiversity.

Table 8: Example dependencies

	Business activity	Environmental assets and ecosystem services depended on	Description
D.1	All	*Ecosystem services* Biological control	The biological control ecosystem service helps to maintain the health of the surrounding ecosystem and prevent the entry of pests and disease to the site.
D.2	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.
D.3	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.
D.4	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.

	Business activity	Environmental assets and ecosystem services depended on	Description
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.
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, which in turn will depend on its own access to water resources. See TNFD water utilities sector guidance.

Sources: 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

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?

In addition to the metrics in Section 3, an organisation can consider assessing changes in the state of nature in line with local practices for infrastructure developments. This 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 assessments of the degree of greenery.

The UK government's Statutory Biodiversity Metric (Box 2) is one example of a regulated measurement of the state of nature. 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 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.

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 because of the development.

Through site selection and layout, developers should avoid or reduce any negative impact on biodiversity on-site. To achieve the 10% net gain, they can first create or enhance new habitat on-site. If the developer cannot achieve all the biodiversity net gain on-site, they can deliver it through a mixture of on-site and off-site activity. Developers can either make off-site biodiversity gains on their own land outside the development site or buy off-site biodiversity units on the market. If developers cannot achieve on-site or off-site 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.

Off-site habitat creations and enhancements, as well as significant on-site habitats, must be legally secured for 30 years.

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

E4 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:

- Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) tool; and
- Pollinator Habitat Scorecard.

2.4. Assess nature-related risks and opportunities

This section provides additional guidance to help engineering, construction and real estate organisations with the Assess phase of the LEAP approach. Organisations should also refer to the TNFD nature-related risk and opportunity registers.

A1: Risk and opportunity identification

Guiding question:

What are the corresponding risks and opportunities for our organisation?

Table 9 and Table 10 provide illustrative examples of nature-related risks and opportunities that may arise for an organisation from the dependencies and impacts on nature identified in the Evaluate phase. Actual risks may vary by sector, region and site, depending on company and local concerns, which may change over time.

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

Asset lifecycle stage	Impact		Risk/opportunity	Classification
Construction	I.1	Impacts associated with production of building materials.	**Risk:** Increased investor requests for reporting on nature-related risks upstream, for example, reporting on timber from native forests or those that host endangered species.	Transition: Market
			Risk: Increased demand from customers and investors for timber and other materials that are certified to sustainability standards.	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.	Transition: Policy, market
			Opportunity: Increased demand for properties made with low impact, low toxicity, circular materials.	Business performance: Products and services
			Opportunity: Lower construction costs and lower embedded impacts on nature through more efficient use of construction materials.	Business performance: Resource efficiency
			Opportunity: Increased use of recycled, reused, remanufactured or compostable 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

Asset lifecycle stage	Impact		Risk/opportunity	Classification
Construction	I.1	Impacts associated with production of building materials.	**Opportunity:** Indigenous and local suppliers of 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
			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

Asset lifecycle stage	Impact		Risk/opportunity	Classification
Construction	I.3	Sealed surfaces increasing temperatures and flood risk, and reducing recharge of water resources.	**Risk:** Increased local temperatures and 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: Association of the company with poor management of polluting substances increases regulatory and stakeholder scrutiny of applications for 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 in the impact of noise pollution on nature increases.	Transition: Policy, market
			Risk: Association of the company with poor noise management increases regulatory and stakeholder scrutiny of applications for new sites.	Transition: Reputational
	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 increases regulatory and stakeholder scrutiny of applications for new sites.	Transition: Reputational
			Opportunity: Installation of water efficiency measures may save costs.	Business performance: Resource efficiency

Asset lifecycle stage	Impact		Risk/opportunity	Classification
Construction	I.7	Disruption to ecosystems due to vehicles spreading 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 increases regulatory and stakeholder scrutiny of applications for new sites.	Transition: Reputational
Construction/ real estate management	I.8	Disruption to ecosystems due to 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 may increase regulatory and stakeholder scrutiny of the organisation's operations, increasing costs and potentially increasing resistance to new projects.	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 of 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

Asset lifecycle stage	Impact		Risk/opportunity	Classification
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 increases regulatory and stakeholder scrutiny of applications for new sites and deters potential tenants.	Transition: Reputational
	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

Asset lifecycle stage	Impact		Risk/opportunity	Classification
Construction	I.15	Green space creation, improving environmental quality and protection from floods, storms and soil erosion, mitigation of urban heat island effect 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
Real estate management	I.17	Green space maintenance.	**Opportunity:** Supporting the recovery of local species and biodiversity can improve the organisation's reputation and provide amenity benefit for the real estate assets and occupants.	Sustainability performance: Ecosystem protection, restoration and regeneration
All	I.18	Clearance of invasive alien species.	**Opportunity:** Removing invasive alien species and support the recovery of local species and also avoid risks associated with plants that can undermine building foundations.	Sustainability performance: Ecosystem protection, restoration and regeneration

Sources: Adapted from BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework*; Ellen MacArthur Foundation (2024)* Building Prosperity: unlocking the potential of a nature-positive, circular economy for Europe*; 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
All	D.1	Biological control	**Risk:** Weakening of biological control could lead to increased pests on-site, increasing elimination costs, or reducing the value of the asset to current or potential tenants. Introduction of disease for local plants could lead to increased maintenance costs to maintain a safe and attractive environment.	Physical: Chronic
Construction	D.2	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.3	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.4	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

Asset lifecycle stage	Dependency		Risk/opportunity	Classification
Real estate management	D.5	Protection from floods, storms, landslides and soil erosion	**Risk:** Landslides, water level rise/ storm surge of adjacent water bodies due to climate change, 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
			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.6	Mitigation of urban heat island effect	**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

Asset lifecycle stage	Dependency		Risk/opportunity	Classification
Real estate management	D.7	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 on-site and off-site revegetation and regeneration or other nearby green or blue urban regeneration due to customer and regulatory demands.	Transition: Policy, market
	D.8	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

Sources: Adapted from BBP et al. (2024) TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework*; 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

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

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 guidance to help engineering, construction and real estate organisations with the Prepare phase of the LEAP approach.

The Kunming-Montreal Global Biodiversity Framework (GBF) aims to "halt and reverse biodiversity loss" by 2030, envisioning "a world living in harmony with nature" by 2050. Achieving this implies a transition which will require significant business changes across sectors. The Taskforce on Nature-related Financial Disclosures (TNFD) has published draft guidance to help organisations develop and disclose nature transition plans. These plans provide a structured way to manage responses and contributions to this transition, starting with key priorities and expanding over time as understanding improves, such as through a LEAP assessment. The LEAP Prepare phase provides initial guidance for addressing dependencies, impacts, risks, and opportunities, laying the groundwork for a nature transition plan.

P1 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 illustrative examples of risk and impact mitigation measures that an engineering, construction and real estate organisation may want to consider. Further mitigation measures can be found in sector standards such as BREEAM, Envision, FAST-Infra, Green Star, GRESB, HKGBC BEAM Plus, IFC Performance Standards, IS Ratings, 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.

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

- **Avoid:** Measures taken to avoid creating harmful 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; choice of materials to avoid upstream impacts (e.g. choice of circular or regenerative materials); and declining to participate in projects that have unacceptably high negative nature impacts;

- **Reduce or minimise:** Measures taken to reduce the duration, intensity and/or extent of harmful 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 harmful 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; and
- **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.[16]

An organisation should also apply the proximity principle to any habitat restoration actions related to the impacts of the project on-site. This means that on-site gains should be prioritised. Only where these have been exhausted or are unachievable should off-site local enhancements be considered, continuing to prioritise actions as near to the development sites as possible.[17] Some jurisdictions have statutory methods in place to manage the implementation of the mitigation hierarchy and to achieve net gain.

In considering material use and waste management, an organisation should refer to the waste hierarchy, which ranks different waste strategies, with waste prevention being the most preferred option, followed by keeping products in use through rental, repair, reuse, refurbishment, remanufacturing and remaking activities, followed by recycling.[18]

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

16 BBOP (no date) The mitigation hierarchy; SBTN (no date) Step 4. Act.

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

18 See Ellen MacArthur Foundation (2021) The butterfly diagram: visualising the circular economy; OECD (2024) Circular economy – waste and materials.

19 SBTN (no date) Step 4. Act.

Table 11 presents illustrative priority and transformative actions that engineering, construction and real estate sector organisations may want to consider based on the dependencies, impacts, risks and opportunities risks identified in the Evaluate and Assess phases. All actions have been categorised by the corresponding life cycle stage and classified based on TNFD's interpretation of SBTN's AR3T framework (Figure 4): avoid and reduce negative impacts; restore and regenerate; transformation of business models, products, services, markets and investments; and contributing to needed systemic change inside and outside value chains.

Figure 4: The SBTN AR3T framework

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.	Design new assets to maximise their lifetime.			
		Maximise reuse and recycling of construction materials, regeneratively sourced bio-based alternatives and materials produced using low-carbon manufacturing processes.			
		Maximise the material efficiency of the design without compromising structural integrity.			
		Prioritise reuse and retrofitting of building and infrastructure over demolition.			
		Adopt circular economy practices for new builds and renovations across their entire life cycle.			
		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.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
Construction	Risks associated with dependencies and impacts in the supply chain.	Assess, monitor and regulate the supply chain to avoid illegal logging, and select suppliers that produce timber products from sustainably managed forestry or using regenerative production practices.			
		Avoid timber from forests of high ecological value and suppliers that use intensive management practices such as clear-felling areas of monoculture plantations and apply heavy chemicals to forests and land.			
		Avoid sand from protected or sensitive locations across land, river and ocean habitats.			
	Risks and impacts associated with land use change and habitat loss.	Avoid development in sensitive locations, declining to participate in projects with unacceptably high impacts. Prioritise development on land of limited natural value and brownfield sites.			
		Minimise further habitat conversion through development of infill sites, densification and building on previously converted areas.			
		Work to protect the ecological and biodiversity value of habitats on and adjacent to sites, during and post-construction. Possible measures include designating protected greenfield areas on the site; working on habitat improvement projects on and near the site; prioritising native plant species in landscaping; and establishing and maintaining landscape corridors, ecological connections and animal crossings for linear infrastructure. Prioritise habitat creation in strategically significant locations (e.g. in line with government nature connectivity plans).			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
Construction	Risks and impacts associated with land use change and habitat loss.	Protect floodplain functions (e.g. water storage, habitat, water quality benefits) by limiting new development within the 100-year floodplain of all types of waterways and watercourses.			
		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 off-site 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.			
		Prioritise use of low-impact materials that are non-toxic.			
		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. Conduct a Construction Noise Impact Assessment (CNIA) and provide adequate monitoring and mitigation measures based on the CNIA report to minimise noise pollution during construction (demolition and foundation are included, if any).			
		Invest in new technologies with lower noise impacts.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
Construction	Risks and impacts associated with access to and use of water.	Introduce water efficiency measures.			
Construction/ infrastructure operation	Risks and impacts associated with spread of invasive alien species and pathogens.	Adopt best practices to limit spread of invasive alien 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 alien 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. Provide facilities for collection, sorting, storage and disposal of recyclable waste.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
Real estate management	Risks and impacts associated with access to and use of water.	Introduce water efficiency measures and rainwater harvesting. Reduce water withdrawals, particularly from water stressed areas. Maximise reuse of water. Monitor water discharge for quality and quantity. Work with tenants to reduce water demands. Replicate natural hydrologic conditions and retain precipitation on-site through measures to improve infiltration and evapotranspiration and to reduce run-off.			
Demolition	Risks and impacts associated with habitat losses.	Adapt business practices to preserve habitats where possible.			
	Risks and impacts associated with pollution and waste.	Adopt best practices for pollution management such as precision application of fertiliser, matching plants' needs as closely as possible, or adoption of integrated pest management practices to minimise reliance on pesticides.			
All – Business transformation options.		Create a site management plan in the project's design phase, detailing actions for soil protection and restoration during the construction phase of the project. Create a site maintenance plan to inform and structure maintenance strategies that ensure long-term site sustainability.			
		Actively participate in spatial planning initiatives to support inclusive, safe, resilient, sustainable and equal living conditions.			
		Screen for priority habitats and consider impacts on nature at the design stage.			

Asset lifecycle stage	Risks to be mitigated	Mitigation	Avoid/ Reduce	Regenerate and restore	Transform
All – Business transformation options.		Consider nature-based solutions as an alternative or complement to grey infrastructure, e.g. sustainable urban drainage systems or natural flood management solutions.			
		Consider initial and ongoing impacts on nature at the design stage, building 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.			

Sources: Arup and Ellen MacArthur Foundation (2022) Circular Buildings Toolkit*; BBP et al. (2024)* TNFD for UK Commercial Real Estate: Supporting UK commercial real estate companies to understand and apply the LEAP process and disclose against the TNFD framework*; Ellen MacArthur Foundation (2024)* Building Prosperity: unlocking the potential of a nature-positive, circular economy for Europe*; G7 Italia 2024 (2024)* G7 Sustainable Urban Development Ministers' Communiqué – final version*; GCBI (2014)* SITES v2 Rating System and Scorecard*, (Sections 4 and 8); Green Building Council Australia (2024)* A nature roadmap for the built environment: Discussion paper*; HKGBC (2023)* BEAM Plus New Buildings*; Ministry of Land, Infrastructure, Transport and Tourism (2024)* Green Transformation for Sustainable Urban Development*; Ministry of Land, Infrastructure, Transport and Tourism (2024)* TSUNAG – 優良緑地確保計画認定制度*; USGBC (2024)* LEED v5 Rating System: Building design and construction: New construction*; WBCSD (2023)* Roadmap to Nature Positive: Foundations for the built environment system.

P2 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 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.

Additionally, when considering international interoperability throughout their disclosure process, organisations may find it helpful to refer to the following documents:

- TNFD – European Financial Reporting Advisory Group (EFRAG) Correspondence Mapping
- TNFD – Global Reporting Initiative (GRI) Standards Interoperability Mapping

P4 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.

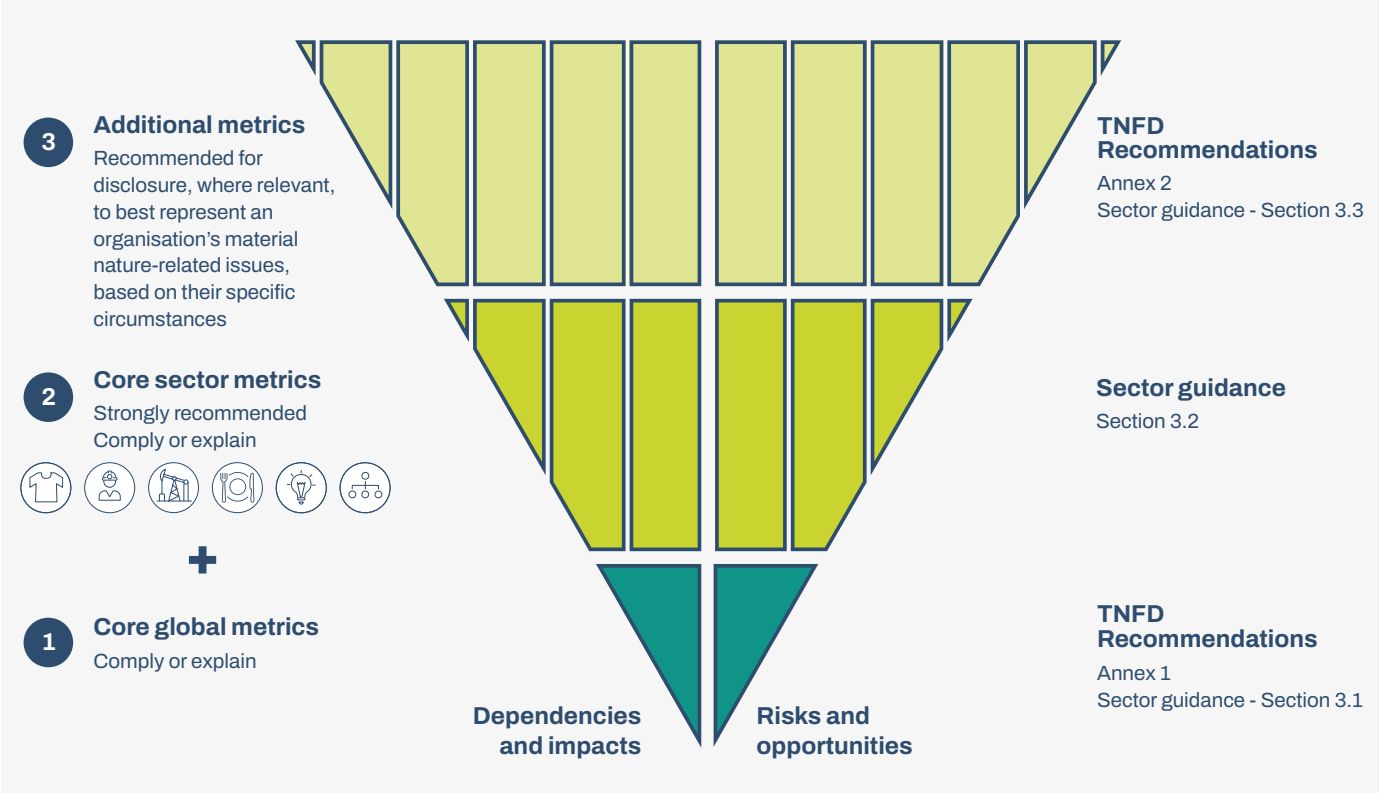
3. Sector-specific disclosure metrics and related guidance – Engineering, construction and real estate

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 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 (now maintained by the International Sustainability Standards Board (ISSB)), 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. 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 these 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.

Companies applying the SBTN methods to set SBTs for Nature will be required to use mostly the same indicators as recommended by TNFD. In some instances, additional data may be required or recommended by SBTN to set and implement targets.

Table 12: Guidance on the application of the core global disclosure metrics

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
	GHG emissions	Refer to IFRS S2 Climate-related Disclosures.	No further sector specific guidance. Refer to the core global metric guidance.	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 disturbed area (km^2); and • Total rehabilitated/restored area (km^2).	In reporting this core global disclosure metric, an organisation should include land owned, leased or managed in its spatial footprint.	GRI 101-5

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 for the management phase of the asset lifecycle. 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.	GRI 101-6 SITES v2 Rating System for Sustainable Land Design and Development TNFD

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 extent conserved and restored: • In areas owned, leased or managed; and • In areas off-site, owned, leased or managed by other organisations. An organisation should also 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 areas conserved and restored separately.	GRI 101-2 TNFD
C1.1	Extent of land/ freshwater/ ocean-use change	Extent of land/freshwater/ocean ecosystem that is sustainably managed[22] (km^2) by: • Type of ecosystem;[23] and • Type of business activity.	No further sector specific guidance. Refer to the core global metric guidance.	TNFD

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

22 See TNFD Glossary.

23 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

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.1	Wastewater discharged	Volume of water discharged (m^3), split into: • Total; • Freshwater; and • Other.[24] 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, such as the sewerage network or 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).	ENCORE GRI 303-4

24 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

			Real estate; Real estate services
			
			When reporting this core global disclosure metric for properties under management, an organisation should include:
			
			• The floor area (m^2 and % of total) for which the organisation has discharge data, and the volume discharged from that area; and
			• For the area for which there are discharge data:
			  • The volume of wastewater discharged without treatment by destination (surface water, groundwater or seawater);
			  • The volume treated on-site or by the organisation elsewhere by destination (surface water, groundwater, seawater or third parties); and
			  • The volume discharged to a third party for treatment (e.g. municipal sewerage company); 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.	

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 report under this core global disclosure metric 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. An organisation should break down waste reported under 'other recovery operations' by operation, with reference to the waste hierarchy.[25]	GRI Standards Glossary NABERS (2021) SASB EM-CM150a.1

25 See Ellen MacArthur Foundation (2021) The butterfly diagram: visualising the circular economy; OECD (2024) Circular economy – waste and materials.

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
			Real estate; Real estate services In 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; • Specify the proportion (%) of waste collected for recycling by whether it was collected separately by material or needs to be further separated by a re-processor; and • Break down waste under 'other recovery operations' by operation, with reference to the waste hierarchy.[26]	
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.[27] 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

26 See Ellen MacArthur Foundation (2021) The butterfly diagram: visualising the circular economy; OECD (2024) Circular economy – waste and materials.

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

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
C2.4	Non-GHG air pollutants	Non-GHG air pollutants (tonnes) by type: • Particulate matter $PM_{2.5}$ and/or PM_{10}); • Nitrogen oxides (NO_2, NO and NO_3); • Volatile organic compounds (VOC or NMVOC); • Sulphur oxides (SO_2, SO, SO_3, SO_x); and • Ammonia (NH_3).	**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-site relative to a pre-development baseline. **Real estate; Real estate services** When reporting the core global metric, an organisation should include emissions of non-GHG air pollutants from fuel combustion on-site. Where total emissions of air pollutants are or cannot be routinely measured, an organisation may instead report the concentrations of the pollutants in the air on-site.	TNFD

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[28] (m^3) from areas of water scarcity,[29] including identification of water source.[30]	**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 (m^3) 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 metric should cover all water purchased and sourced but may include itemisation of water allocated to other parties as the end user.	GRI 303-4 GRI G4 Construction and real estate EN8, EN9 SASB IF-RE-140a.1., IF-RE-140a.2., IF-RE-140a.3.

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

29 See TNFD Glossary.

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

Metric no.	Core global indicator	Core global metric	Guidance for the sector	Source
			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 (m^3) 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.	

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[31] (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 Construction and real estate EN1 SBTN (2024)

31 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[32] (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 Construction and real estate EN1 SBTN (2024)

32 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)[33]	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.	

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

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

3.2. Core sector disclosure indicators and metrics

The 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: 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 RE.A1.0	Change in fragmentation due to linear infrastructure	**Engineering and construction** Length (km), footprint (km^2), quantity (number) of lanes, planned traffic volume, and surface or material type of upgraded and/or new linear infrastructure (e.g. conveyors, roads, rails, powerlines, canals, pipelines, fences) built: • In sensitive locations, by sensitive location criteria met, stating the ecosystem type;[34] and • In other areas, stating the ecosystem type. 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 (m). Crossing structures include underpasses, overpasses, canopy bridges. Other fragmentation mitigation efforts may include retrofits of existing culverts, fencing and jump-outs.	TNFD

34 See TNFD Glossary for the definition of sensitive location

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, toxic chemicals and wastewater discharges that exceed local regulatory or international standards (m^3), by national or company spill classification scheme, where relevant, and by type of ecosystem affected, with reference to the standard adhered to.	ENCORE GRI 303-4
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. Additional sector disclosure indicators and metrics

The 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: 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 (m^2); • Planted area (m^2); • Area of tree planting (m^2); • Number of trees planted; • Surface area of a building on which plants are planted, including vertical area (m^2); 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.	IUCN (2023) HTT Tokyo (2023) Ministry of Land, Infrastructure, Transport and Tourism (2024) Ong (2003) The Ecology Consultancy (2017)

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 (m^2) and proportion (%) of area with nighttime lighting; and/or • Number and proportion (%) of outdoor lights that are kept on at night; and number and proportion (%) of outdoor lights that are and are not dimmed at night, by degree of dimming.	IUCN (2023) TNFD

Metric category	Metric subcategory	Metric no.	Cross-sector indicator	Additional sector disclosure indicator or metric	Sources
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.	GRI 101 TNFD
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).	ESRS E4: Biodiversity and ecosystems GRI 101 TNFD

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.A23.0 RE.A23.0	Circular economy indicators	Proportion of input materials used that are from recycled and reused by significant categories of raw materials, renewable materials and manufactured products (%). 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. (%).	Arup, Ellen MacArthur Foundation (2022) Ellen MacArthur Foundation Circulytics Indicator 6a. GRI G4 Construction and real estate 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
Response	Dependency, impact, risk and opportunity management: Changes to nature (dependency and impact): mitigation hierarchy steps	RE.A24.0	Water reuse	Total volume of water recycled and reused by the organisation linked to metered utility data.	GRI G4 Construction and real estate EN10

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