Draft sector guidance
Water utilities

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Open for consultation and feedback

SICS® industry:
Infrastructure - Water Utilities and Services (IF-WU)

Taskforce on Nature-related Financial Disclosures

Contents

Draft for consultation

This sector guidance is a draft for consultation with market participants and other interested stakeholders. The Taskforce welcomes feedback provided via the TNFD website by 4 April 2025.

Feedback will be reviewed by the Taskforce and final sector guidance issued by the TNFD in June 2025.

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 water utilities and services 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 water utilities and services 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 water utilities and services sector (Section 3.1); and
- Core and additional sector disclosure indicators and metrics (Sections 3.2 and 3.3).

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

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

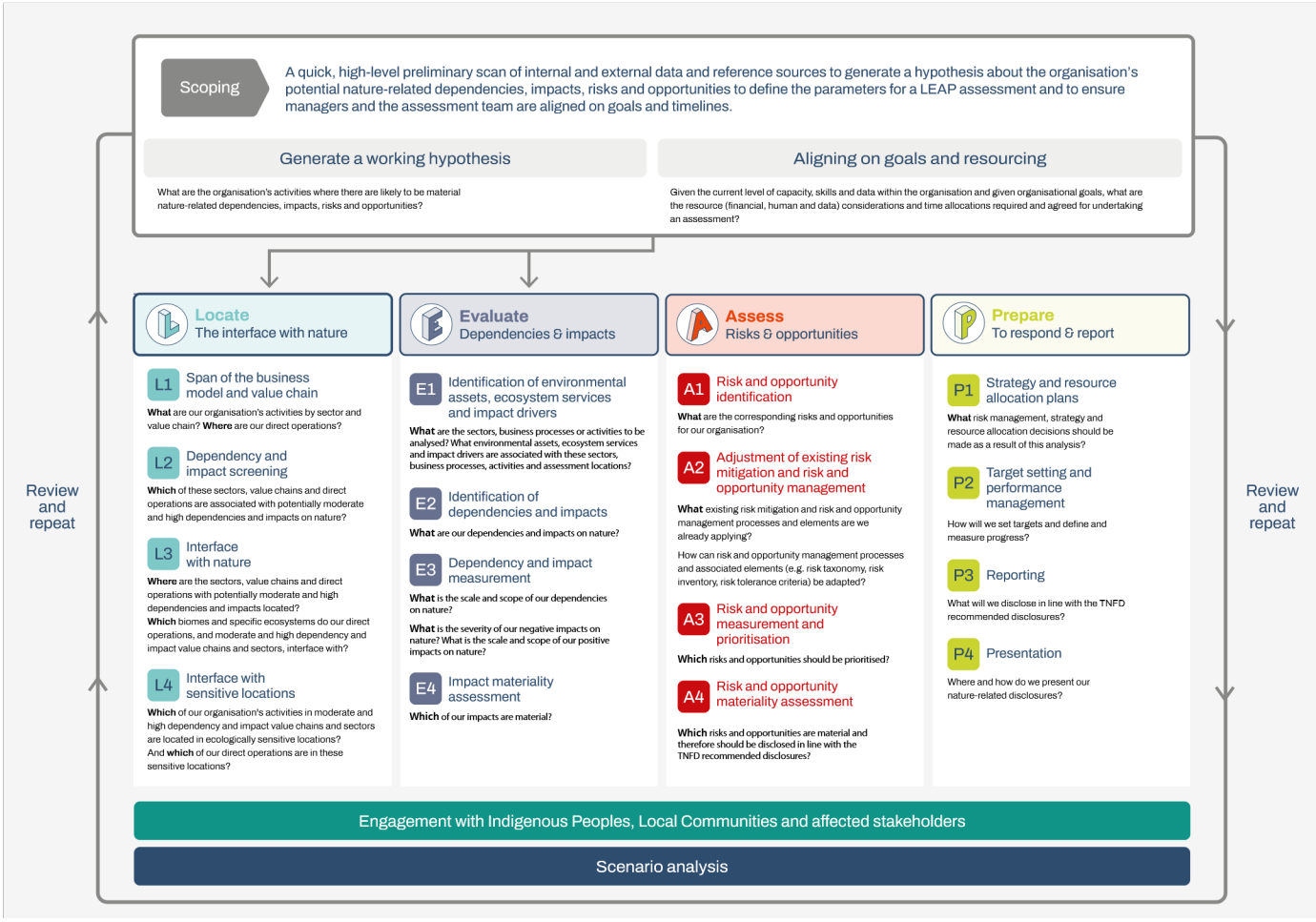
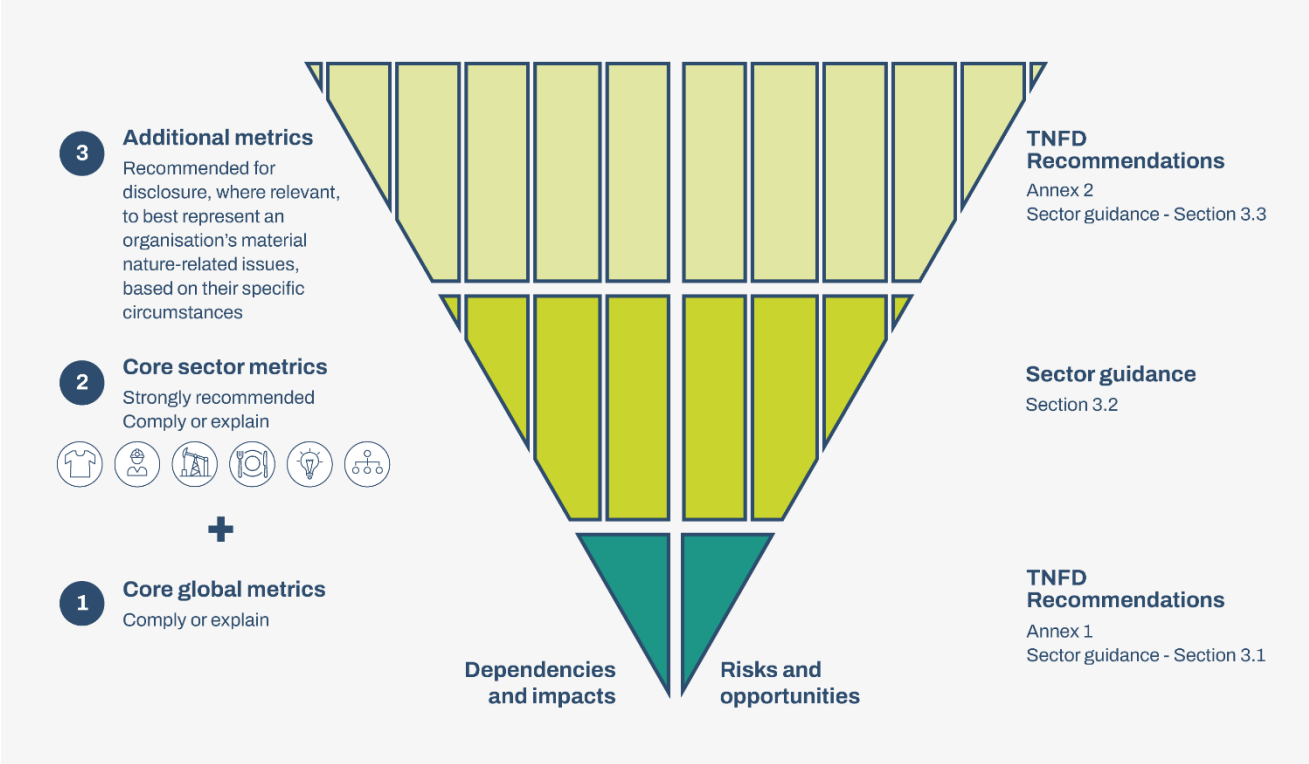


Figure 1: TNFD disclosure metrics architecture signposted to metrics lists



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 leverage 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®) Water Utilities & Services industry (Box 1). These are referred to as 'water utility organisations' in this guidance.

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

Water Utilities & Services (IF-WU)

Water Utilities & Services industry entities own and operate water supply and wastewater treatment systems (generally structured as regulated utility businesses) or provide operational and other specialised water services to system owners (usually market-based operations). Water supply systems include the sourcing, treatment and distribution of water to residences, businesses and other entities such as governments. Wastewater systems collect and treat wastewater, including sewage, greywater, industrial waste fluids and stormwater runoff, before discharging the resulting effluent back into the environment.

From SASB Standards (2024) Sustainable Industry Classification System (SICS)

Water utility organisations have varying levels of influence and control over management of their nature-related issues across their value chain, depending on the legal and contractual arrangements with local water authorities. Typically, local, regional, national or international bodies regulate water usage and allocation within a watershed. How water is supplied to users varies between countries and regions, including state-owned water utilities, private businesses that run and own water infrastructure, and private businesses that are contracted to operate publicly owned infrastructure and facilities. When water utilities do not own the assets or infrastructure they operate and/or where the local water authority precisely defines its objectives, their influence over their interface with nature may be limited. Although parts of this guidance may be less applicable for water utilities that face these constraints, conducting a nature-related assessment using the LEAP approach will be beneficial regardless of the legal system in which water utilities operate.

This guidance does not cover the design and construction of water utility infrastructure projects. These fall within the Engineering & Construction Services industry (IF-EC). On construction of utility projects, water utility organisations should refer to the TNFD additional sector guidance for the engineering, construction and real estate and construction materials sectors, where relevant.

Annex 1 provides a comparison of classification systems for water utilities' different activities. This guidance covers:

- Water sourcing/collection;

- Water treatment;
- Water distribution and supply;
- Wastewater management;
- Wastewater discharge;
- Construction of infrastructure water utilities activities (only partial coverage); and
- Recycling and resource recovery activities, including resource transformation into bioresources.

The guidance is a supplement to the TNFD's Guidance on the identification and assessment of nature-related issues: The LEAP approach and should be read in conjunction with that guidance. Water utility organisations should also refer to the TNFD biome guidance and Guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders.

The examples provided in this guidance for the water utilities 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 organisations to consult additional relevant sources, including scientific references and relevant industry standards or best practice guides, and conduct thorough assessments to identify and assess nature-related dependencies, impacts, risks and opportunities specific to their operations and value chains. This guidance aims to support, not replace, a tailored assessment, which will be necessary for each organisation.

Table 1: Areas of LEAP with additional guidance for the water utilities and services sector

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

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?

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?

Water utility organisations typically source water supply (upstream), treat and distribute water (direct operations), and treat wastewater before discharge (downstream):

- **Upstream:** Due to the critical need to maintain the quantity and quality of water supply, water utility organisations typically understand which watersheds they supply from. For an organisation that already considers some upstream nature-related issues, this guidance can help expand this understanding. As noted above, the ability of a water utility organisation to change management of nature-related issues will vary depending on their legal and contractual status with local authorities.
- **Direct operations:** Water utility organisations are typically able to act upon nature-related issues within direct operations to achieve operational efficiency and for innovation development.
- **Downstream:** Management of the nature-related issues for water utilities' downstream activities is critical and should not be overlooked. As water utility organisations release water back into freshwater ecosystems, they have significant impact on water quality (such as contaminant loads and temperature) and water quantity (including temporal variability). This has impacts on downstream stakeholders and biodiversity.
- **Area of influence:** Whenever a water utility organisation relies on large-scale, transboundary water transfers, it will be relevant to consider nature-related issues beyond the watersheds where its direct operations are located.

Engagement with stakeholders is important for all types of water utilities and is therefore important when scoping a LEAP assessment and throughout all phases of the LEAP approach. Organisations may find it useful to refer to the TNFD's Guidance on engagement with Indigenous Peoples, Local Communities and affected stakeholders.

2.2. Locate the organisation's interface with nature

This section provides additional guidance to help water utility organisations with the Locate phase of the LEAP approach.

L1: Span of the business model and value chain

Guiding questions:

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

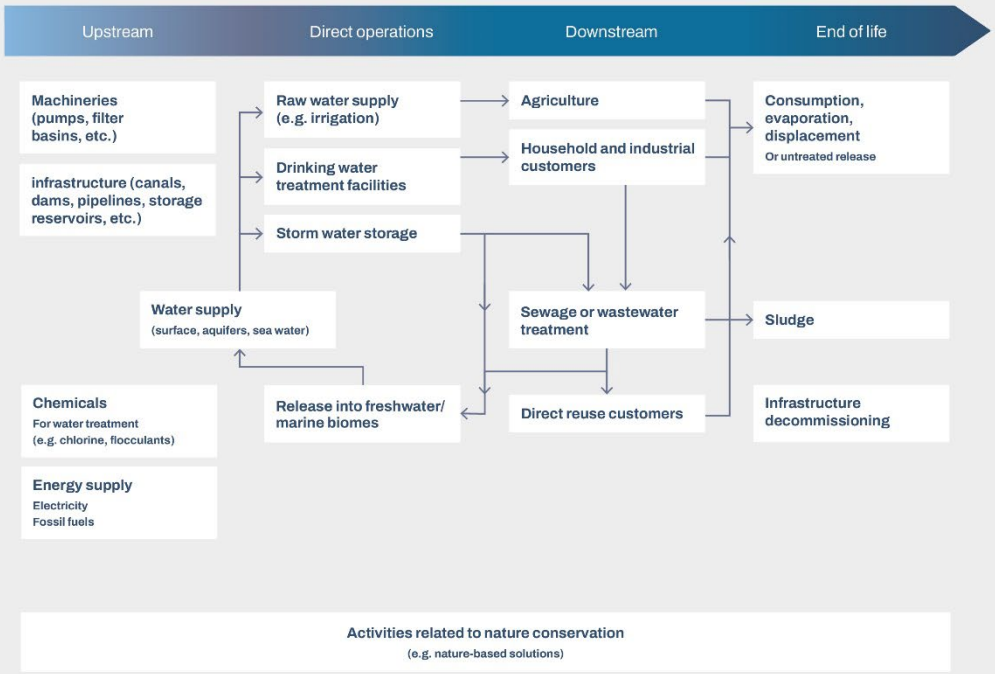
Water utilities' core activities essentially consist of moving and treating water. This usually requires large-scale infrastructure, some of which can have a significant land footprint, such as reservoirs and aqueducts. The long lifespan of engineering infrastructure may lead to 'lock-ins' that restrict changes and adaptation options in the context of a changing climate or deteriorating conditions of local ecosystems.

While water utilities' direct operations typically depend on local catchment areas, some water utilities operate across watersheds and may rely on transboundary water transfers, particularly in water scarce areas, where average local water supplies do not meet demand. This means the dependencies and impacts on nature of water withdrawals may be far away from consumers. This can increase the risk of conflicts among water users and lead to energy requirements at a regional or international level.

To preserve a sufficient quantity of water resources, water utilities commonly act within their value chain. Water utilities typically create incentives for their clients to reduce their consumption, track and fix leaks within the network and, when necessary, support alternative water resources (such as aquifer replenishment, water reuse and desalination).

Figure 3 provides a high-level mapping of some of the activities typically associated with the water utilities value chain that may help water utility organisations scope their LEAP assessment.

Figure 3: Water utilities and services sector value chain



To determine their upstream nature-related issues, organisations should refer to guidance from other relevant sectors including TNFD sector guidance on metals and mining, chemicals, construction materials and agriculture.

L2: Dependency and impact screening

Guiding question:

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

Table 2 lists the ecosystem services that organisations in the water utilities and services sector commonly depend on and Table 3 lists the sector's primary impact drivers based on the ENCORE tool and database. Organisations can use these tables as a first filter to screen activities with potentially high dependencies and impacts. These tables present global sector averages. Actual dependencies and impacts will vary across organisational and geographical contexts. Organisations can also refer to locally defined standards or international standards that set out key environmental impacts of the water utilities and services sector such as:

- The Alliance for Water Stewardship Standard 2.0; and
- ICMA and Green Bonds Framework for Impact Reporting For Sustainable Water and Wastewater Management Projects.

Organisations should also consult the associated TNFD sector guidance for other sectors in the value chain, where available.

Table 2: Materiality ratings of ecosystem services the water utilities and services sector typically depends on

Ecosystem services functionality		Construction of utility projects	Wholesale of machinery, equipment and supplies	Water collection, treatment and supply	Sewerage	Materials recovery
Provisioning services	Other provisioning services – Animal-based energy	N/A	N/A	N/A	N/A	N/A
	Biomass provisioning	N/A	N/A	VL	N/A	N/A
	Genetic material	N/A	N/A	N/A	N/A	N/A
	Water supply	M	L	M	L	M
Regulating and maintenance services	Solid waste remediation	ND	ND	VH	VH	H
	Soil and sediment retention	H	L	M	VL	VL
	Water purification	M	ND	VH	M	N/A
	Soil quality regulation	N/A	N/A	N/A	N/A	N/A
	Other regulating & maintenance services – Dilution by atmosphere and ecosystems	L	N/A	N/A	M	VL
	Biological control	ND	VL	VL	VL	VL
	Air filtration	VL	N/A	M	VL	M
	Flood mitigation	M	L	M	H	VL
	Global climate regulation	M	VL	VL	VL	VL
	Nursery population and habitat maintenance	N/A	N/A	N/A	N/A	N/A

Ecosystem services functionality		Construction of utility projects	Wholesale of machinery, equipment and supplies	Water collection, treatment and supply	Sewerage	Materials recovery
Regulating and maintenance services	Noise attenuation	VL	N/A	VL	VL	VL
	Other regulating and maintenance services – Mediation of sensory impacts (other than noise)	VL	N/A	VL	VL	VL
	Local (micro and meso) climate regulation	L	L	L	ND	ND
	Pollination	N/A	N/A	N/A	N/A	N/A
	Storm mitigation	M	L	L	H	VL
	Water flow regulation	M	L	M	H	L
	Rainfall pattern regulation	VH	VL	VH	M	M
Cultural services	Recreational related services	N/A	N/A	N/A	N/A	N/A
	Visual amenity services	N/A	N/A	N/A	N/A	N/A
	Education, scientific and research services	N/A	N/A	N/A	N/A	N/A
	Spiritual, artistic and symbolic services	N/A	N/A	N/A	N/A	N/A

Notes: Ratings for dependencies refer to the importance of the contribution an ecosystem service makes to the production process.

N/A = Non-applicable ND = No data

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

The ecosystem service classification used by ENCORE, one of the sources of this table, differs from the classification used in the TNFD guidance, which is based on the UN SEEA. A crosswalk is available from UN SEEA.

Table 3: Materiality ratings for impact drivers typically relevant for the water utilities and services sector

Ecosystem services functionality		Construction of utility projects	Wholesale of machinery, equipment and supplies	Water collection, treatment and supply	Sewerage	Materials recovery
Land, freshwater and ocean use change	Area of land use	L	L	H	L	M
	Area of freshwater use	VH	N/A	H	M	N/A
	Area of seabed use	M	N/A	ND	M	ND
Climate change	Emissions of greenhouse gases (GHG)	M	M	M	H	M
Pollution/pollution removal	Emissions of non-GHG air pollutants	L	L	M	L	M
	Disturbances (e.g. noise, light)	VH	L	M	VH	H
	Emissions of toxic soil and water pollutants	H	L	M	VH	M
	Emissions of nutrient soil and water pollutants	N/A	N/A	N/A	VH	N/A
	Generation and release of solid waste	M	VL	L	M	M
Resource use/ replenishment	Volume of water use	L	M	L	L	M
	Other biotic resource extraction (e.g. fish, timber)	N/A	N/A	N/A	N/A	N/A
	Other abiotic resource extraction	N/A	N/A	N/A	N/A	N/A
Invasive alien species	Introduction of invasive species	L	ND	N/A	VH	M

Ratings for impacts refer to the importance of a potential impact of a production process on natural capital.

N/A = Non-applicable ND = No data

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

L3: Interface with nature

Guiding questions:

Where are the sectors, value chains and direct operations with potentially moderate and high dependencies and impacts located? Which biomes and specific ecosystems do our direct operations, and moderate and high dependency and impact value chains and sectors, interface with?

Water utility organisations typically interface with a wide variety of biomes, given their necessary presence wherever human populations and activities are located. Water utility organisations typically interface with the following biomes:

Land:

- Tropical-subtropical forest (T1);
- Temperate boreal forests and woodlands (T2)
- Shrublands and shrubby woodlands (T3)
- Savannahs and grasslands (T4);
- Deserts and semi deserts (T5);
- Polar/alpine (T6); and
- Intensive land use systems (T7).

Freshwater:

- Rivers and streams (F1);
- Lakes (F2);
- Artificial wetlands (F3);
- Vegetated wetlands (TF1); and
- Subterranean freshwaters (SF1).

Ocean:

- Marine shelf (M1);
- Shoreline systems (MT1);
- Maritime vegetation (MT2);
- Coastal inlets and lagoons (FM1); and
- Brackish tidal systems (MFT1).

A number of tools, datasets and methods may be helpful to locate the specific ecosystems in the rivers and streams biome. Water utilities sector organisations should also refer to the TNFD biome guidance.

Organisations can use primary spatial data on infrastructure (e.g. point coordinates or polygons of hydropower or water storage infrastructure) or localised resources (e.g. point coordinates of water abstraction). This can be overlayed with spatial data on rivers and streams from the IUCN Global Ecosystem Typology data. Data from the following datasets may also be helpful:

- WWF HydroSHEDS;
- WWF HydroRIVERS;
- Global River Classification (GloRiC);
- Distribution of IUCN Red List of Threatened Species;
- Freshwater Key Biodiversity Areas; and
- Ramsar List of Wetlands of International Importance.

Organisations should refer to the TNFD biome guidance for more information on how to locate the interfaces with these biomes.

L4: Interface with sensitive locations

Guiding questions:

Which of our organisation's activities in moderate and high dependency and impact value chains and sectors are located in ecologically sensitive locations? And which of our direct operations are in these sensitive locations?

Water utility organisations should refer to the relevant TNFD biome guidance for further details on what are considered sensitive locations in each biome, as applicable.

Freshwater ecosystems, including rivers and streams, are particularly threatened, and have experienced greater declines in biodiversity than ecosystems on land. All interactions with water bodies (wetlands, lakes, rivers, streams and bogs) are therefore potentially sensitive locations, given their biodiversity importance, rapid declines in ecosystem integrity and crucial ecosystem function.[1]

When assessing whether other locations are sensitive, the organisation should ensure it is adopting an appropriate scale for its operations and for the larger regions in which it is operating or sourcing from so that the area of influence of the service or site is integrated into the overall assessment.

[1] WWF (2024) Living Planet Report 2024 – A System in Peril. WWF, Gland, Switzerland.

2.3. Evaluate dependencies and impacts on nature

This section provides additional guidance to help water utilities sector organisations with the Evaluate phase of the LEAP approach.

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

Guiding questions:

What are the sectors, business processes or activities to be analysed?

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

Water-related ecosystem services are critical for water utilities' operations, including water supply and water purification. They must ensure adequate quality and quantity of water for their operations. Downstream, wastewater treatment is an activity that, when operating effectively, can have a positive impact on ecosystems, as it removes pollutants and contaminants before discharge. However, when consistent operations are not adequate, such as during storm overflows, and/or with lack of proper investment and oversight, wastewater discharge quality may harm aquatic ecosystems. This can be due to eutrophication, bacterial contamination or due to the presence of components and byproducts from various industries (e.g. pharmaceutical, cosmetic, chemical), with implications for human health such as disease transmission.[2]

Water utilities need to adapt to local conditions, including external factors outside of their control. Understanding which environmental assets, ecosystem services and impact drivers they currently work with is therefore crucial. Given their significant dependencies and impacts on water resources, it is particularly important to all water utility organisations to identify the dependencies and impacts on water resources of Indigenous Peoples, Local Communities, industries, conservation organisations and other stakeholders within relevant watersheds.

External factors including climatic conditions and economic activities will have significant effects on the watersheds and ecosystem services that water utilities depend on. For example, if the watershed supporting a water utility organisation contains a large extent of forests in good condition or naturally filtering dunes with abundant and regular precipitation, there will be abundant provision of water supply and water purification services. In contrast, a water utility in a water scarce region, with limited rainfall, large population and/or significant demands on water resources from other industrial activities may face risks associated with a limited quality and quantity of water. Water reuse potential may be constrained by external factors such as nearby pollution or regulations.

[2] WHO (2023) Drinking water.

Desalination may offer a viable alternative to freshwater, particularly in regions facing high water stress. However, desalination requires significant investment and operational expenditures due to high energy requirements, which may be fossil fuel-dependent, and have a potential impact on local marine and coastal ecosystems through brine discharge. Brine discharge temporarily increases salinity in receiving waters, but when properly managed this should not reach harmful levels. Improper management, such as discharges containing harmful level of chemicals, should be clearly identified as malpractice rather than standard practice within the industry.

E2: Identification of dependencies and impacts

Guiding question:

What are our dependencies and impacts on nature?

Dependencies on nature

Table 4 provides examples of dependency pathways relevant to water utility organisations, linking the dependencies prioritised in L2 to key commodities or production systems.

Table 4: Examples of dependency pathways in the water utilities and services sector, by activity

Water utilities and services sector activity	Environmental assets and ecosystem services depended on	Considerations for the water utilities and services sector (including ENCORE materiality ratings by ecosystem service where applicable)
Water collection, treatment and supply	**Environmental assets** • Terrestrial (land based) ecosystems • Water resources • Freshwater ecosystems **Ecosystem services** *Provisioning services* • Water supply • Biomass provisioning *Regulating and maintenance services*	Water utility organisations rely on terrestrial (land based) ecosystems, freshwater ecosystems and water resources. They depend on water from surface water (rivers and lakes) and groundwater (aquifers) to provide clean water to meet human needs. They depend on various ecosystem services including: **Water supply (M)**: As a direct physical input to the value chain, water utility organisations are dependent on sufficient freshwater from both surface water (natural or artificial waterways containing freshwater, including lakes, rivers, streams and canals) and ground water (freshwater located in the subsurface pore space of soil and highly permeable rocks called aquifers). **Rainfall pattern regulation (VH)**: Water collection, treatment and supply depends on rainfall pattern regulation by ecosystems to secure water supply.

	• Rainfall pattern regulation • Water purification • Solid waste remediation • Water flow regulation • Soil and sediment retention • Flood mitigation • Air filtration • Storm mitigation • Low (micro and meso) climate regulation • Biological control • Noise attenuation • Other maintenance and regulating service – Mediation of sensory impacts (other than noise)	**Water purification (VH) and solid waste remediation (VH)**: Water utility organisations also depend on water filtration and purification and solid waste remediation before and after treatment to help maintain and/or improve water quality. Organisations rely on healthy rivers with low levels of nutrients and pollutants, and the quality of water determines the extent of treatment required.[3] **Solid waste remediation (VH)**: Water utility organisations depend on solid waste remediation services, which is determined by ecosystems' ability to process organic and inorganic substances. **Water flow regulation (M):** Water utility organisations rely on the hydrologic cycle to recharge groundwater sources, regulate river flows and maintain surface water flows, notably groundwater and lake water tables. **Soil and sediment retention (M)**: Healthy soils form a key component of the hydrological cycle and are critical to sustaining the sector as they store, accept, transmit and purify water. They also reduce the loss of soil (and sediment), which if not maintained appropriately, can have adverse impacts on an organisation's infrastructure, e.g. landslides. **Flood mitigation (M):** Water utility organisations depend on flood mitigation regulation to ensure their infrastructure operates normally without risk of damage to facilities from extreme weather events, e.g. heavy rainfall flooding and/or landslides.[4] **Air filtration (M)**: Water collection, treatment and supply depends on air filtration provided by ecosystems to mitigate the harmful effects of air pollutants released. For water collection, treatment and supply, water utility organisations, depending on their location and interaction with the environment, may also find it relevant to consider their dependence on other ecosystem services including biomass provisioning; storm mitigation; local climate regulation; biological control; noise attenuation; and mediation of sensory impacts (other than noise).

[3] Business for Nature (2023) Water utilities and services: Priority actions towards a nature-positive future.

[4] EPA (2024) Climate Adaptation and Water Utility Operations.

Desalination	**Environmental assets** Marine (ocean) ecosystems **Ecosystem services** *Regulating and maintenance services* • Solid waste remediation • Flood mitigation • Rainfall pattern regulation • Soil and sediment retention	Desalination plants depend on marine (ocean) ecosystems to carry out their activities, which involve extracting water from marine ecosystems and processing for human consumption. **Solid waste remediation**: Some desalination facilities are dependent on solid waste remediation services, which include the transformation of organic or inorganic substances, to dilute and disperse the discharge of brine.[5] **Flood mitigation and rainfall pattern regulation**: Desalination facilities also depend on flood mitigation and rainfall pattern regulation, as well as soil and sediment retention, to ensure their infrastructure operates normally without risk of damage from extreme weather events, e.g. heavy rainfall, flooding and/or landslides. **Soil and sediment retention**: Healthy soils are critical to reduce the loss of soil (and sediment) which if not maintained appropriately can have adverse impacts on the business' infrastructure, e.g. landslides.
Wastewater treatment and discharge (sewerage)	**Environmental assets** Water resources **Ecosystem services** *Provisioning services* Water supply *Regulating and maintenance services* • Solid waste remediation • Water purification • Flood mitigation	For wastewater treatment and discharge, water utility organisations depend on water resources to process the effluent. **Solid waste remediation (VH) and water purification (M)**: Water utility organisations depend on the capacity of the ecosystem to receive treated wastewater (final effluent). While wastewater is treated, it will still contain nutrients (due to technical limitations of the wastewater treatment process). Water utility organisations rely on rivers in good health with low levels of nutrients and pollutants from other sources such as farming in order to minimise the impact of the final effluents. Hence, they depend on water purification services before and after treatment to help maintain and/or improve water quality. They also highly depend on solid waste remediation services, which include the transformation of organic or inorganic substances, through the action of micro-organisms, algae, plants and animals that mitigate the harmful effects of sewage entering water bodies. It should be noted

[5] Sahu, P. (2021) A comprehensive review of saline effluent disposal and treatment: conventional practices, emerging technologies, and future potential. Water Reuse 11(1): 33-65.

	• Storm mitigation • Rainfall pattern regulation • Water flow regulation • Global climate regulation • Air filtration • Other regulating and maintenance service – Dilution by atmosphere and ecosystems • Biological control Soil and sediment retention • Noise attenuation • Other regulating and maintenance service – Mediation of sensory impacts (other than noise)	that combined sewers are not pervasive across the world, so in many areas rainfall will not cause an overflow.[6] **Flood mitigation (H):** Water utility organisations highly depend on flood mitigation services as floods can result in damage to infrastructure and can lead to overflows in the sewage network. **Storm mitigation (M)**: Water utility organisations also depend on storm mitigation to ensure their infrastructure operates normally, without risk of damage. Extreme weather events can lead to overflows in the sewage network, leading to discharge of raw sewage into rivers and coastlines. **Rainfall pattern regulation (M):** Water utility organisations depend on rainfall pattern regulation to avoid overflow of sewage. **Water flow regulation (M):** Water utility organisations depend on water flow regulation services to maintain water flow to manageable levels and avoid overflows especially in cases of extreme weather events, e.g. flooding, storms etc. **Other regulating and maintenance services – Dilution by atmosphere and ecosystems (M):** Water utility organisations depend on other regulating and maintenance services because water, both fresh and saline, and the atmosphere can dilute the gases, fluids and solid waste produced by human activity. Note that for wastewater treatment and discharge activities, water utility organisations may need to consider their dependence on water supply, global climate regulation, air filtration, biological control, soil and sediment retention, noise attenuation and mediation of sensory impacts (other than noise) services.

[6] Business for Nature (2023) Water utilities and services: Priority actions towards a nature-positive future.

Impacts on nature

Table 5 provides examples of impact pathways relevant to the water utilities and services sector. It is not comprehensive, and an organisation will need to further identify how these impact drivers affect the state of nature and the ability of nature to deliver ecosystem services.

Table 5: Examples of impact pathways for the water utilities and services sector, by activity

Water utilities and services sector activity	Impact driver	Environmental assets and ecosystem services affected	Considerations for water utilities and services sector
Water collection, treatment and supply	**Area of land use (H)**: Damage to ecosystems from activities across the value chain	**Environmental assets** • Land • Terrestrial (land based) ecosystems • Water resources • Freshwater resources **Ecosystem services** *Provisioning services* Water supply *Regulating and maintenance services* • Water purification • Solid waste remediation	Water collection, treatment and supply can require large areas of land for infrastructure, which impacts terrestrial and freshwater ecosystems (and in some cases, coastal ecosystems) from land use change, as well as activities that arise in direct operations.[7] Activities across the value chain can have an impact on these ecosystems and their ability to provide services. Ecosystems that water utilities critically depend on will be impacted by any damage caused to the ecosystems. These services include water supply, water purification, solid waste remediation, water flow regulation, soil and sediment retention and flood mitigation.[8]

[7] EEA (2021) Drivers of and pressures arising from selected key water management challenges.

[8] Envirotechonline (n.d.) How Does the Water Industry Affect the Environment?

		• Water flow regulation • Soil and sediment retention • Flood mitigation	
	Area of freshwater use (H) and volume of water use (L): Over-exploitation of water resources can harm freshwater ecosystems and cause water scarcity beyond normal variance	**Environmental assets** • Water resources • Freshwater resources • Subterranean freshwater ecosystems **Ecosystem services** *Provisioning services* • Water supply *Regulating and maintenance services* • Water flow regulation • Water purification	Water utilities companies depend on water resources, surface water (rivers and lakes) and groundwater (aquifers). Over-abstraction can have an impact on water supply where rivers may dry up or groundwater levels may drop to low levels, resulting in water scarcity.[9] This has an impact on water resources that organisations depend on and associated ecosystem services, including water supply, water flow regulation and water purification services.[10] Additionally, organisations should identify issues related to infrastructure (e.g. burst pipes, leakage from deterioration) as this may result in water leakage, which can have an incidence on water waste and unnecessarily increase the demand on water resources.[11] Water collection, treatment and supply uses water through pumps, chemical treatment and other infrastructure. It is estimated that the average water utility uses about 10% of the water it collects for these purposes.[12]
	GHG emissions (M): Emissions linked to water treatment processes	**Environmental assets** • Atmospheric systems • Renewable energy resources	Water collection, supply and treatment activities can lead to a release of GHG emissions in the atmosphere. In some

[9] Foster, S. and Gogu, R. (2022) Groundwater Assessment and Management for sustainable water-supply and coordinated subsurface drainage: A Guidebook for Water Utilities and Municipal Authorities. IWA Publishing.

[10] EEA (2021) Drivers of and pressures arising from selected key water management challenges.

[11] Envirotechonline (n.d.) How Does the Water Industry Affect the Environment?

[12] ENCORE (2024)

		Ecosystem services • Local (micro and meso) climate regulation • Global climate regulation • Air filtration	instances, businesses use renewable energy sources to power their operations.[13] When organisations rely on fossil fuels, this leads to air pollution and impacts on local climate regulation, global climate regulation and air filtration services.
	Non-GHG emissions (M): Non-GHG emissions relating to water treatment activities	**Environmental assets** Atmospheric ecosystems **Ecosystem services** *Regulating and maintenance services* • Local (micro and meso) climate regulation • Global climate regulation • Air filtration	Organisations should consider potential impacts generated by the release of non-GHG emissions, such as methane and nitrous oxide, which arise from their activities and the associated impacts on air pollution and ecosystem services they depend on.
	Disturbances (M): Noise pollution	**Ecosystem services** Noise attenuation services	Water collection, treatment and supply can cause disturbances like noise pollution due to the operation of machinery in treatment plant and wastewater pumping stations, which can disrupt or negatively affect species populations.
	Emissions of toxic and nutrient soil and water pollutants (M):	**Environmental assets**	Water collection, treatment and supply can involve methods and reagents that generate both solid and liquid wastes, which can lead to soil and water pollution.

[13] IWA (2023) A Short IWA Guide to Greenhouse Gas Emissions and Water Resource Recovery Facilities. .

	Solid and liquid waste generation leading to soil and water pollution	• Terrestrial (land based) ecosystems • Water resources • Freshwater resources **Ecosystem services** *Regulating and maintenance services* • Nursery population and habitat maintenance • Solid waste remediation • Water purification	Excess phosphorous may arise during extraction practices and may also result from leakage linked to infrastructure issues (e.g. burst pipes, leakage from infrastructure deterioration). Excess phosphorous impacts the quality of the water source (water resources and/or freshwater resources), the aquatic organisms and local environments (nursery population and habitat maintenance), and the ability of ecosystems to provide water purification services.
	Generation and release of solid waste (L): Use of reagents can lead to water pollution	**Environmental assets** • Water resources **Ecosystem services** • *Regulating and maintenance services* Solid waste remediation	Water treatment can generate solid waste though the use of reagents. This can lead to adverse environmental impacts such as water pollution.
Desalination	GHG emissions: Increase in emissions linked to energy intensive process	**Environmental assets** • Atmospheric systems • Renewable energy resources	The process of desalination is an energy-intensive process that can be powered by fossil fuels, leading to an increase in GHG emissions in the atmosphere. In some instances,

	(when business relies on fossil fuels)	**Ecosystem services** • Local (micro and meso) climate regulation • Global climate regulation • Air filtration	businesses use renewable energy sources to power their operations.[14] When organisations rely on fossil fuels, this leads to impacts on local climate regulation, global climate regulation and air filtration services.
	Land/freshwater/ocean use change: Changes to the coastlines and introduction of salt	**Environmental assets** • Terrestrial (land based) ecosystems • Marine (ocean) ecosystems **Ecosystem services** *Regulating and maintenance services* • Nursery population and maintenance Water purification	Desalination processes may induce changes in coastal ecosystems (infiltration) and indirectly in terrestrial ecosystems. Mismanagement may cause harm to local ecosystems and their ability to provide services organisations depend on, such as water purification and ability to maintain and regulate nursery populations.[15]
Wastewater treatment and discharge (sewerage)	**Disturbances (VH)**: Generation of disturbances from wastewater treatment facilities	**Environmental assets** • Terrestrial (land based) ecosystems	Sewerage activities can cause disturbances like noise, light and odour pollution due to the operation of disposal facilities and waste transportation that can disrupt or negatively affect species populations.

[14] Cornejo, P. K., Santana, M. V., Hokanson, D. R., Mihelcic, J. R. and Zhang, Q. (2014). Carbon footprint of water reuse and desalination: a review of greenhouse gas emissions and estimation tools. Journal of Water Reuse and Desalination 4 (4):238.

[15] UNEP (2019) Towards sustainable desalination.

		Ecosystem services • *Regulating and maintenance services* • Nursery population and maintenance • Biological control	
	Emissions of toxic and pollutants to soil and water (VH): Eutrophication, bacterial contamination or due to the presence of components and byproducts	**Environmental assets** • Terrestrial (land based) ecosystems • Water resources • Freshwater ecosystems **Ecosystem services** *Regulating and maintenance services* • Nursery population and maintenance • Solid waste remediation • Water purification	Water utility organisations may contribute to the pollution of rivers, lakes and coastal waters through undertreated and/or untreated wastewater discharges as well as ageing (e.g. lead pipes) and leaky infrastructure that can have impacts on land-based and freshwater ecosystems.[16] Organisations should identify issues related to infrastructure as this may result in water leakage, which can have an incidence on water sources. Ageing, poorly maintained or designed sewers can lead to discharge/release of raw sewage into rivers and coastlines, and untreated wastewater, which can contaminate water sources, affect water quality and impact aquatic life and local wildlife. This can also occur during extreme rainfall events when there are overflows in the sewerage network. As a result, various ecosystem services can be impacted. Excess phosphorous impacts the quality of the water source (water resources and/or freshwater resources) and the aquatic organisms and local environments (nursery

[16] EEA (2023) Water use and environmental pressures.

			population and habitat maintenance), as well as the ability of ecosystems to provide water purification services.[17]
	Introduction of invasive species (VH): Propagation of invasive plants via wastewater	**Environmental assets** • Water resources • Freshwater ecosystems **Ecosystem services** *Provisioning services* Water supply *Regulating and maintenance services* • Nursery population and maintenance • Solid waste remediation • Water purification	Seeds, viable roots or other propagules of invasive plants may be easily spread to receiving waters through sewerage and wastewater discharge and then spread by water flow to distant areas downstream. Ineffective wastewater management and sewage effluent can lead to the development of aquatic weeds caused by nutrient enrichment. In these areas, invasive species can harm water sources and have an incidence on the waterbodies' quality.[18]
	GHG emissions (H): Increase in emissions linked to wastewater treatment and discharge	**Environmental assets** Atmospheric systems **Ecosystem services** • Local (micro and meso) climate regulation • Global climate regulation	Wastewater treatment can generate GHG emissions during treatment processes, such as anaerobic digestion or aerobic treatment, organic matter decomposition and microbial activity, contributing to air pollution and impacting the ecosystem services an organisation depends on.

[17] EEA (2023) Water use and environmental pressures.

[18] Van Gingel, C. (2010) Eutrophication: Present reality and future challenges in South Africa.

		• Air filtration	
	Area of seabed use (M) land use (L): Damage to ecosystems	**Environmental assets** • Land • Terrestrial (land based) ecosystems • Marine ecosystems **Ecosystem services** *Provisioning services* Water supply *Regulating and maintenance services* • Water purification • Solid waste remediation • Water flow regulation • Soil and sediment retention • Flood mitigation	Alongside water withdrawal (or abstraction) and flow alteration that cause impacts to ecosystems, impacts also arise from wastewater treatment and disposal as facilities intersect with freshwater bodies, impacting geomorphology and hydrology. Depending on the spatial footprint of the project, damage to terrestrial, and in some cases, coastal ecosystems, can occur as well as impacts to the seabed via sewage pipes. This can affect the provision of ecosystem services organisations in the sector depend on.[19] For example, changes in water flows can emerge from the transfer of water flows (installation dependent).
	Solid waste generation and disposal (M): Organic matter generation and release	**Environmental assets** • Terrestrial (land based) ecosystems • Water resource • Freshwater ecosystems	Sewage, animal manure and sludge are high in organic matter, which can reduce the amount of oxygen in water. If not appropriately treated, they are released into water resources and freshwater ecosystems, harming aquatic organisms and the surrounding ecosystem (terrestrial ecosystems). This may impact ecosystem services that

[19] Corominas, L., Byrne, D. M., Guest, J. S., Hospido, A., Roux, P., Shaw, A., & Short, M. D. (2020). The application of life cycle assessment (LCA) to wastewater treatment: A best practice guide and critical review. Water Research Volume 184: 116058.

		Ecosystem services *Regulating and maintenance services* • Nursery population and maintenance • Solid waste remediation • Water purification	water utility organisations depend on, including solid waste remediation and water purification.[20]
	Non-GHG air emissions (L): activities release non-GHG air emissions leading to air pollution	**Environmental assets** Atmospheric ecosystems **Ecosystem services** *Regulating and maintenance services* • Local (micro and meso) climate regulation • Global climate regulation • Air filtration	The treatment and disposal of sewage can lead to the emissions of pollutants like particulate matter, sulfur dioxide, nitrogen oxides, volatile organic compounds and heavy metals, which can lead to air pollution.
	Volume of water use:	**Environment assets** **Water resources** **Ecosystem services** *Provisioning services* Water supply	Treatment and disposal of sewage requires water use to transport wastewater from homes and businesses to treatment plants.

[20] IWA (2016) Water Utility Pathways in a Circular Economy.

Positive impacts

Water utility organisations can also generate positive impacts on nature i.e. positive changes to the state of nature. They can be generated by both positive impact drivers and those that reduce negative impact drivers. For water utility organisations these include:

- Practices associated with water recycling and the use of alternative water sources that lead to reduced extraction of water resources;
- Water treatment activities that effectively reduce nutrient loading and improve the quality of the water returned to the environment, ideally operating with minimal energy requirements;
- Resource transformation processes involving bioresources, such as transforming sewage sludge, a waste product from wastewater treatment, into biosolids that can be used to supplement or substitute synthetic fertilisers; developing biogas as an energy resource; and other recovered substances and materials such as polymers;[21]
- Nature-based solutions associated with water utilities, such as those involving wetlands or forest protection upstream, which can lead to positive impacts on nature.[22]

External factors with relevance to the sector include:

- **Climate change:** Climate change leads to higher frequency of rapid weather events, such as drought, and slow onset weather events, which can lower water tables. These influence provisioning services such as water supply and regulating and maintenance services, such as rainfall pattern regulation. Organisations will need to assess the influence of climate change on the ecosystem services upon which its activities depend.
- **Cumulative impacts:** Other stakeholders may have activities in watersheds that water utility organisations depend on. Their activities may result in passing local ecological thresholds and tipping points, such as excessive water withdrawals or nutrient loads due to fertilisers in freshwater ecosystems, affecting the reliability of water-related ecosystem services and the resilience of water utility operations.

[21] IWA (2016) Water Utility Pathways in a Circular Economy

[22] IWA (n.d.) Nature for Water and Sanitation.

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?

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

For the quantification of dependencies and impacts, water utility organisations may find it useful to refer to the TNFD sector metrics for water utilities and services in Section 3.

E4: Impact materiality assessment

Guiding question:

Which of our impacts are material?

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

2.4. Assess nature-related risks and opportunities

This section provides additional guidance to help water utility organisations with the Assess phase of the LEAP approach.

A1: Risk and opportunity identification

Guiding question:

What are the corresponding risks and opportunities for our organisation?

Table 6 provides illustrative examples of risks for the water utilities and services sector.

Table 6: Illustrative risks in the water utilities and services sector

Risk type		Illustrative risk in the water utilities and services sector	Magnitude indicator
Physical, transition or systemic-risk type	**Risk category**		
Physical	Acute	Changes in input conditions.	• Increase in production costs and potential non-compliance with production targets, with consequent fines or investment issues.
Physical	Acute	Extreme weather events, such as heavy rainfall, flooding, landslides or other natural disasters within watershed, representing a risk to water utilities operations (e.g. infrastructure collapse or overflow).	• Increase in capital expenditure on infrastructure repair due to damage by extreme weather events. • Reputational damage caused by contamination of water ecosystems and possible eutrophication.
Physical	Acute	Invasive alien species in supply infrastructure (e.g. irrigation canals or inter-basin pipelines).	• Increase in direct costs as result of invasive alien species, requiring a management plan for removal.
Physical	Chronic	Inadequate treatment or problems occurring during wastewater treatment, leading to water quality degradation and eutrophication.	• Increase in direct costs to manage impacts on receiving water body. • Increase in fines due to failure to meet quality requirements
Physical	Acute or chronic (dependent on local contexts)	Over-abstraction stressing water resources and freshwater ecosystems.	• Increase in production and sourcing costs due to high or extremely high baseline water stress. • Increased costs associated with the relocation of water sourcing operations due to increase in water stressed areas.

Transition	Policy	Stricter water quantity and/or quality regulation.	• Increase in fines due to failure to meet regulatory limits on water use or quality requirements. • Increase in taxes leading to increase in expenditure. • Permit denials because of failure to meet legally binding targets to reduce water use. • Requirement for increased investment levels leading to increased expenditure.
Transition	Technology	Novel substances of concern (e.g. PFAS[23], microplastics, pharmaceuticals) and other contaminants.	• Increase in capital expenditure on new and additional water purification and desalination technologies.
Transition	Reputation	Reputational damage caused by changing rainfall patterns for distribution and over-abstraction from the catchment.	• Risk of over-abstraction leads to reputational risk as water scarcity is a growing concern among consumers and broader society

Table 7 provides illustrative examples of opportunities for the water utilities and services sector.

Table 7: Illustrative opportunities in the water utilities and services sector

Nature-related opportunity type	Illustrative nature-related opportunity in the water utilities and services sector	Magnitude indicators
Resource efficiency	Maintaining sustainable water supplies within watershed	• Increased resilience • Reduced capital/infrastructure costs • Avoided fines/penalties • Reduction in operational costs due to improved readiness and response to regulatory changes • Reduced costs of potential impacts on operations that are external to the organisation (e.g. impacts at the watershed level)
	Water quality improvement due to additional investment in treatment technology	• Reduced capital/infrastructure costs • Avoided fines/penalties • Reduced costs of potential impacts on operations that are external to the organisation (e.g. impacts at the watershed level)
	Reducing water loss and leaks	• Reduced capital/infrastructure costs by supporting smart water management system and tools to track leaks

[23] Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals.

		• Reduced non-revenue water loss • Reduced freshwater resource demands
	Reducing consumer use	• Reduced water footprint through diagnostics and water efficiency measures leading to reduced demand on water in local communities, improving availability for essential uses • Increased resilience • Reduced capital/infrastructure costs • Avoided fines/penalties • Reduced operational costs
Products/services	Processing of sludge into biogas for power generation and/or fertilisers	• Reduced energy expenditures via use of biogas • Transformed sludge can be repurposed on-site, reducing dependence on external resources • Creation of new product leading to opportunity for new revenue streams
	Implementing sustainable drainage systems	• Reduced capital/infrastructure costs • Reduced costs of potential impacts on operations that are external to the organisation (e.g. impacts at the watershed level)
Markets	Increase in sustainable (green and blue) bonds based on increased interest in water security	• New financial products
	Resource transformation, such as biorefinery technology	• Development of new markets

Further support and tools on nature-based solutions that may be helpful for water utility organisations include:

- IUCN Global Standard for nature-based solutions
- IWA Nature-based solutions for wastewater treatment: A series of factsheets and case studies
- IWA Nature for water: A series of utility spotlights
- IWA Nature-based solutions for water utilities and regulators
- UN CEO Water Mandate and Pacific Institute: Benefit accounting of nature-based solutions for watersheds

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

Guiding questions:

What existing risk mitigation and risks 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, risk appetite) be adapted?

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

A3: Risk and opportunity measurement and prioritisation

Guiding question:

Which risks and opportunities should be prioritised?

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

A4: Risk and opportunity materiality assessment

Guiding question:

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

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

2.5. Prepare to respond and report

This section provides additional guidance to help water utility 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 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: 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 8 provides presents illustrative priority and transformative actions that water utility sector organisations may want to consider based on the dependencies, impacts, risks and opportunities identified in the earlier phases of LEAP. All actions have been categorised by the corresponding impact driver and classified according to Science Based Target Network's AR3T framework (Figure 4), based on the TNFD's interpretation of SBTN's AR3T framework, (pending alignment with future development of SBTN's Step 4 guidance): avoid and reduce negative impacts; restore and regenerate; transformation of business models, products, services, markets and investments; and contribute to needed systemic change inside and outside value chains.

Figure 4: SBTN's AR3T framework

Table 8: Illustrative examples of responses to nature-related impacts

Impact driver/dependency	Examples of responses to impacts on nature and associated risks	SBTN action framework (AR3T)					Global framework alignment
		Avoid	Reduce	Regenerate	Restore	Transform	
Land/freshwater/ocean use change	Reduce water quality pressures and enable more climate-resilient waterflows by adopting and/or engaging with watershed stakeholders and local authorities on land protection and conservation activities. This can include payments for ecosystem services for farmers and other land managers	X	X	X			GBF Target 11
	Implement water replenishment measures to restore local ecosystems directly benefiting communities that rely on these resources				X		SDG Goal 12, GBF Target 16
	Support the development of nature-based solutions such as wetland construction, restoration and conservation (see The Dragonfly Concept[24] and Ingoldisthorpe Wetland[25]) as energy-efficient, biodiversity-supporting alternatives to conventional water systems and/or engage in policy discussions that support/promote nature-based solutions			X	X	X	SDG Goal 12 & 15, GBF Target 11
	Restore and regenerate habitats and ecosystems by working in partnership across catchments to conserve intact habitats and			X	X		SDG Goal 15, GBF Target 2, SBTN Land targets

[24] SUEZ (n.d.) Shanghai Chemical Industry Park eco-wetland renovation project.

[25] Norfolk River Trust (2018) Ingoldisthorpe Wetland Creation

	restore and regenerate degraded or converted ecosystems						
	Adopt or engage with relevant stakeholders and authorities on the adoption of sustainable water drainage systems, wherever feasible					X	GBF Target 20
Water use/replenishment	Avoid sourcing freshwater in water-stressed regions and areas important to biodiversity; and reduce unsustainable freshwater use	X	X				SDG Goal 12, GBF Target 16, SBTN Freshwater targets
	Reduce consumer water use as an effective strategy to reduce demands on infrastructure by implementing incentives strategies such as smart meters and consumer education campaigns		X				SDG Goal 12, GBF Target 20 & Target 21
	Design infrastructures that enable water reuse, ensuring its maximum use and benefiting regions where water availability is limited and where regulations allow. Potential (direct) water reuse post-tertiary treatment includes industrial uses, agricultural irrigation, municipal parks, golf courses and other recreational purposes		X			X	GBF Target 16
	Actions implemented to improve network efficiency and performance		X			X	GBF Target 7
Water pollution	Avoid and reduce water pollution by refurbishing and/or rehabilitating facilities; optimise wastewater and sludge as a circular resource for energy, nutrients and other recoverable materials; leverage technologies for a smart wastewater network; and educate customers to reduce pollution caused by blockages	X	X			X	SDG Goal 6 & 14, GBF Target 7, SBTN Freshwater targets

Solid waste remediation	Circular wastewater treatment solutions, such as biogas or sludge composting, to mitigate energy expenditures and produce resources such as fertilisers					X	SDG Goal 12, GBF Target 20

P2: Target setting and performance management

Guiding question:

How will we set targets and define and measure progress?

Water utility organisations may find it useful to consider the following resources to set targets:

- SBTN methods for setting science-based targets for nature related to water quality and water quantity;
- The CEO Water Mandate guidance on setting effective site water targets informed by catchment context (contextual water targets);
- The International Water Stewardship Standard Version 2.0 for setting water-related targets; and
- Organisations can use SBTN's Short Paper to address biodiversity within science-based targets for nature. The document introduces a forthcoming detailed analysis of biodiversity coverage in the first release of science-based targets for nature, which will inform the development of further SBTN methods.

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; and
- TNFD – Global Reporting Initiative (GRI) Standards Interoperability Mapping.

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.

List of datasets and tools

A list of datasets and tools relevant to the water utilities and services sector can be found below.

Table 9: Datasets and tools relevant to the water utilities and services sector

Tool name	Description (relevance to sector)	LEAP phase
Aquastat	AQUASTAT is the FAO global information system on water resources and agricultural water management. It collects, analyses and provides free access to over 180 variables and indicators by country from 1960.	Locate
Global Environmental Flow Information System	Provides interactive maps with information related to environmental flows for current conditions and different Environmental Management Classes (EMCs) of a river system.	Locate, Evaluate
Global Freshwater Biodiversity Atlas	A geographic visualisation tool that provides an online, open-access, interactive gateway to key geographical information and spatial data on freshwater biodiversity across a wide range of scales, freshwater resources and ecosystems, human pressures and impacts on freshwater, and the conservation and management of freshwater ecosystems.	Locate
Global River Classification (GloRiC)	The Global River Classification (GloRiC) provides river types and sub-classifications for all river reaches contained in the HydroRIVERS database. GloRiC has been developed by utilising the river network delineation of HydroRIVERS combined with the hydro-environmental characteristics from the HydroATLAS database and auxiliary information.	Locate
Global Water Scarcity Atlas	Introduction to water scarcity and showcases analyses that cover the whole world.	Locate, Evaluate
IUCN Water Knowledge Platform	Evidence-based and adaptive change in water resource management that benefits nature and people.	Locate, Evaluate
Protected Planet	Source of data on protected areas and other effective area-based conservation measures (OECMs).	Locate
UNESCO IHP's "Global Network on Water and Development Information for Arid Lands"	Objective to strengthen the global capacity to manage the water resources of arid and semi-arid areas.	Locate

Water Footprint Network	Use the water footprint concept to promote the transition toward sustainable, fair and efficient use of freshwater resources worldwide.	Evaluate
Water Plan	AI-powered platform to measure, report and respond to water risk.	Locate, Evaluate
WRI Aqueduct Water Risk Atlas	Uses open-source, peer reviewed data to map water risks such as floods, droughts and stress.	Locate, Evaluate, Assess
WWF HydroATLAS	The HydroATLAS database is divided into three distinct sub-datasets: BasinATLAS, RiverATLAS and LakeATLAS, which represent sub-basin delineations (polygons), the river network (lines) and lake shorelines (polygons) respectively. In total, HydroATLAS contains 1.0 million sub-basins, 8.5 million river reaches and 1.4 million lakes.	Locate
WWF HydroRIVERS	HydroRIVERS represents a vectorized line network of all global rivers that have a catchment area of at least 10 km² or an average river flow of at least 0.1 m³/sec, or both. HydroRIVERS has been extracted from the gridded HydroSHEDS core layers at 15 arc-second resolution. The global coverage of HydroRIVERS encompasses 8.5 million individual river reaches with an average length of 4.2 km, representing a total of 35.9 million km of rivers globally. HydroRIVERS only includes a limited amount of (mostly geometric) attribute information, such as the river reach length, the distance from upstream headwaters and ocean outlet, the river order, and an estimate of long-term average discharge. Every river reach is also co-registered to the sub-basin of the HydroBASINS database in which it resides (via a shared ID).	Locate
WWF HydroSHEDS	HydroSHEDS provides hydrographic information in a consistent and comprehensive format for regional and global-scale applications. These data layers are available to support watershed analyses, hydrological modelling and freshwater conservation planning at a quality, resolution and extent that had previously been unachievable in many parts of the world.	Locate
WWF Water Risk Filter	Enables companies and investors to explore, assess and respond to water risks.	Locate, Evaluate
Tools for nature-based solutions	• IUCN Global Standard for nature-based solutions • IWA Nature-Based Solutions for Wastewater Treatment: A Series of Factsheets and Case Studies • IWA Nature for Water: A Series of Utility Spotlights • IWA Nature based solutions for water utilities and regulators • UN CEO Water Mandate and Pacific Institute: Benefit Accounting of Nature-Based Solutions for Watersheds	Evaluate, Prepare

Sector-specific disclosure metrics and related guidance – Water utilities

Sector-specific metrics form an important part of the TNFD's measurement architecture (see Figure 5). This reflects the diversity of business models across value chains and their interface with nature across and within sectors. Sector-specific metrics help financial institutions to compare organisations within the same sector, which often face similar nature-related issues. This section provides the proposed TNFD sector-specific metrics for the water utilities and services sector. It includes:

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

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

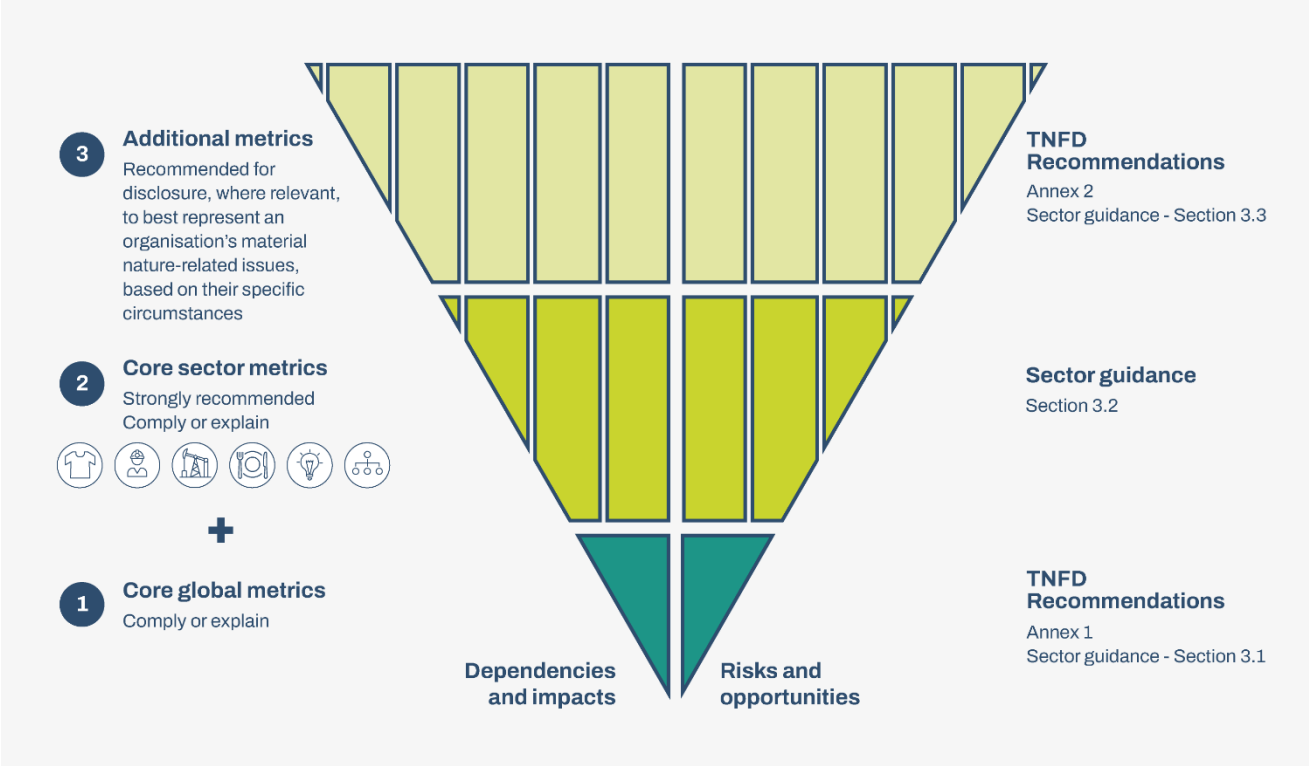
Organisations in the water utilities and services sector should refer to Annex 1 of the TNFD recommendations for further information on the core global disclosure metrics. As outlined in the TNFD recommendations, core global disclosure metrics should be reported on a comply or explain basis, with the 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.

An organisation 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.

Figure 5: TNFD disclosure metrics architecture signposted to metrics lists



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 water utilities and services 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 water utilities and services 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.

Table 10: Proposed guidance on the application of the core global disclosure metrics

Metric no.	Core global indicator	Core global metric	Proposed guidance for this sector	Source
Driver of nature change: Climate change				
	GHG emissions	Refer to IFRS S2 Climate-related Disclosure Standard	No further sector specific guidance.	
Driver of nature change: Land/freshwater/ocean-use change				
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 total surface area controlled/managed, an organisation also should disclose: • The spatial footprint (km^2) of the watershed/catchment land which the organisation depends on, but is not controlled/managed • Relevant business activities, including land stewardship activities within the catchment area/watershed, and whether they are with or without landscape partners • Total disturbed area (km^2) should include areas affected by untreated wastewater and/or accidental discharge.	Adapted from AWS (2019)
C1.1	Extent of land/ freshwater/ocean use change	Extent of land/freshwater/ ocean ecosystem use change (km^2) by: • Type of ecosystem;[26] and • Type of business activity.	No further sector specific guidance.	
	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.	No further sector specific guidance.	
		Extent of land/freshwater/ ocean ecosystem that is sustainably managed (km^2) by: • Type of ecosystem;[27] and	In reporting this core global placeholder metric, an organisation should disclose: • Area (km^2) covered by sustainable land and water resources management practices; and	

[26] When disclosing on extent of ecosystem types users should refer to the International Union for Conservation of nature Global Ecosystem Typology.

[27] When disclosing on extent of ecosystem types users should refer to the International Union for Conservation of nature Global Ecosystem Typology.

		• Type of business activity.	• Annual catchment of water (m^3/year) that complies with quantity (m^3/year) and quality (e.g. turbidity) requirements by utilities.	
Driver of nature change: Pollution/pollution removal				
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.	No further sector specific guidance.	
C2.1	Wastewater discharged	Volume of water discharged (m^3), split into: • Total; • Freshwater; and • Other.[28] 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.	No further sector guidance, see core sector metrics list for associated metric.	SASB IF-WU (2018)

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

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.	In reporting this core global placeholder metric, an organisation should disclose: • Absolute (gross) weight of raw/untreated sewage sludge that is treated and disposed of (tonnes of dry solids, %); and • Absolute (gross) weight of sludge that is reused (tonnes of dry solids, %).	ICMA (2017)
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 the raw material content.[29] For plastic packaging, percentage of plastics that is: • Reusable; • Compostable; • Technically recyclable; and • Recyclable in practice and at scale.	No further sector guidance.	

[29] When disclosing on raw material content users should use: % of virgin fossil-fuel feedstock; % of post-consumer recycled feedstock; % of post-industrial recycled feedstock; % of virgin renewable feedstock.

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).	No further sector specific guidance.	
Driver of nature change: Resource use/replenishment				
C3.0	Water withdrawal and consumption from areas of water scarcity	Water withdrawal and consumption[30] (m^3) from areas of water scarcity, including identification of water source.[31]	Relevant information to disclose includes annual, and where appropriate, seasonal variance; trans-boundary transfer to and from areas of water scarcity.	Alliance for Water Stewardship - International Standard 2.0 - Indicator 1.3.4
C3.1	Quantity of high-risk natural commodities sourced from land/ ocean/ freshwater	Quantity of high-risk natural commodities[32] (tonnes) sourced from land/ocean/freshwater, split into types, including proportion of total natural commodities.	No further sector specific guidance.	
		Quantity of high-risk natural commodities[33] (tonnes) sourced under a sustainable management plan or certification programme, including proportion of total high-risk natural commodities.		
Driver of nature change: Invasive alien species and other				

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

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

[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.

[33] 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.

C4.0	Placeholder indicator: Measures against unintentional introduction of invasive alien species (IAS)[34]	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.	
State of nature				
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; • 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.	
	Placeholder indicator: Species extinction risk		No further sector specific guidance.	

[34] 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'.

3.2. Proposed core sector disclosure indicators and metrics

The TNFD proposed core sector disclosure metrics for the water utilities and services 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 11: Proposed core sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric No.	Indicator	Proposed core sector disclosure indicator or metric	Source
Impact driver	Resource use/ replenishment	A3.2	Water reduced, reused or recycled	Total volume (m^3) or proportion (%) of water (total, freshwater, other) reduced, reused or recycled.	SASB IF-WU (2018)
Impact driver	Pollution/pollution removal	WU.C2.11	Sanitary sewer overflows and recovery	Number of sanitary sewer overflows incidents, including: • Volume (m^3) • Proportion (%) of total volume recovered or duration of the incident if volume information is not yet available.	SASB IF-WU (2018)
Impact driver	Resource use/ replenishment	A3.3	Water loss mitigated	Volume (m^3) of water loss mitigated.	TNFD

3.3. Proposed additional sector disclosure indicators and metrics

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

Table 12: Proposed additional sector disclosure indicators and metrics

Metric category	Metric subcategory	Metric No.	Indicator	Proposed core sector disclosure indicator or metric	Source
Ecosystem services	Water supply	WU.A6.0	Clean drinking water provision	Number of people with access to clean drinking water through infrastructure supporting sustainable and efficient water use, where average consumption per person is consistent with internationally recognised standards for sustainable water use.	TNFD

Glossary

Sector-specific concepts and definitions are defined in this section. The TNFD glossary will be updated to include these concepts once the water utilities and services sector guidance is finalised, based on market consultation and feedback. Readers are recommended to visit the TNFD glossary for other terms used throughout the document.

Concept	Definitions
Abstraction	The process of taking or extracting water from a natural source (rivers, lakes, groundwater aquifers, etc.) for various uses, from drinking to irrigation, treatment and industrial applications. Source: British Association for Landscape Industries
Bioresources	Bioresources are naturally occurring supplies and commodities that are processed to yield economically useful products. All of these bioresource materials can be utilised as a source to manufacture value-added products. Source: Swaminaathan et al.
Borehole	A narrow hole drilled to establish the nature of, sample, test or monitor soil, bedrock or contained fluids and gases, or for abstraction of water or minerals. Source: Encyclopedia of Engineering Geology
Catchment/ watersheds	A water catchment (also known as a watershed or basin) is an area of land where all water flows and is directed into a single stream or river. Natural boundaries of water catchments can vary in scale and can be very small for a single stream or river, or very broad for a large river such as the Amazon or Congo Rivers. Land and freshwater use in a watershed can affect the entire length of river, depending on the intensity of the use and impact. Source: TNFD Biome guidance
Desalination	A process where seawater or brackish water is turned into drinking water by removing the salt, providing a reliable source of water, including during droughts. Source: Climate ADAPT
Leakage reduction	Controlling the loss of treated water through leaks in the distribution system by actively finding and fixing leaks and/or by replacing whole sections of pipe or upgrading equipment. Source: Ofwat
Rivers and stream biome	Rivers and streams include lotic (running water) ecosystems, flowing from elevated uplands or underground springs to deltas, estuaries and lakes. They are defined primarily by their linear structure, unidirectional flow regimes and close interaction with the surrounding landscape. Individual rivers drain catchments separated by watersheds. Channels that make up a river system can be classified into stream orders, with 1st order streams having no

	tributaries, 2nd order streams having 1st order tributaries, 3rd order streams having 2nd order tributaries and so on. Source: IUCN Global Typology Ecosystem 2.0
Sewage	Sewage is the part of wastewater that is contaminated with faeces or urine but is often used to mean any wastewater. When this is the case, sewage refers to wastewater from domestic, municipal and other sources, or industrial liquid waste products, usually disposed of via a pipe or sewer system. Source: UNEP
Wastewater	Wastewater is any water that has been adversely affected in quality by anthropogenic influence and comprises liquid waste discharged by domestic residences, commercial properties, industry and/or agriculture and can encompass a wide range of potential contaminants and concentrations. Source: UNEP
Water replenishment	Groundwater replenishment happens through direct recharge and in-lieu recharge. Water used for direct recharge most often comes from flood flows, water conservation, recycled water, desalination and water transfers. Replenishment within the context of groundwater management is accomplished through recharge at rate that exceeds natural conditions, maintaining or improving groundwater elevation levels. Source: Water Education Foundation

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Annex 1: Comparison of water utilities and services sector's business activities classification by standards

Business activities associated to the water utilities and services sector	Scope of SASB Standard	ISIC equivalency	Description (as per ISIC)	Scope of guidance

Construction of infrastructure water utilities activities	Engineering & Construction Services (IF-EC) Standard	Construction of utility projects	This class includes the construction of distribution lines and related buildings and structures that are an integral part of these systems.
			
			This class includes:
			
			- Construction of civil engineering constructions for:
			  ○ Long-distance pipelines, communication and power lines
			  ○ Urban pipelines
			  ○ Urban communication and power lines; ancillary
			  ○ Urban works water main and line construction
			  ○ Irrigation systems (canals)
			  ○ Reservoirs
			
			- Construction of:
				The topic is covered to a limited extent based on its relevance to the sector and for ease of navigation for sector organisations. For more detailed information refer to TNFD Engineering, Construction and Real Estate sector guidance.

			○ Sewer systems, including repair ○ Sewage disposal plants ○ Pumping stations ○ Power plants ○ Water well drilling This class excludes: - Project management activities related to civil engineering works.	
Water sourcing/collection **Water treatment** **Water distribution/supply**	Business activities covered in the Water Utilities & Services Standard (IF-WU)	Water collection, treatment and distribution	Water collection, treatment and distribution activities for domestic and industrial needs. Collection of water from various sources, as well as distribution by various means is included. The operation of irrigation canals is also included, but the provision of irrigation services through sprinklers, and similar agricultural support services, is not included. This includes: - Collection of water from rivers, lakes, boreholes, reservoirs etc - Collection of rainwater - Treatment of water for water supply purposes - Treatment of water for industrial and other purposes - Desalting of sea or ground water to produce water as the principal product of interest - Distribution of water through mains, by trucks or other means, and operation of irrigation canals	In scope of guidance.

			This excludes: - Operation of irrigation equipment for agricultural purposes - Treatment of wastewater in order to prevent pollution - (Long-distance) transport of water via pipelines	
Wastewater management **Wastewater discharge**	Business activities covered in the Water Utilities & Services Standard (IF-WU)	Sewerage	The operation of sewer systems or sewage treatment facilities that collect, treat and dispose of sewage. This includes: - Operation of sewer systems or sewer treatment facilities - Collecting and transporting of human or industrial wastewater from one or several users, as well as rainwater by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.) - Emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage; servicing of chemical toilets - Treatment of wastewater (including human and industrial wastewater, such as water from swimming pools) by means of physical, chemical and biological processes like dilution, screening, filtering and sedimentation etc. - Maintenance and cleaning of sewers and drains, including sewer rodding	In scope of guidance.

Recycling and resource recovery (resource transformation into bioresources)	SASB's Waste Management Standard (IF-WM)	Materials recovery	This class includes: - Processing of metal and non-metal waste and scrap and other articles into secondary raw materials, usually involving a mechanical or chemical transformation process - Recovery of materials from waste streams in the form of: ○ Separating and sorting recoverable materials from non-hazardous waste streams (i.e. garbage) ○ Separating and sorting of commingled recoverable materials, such as paper, plastics, used beverage cans and metals, into distinct categories	This topic is covered to a limited extent in this guidance as it is material to the sector.

Taskforce on Nature-related
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