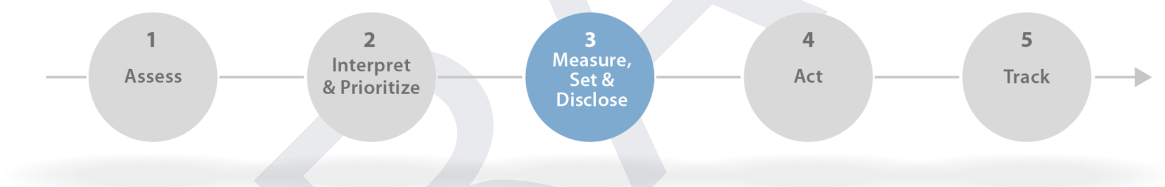
Technical Guidance for Step 3: Measure, Set & Disclose - Initial Freshwater SBTs

Draft for Public Comment

September 2022



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Disclaimers for readers

Please keep the following disclaimers in mind as you review this content.

1. This consultation is open to the public and applies to the following documents: “Technical Guidance for Step 1: Assess”, “Technical Guidance for Step 2: Prioritize”, and “Technical Guidance for Step 3: Measure, Set & Disclose - Initial Freshwater SBTs”.
2. The scope of the guidance documents in this public consultation are restricted to Steps 1 (Assess), 2 (Prioritize and Interpret) and 3 (Measure, Set, and Disclose) of the five-step SBTN Framework. Steps 4 (Act) and 5 (Track) will be addressed in later versions of SBTN’s guidance.
3. These documents are the result of several iterative internal feedback reviews with SBTN’s NGO and corporate partners conducted over the last year.
4. Companies are not able to start setting targets using SBTN’s guidance until Q1 2023, at which point SBTN will release science-based targets for nature v1. SBTN will not recognize claims, public statements, or any targets coming from the use of this guidance before public approval in Q1 2023.
5. The guidance documents are written in technical language; the primary audience of this document are assumed to have the technical knowledge necessary to engage with this content. A more corporate-friendly version of this guidance will be published as part of the SBTs for nature v1 release in 2023.
6. Due to the technical nature of this content, feedback is requested from stakeholders with the following expertise: sustainability, environmental risk management, environmental and social science, ecology and conservation.
7. For further information about this public consultation, please visit this site.

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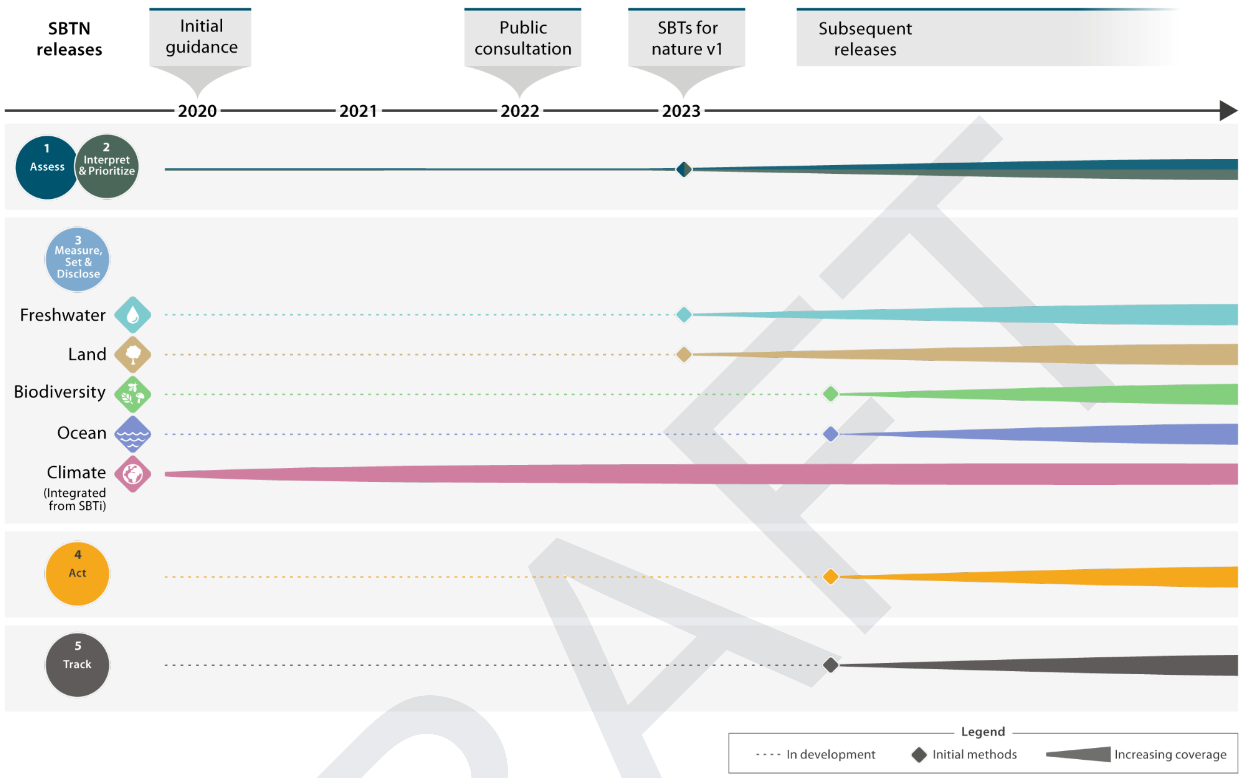
Roadmap for SBTN guidance development

SBTN Roadmap



Dear Reader,

The first release of science-based targets for nature v1 will occur in early 2023. Ahead of this release, the Science Based Targets Network (SBTN) is seeking public comment on new technical guidance from the Network for companies, including initial target-setting methods for freshwater.

SBTN is a unique collaboration of over 60 leading global non-profits and mission-driven organizations, helping companies adopt a roadmap for integrated environmental action in the face of mounting environmental and social crises associated with nature loss. To complement existing science-based targets for climate through the Science Based Targets initiative, SBTN is developing science-based targets for nature: including freshwater, land, oceans and biodiversity. By using this guidance, companies can take actions aimed at mitigating their environmental pressures, and seize opportunities to tackle those dual crises.

In 2020, SBTN publicly issued its Initial Guidance for Business on science-based targets (SBTs) for nature. The Initial Guidance was the first introduction for the public to what science-based targets for nature are, why they are important, and how they will work. It also identified "no regrets" actions consistent with the urgency of biodiversity and nature loss.

With that Initial Guidance, SBTN created a framework for companies to use to set SBTs for nature, and helped increase the familiarity of the business world with core concepts and tools to prepare for target setting.

With the release of SBTs for nature v1 in 2023, SBTN will make available a robust methodology that offers both guidance and tools to enable the first companies to set validatable targets.

SBTN guidance is developed using an iterative process, constantly evolving with feedback from partners, stakeholders and experts. Much of the forthcoming guidance has already been piloted, with significant corporate consultation via our NGO partners and Corporate Engagement Program. This guidance builds on the 2020 release to provide the additional detail requested by companies and other stakeholders.

SBTN is, by design, more detailed than other frameworks in the sustainability space, providing thorough step-by-step guidance at each stage of the process. The purpose of our guidance is to empower companies to deploy a clear, analytical approach for assessing and addressing their environmental impacts which has been tested and vetted by scientific experts.

Today we are starting the public consultation of these new guidance documents, which will be launched in early 2023. In reading the guidance documents provided, you will now be introduced to: prescriptive and flexible methodologies on how to proceed through the target-setting process; guidance on data needs and outputs for validation for each of the discrete steps; and guidance on tools, data, and metrics for use when calculating statistics for assessing pressures and the state of nature, and for setting targets.

The methodology for SBTs for nature v1 will address freshwater and land impacts, constituting a subset of the overall projected issues that the SBTN methods will cover. This version covers a subset of the types of targets that companies may eventually be able to set, reflecting the current state of science and technology. As SBTN's science teams advance our work to understand the key relationships between anthropogenic pressures and nature, we will be updating the scope of our guidance and recommendations.

Key advancements to look for in future versions (V2 and on) include additional guidance on biodiversity and ocean and the inclusion of additional sources of freshwater pollution, to name a few. We will also update guidance on tools and data in order to address noted gaps.

This guidance we are sharing today represents a milestone on our path toward SBTs for nature v1. Additional developments anticipated before Q1 2023 include:

- The release of initial land SBTs
- The release of an updated Sectoral Materiality Tool and High Impact Commodity Tool for companies to use in the prescriptive methodology for materiality screening in Step 1: Assess
- Data management approaches (templates and tools) to support companies with formatting and data provision in line with SBTN validation requirements
- A "SBTN Criteria and Recommendations" v1 document summarizing all required and optional steps including: concrete data requirements, scopes of all assessment steps, and the respective validation criteria for each step of the guidance
- A "Claims Guidance" v1 document stating what claims companies can make about their SBTs for nature, and where they are at in the target-setting process, including additional guidance on time horizons for target setting and re-assessment
- Stakeholder engagement guidance for companies to apply throughout their target-setting process

This public consultation marks a critical point in the development of SBTs for nature. It is your opportunity to provide input into our multi-stakeholder process to ensure the finalized guidance for companies released in 2023 is as robust, clear and practical as possible.

With this pioneering technical guidance for SBTs for nature v1, we aim to ensure companies take measurable steps toward assessing, mitigating, and managing their impacts on nature. By taking enough of the right actions, in the right places, and at the right time, companies can contribute towards an environmentally safe and socially just future.

We look forward to your input.

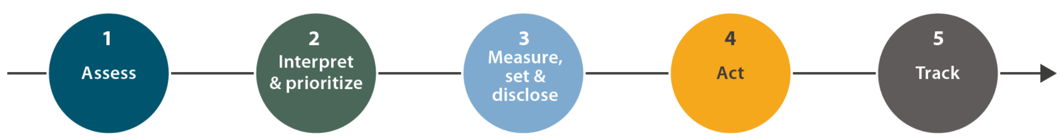
Varsha Vijay
Technical Director
Science Based Targets Network

Guide for readers

In 2020, the Science Based Targets Network (SBTN) released its Initial Guidance for Business.[1] This foundational guidance document introduced readers to the process of setting science-based targets (SBTs) for nature and the basic elements of the conceptual framework that underpins the Network's approach to developing target setting methods. For anyone getting started with target setting or just learning about SBTs for nature, it is recommended that they consult the Initial Guidance.

Building on the Initial Guidance, the SBTN Technical Guidance documents have been developed to provide the methodological detail requested by companies to set targets; they build on but do not completely replace the Initial Guidance for Business. Each Technical Guidance document developed is specific to a step in the full target setting process, and the *environmental pressures*[2] and scope of the *value chain*[3] covered by the guidance will vary depending on factors such as the availability of data and tools. Technical documents are expected to be expanded over time as datasets, tools and other methodological inputs improve.

To set SBTs for nature, companies are expected to follow five steps: (1) assessment of impacts; (2) interpretation of data and prioritization of locations; (3) baseline data collection, target setting, and disclosure; (4) action to meet targets; and (5) monitoring, verifying and reporting on progress over time.



Five primary steps of setting science-based targets for nature.

As of September 2022, Technical Guidance is available for Step 1: Assess and Step 2: Prioritize. By following the methods in this guidance, companies will be able to use methods for setting targets, as part of Step 3: Measure, Set, Disclose. For the September public consultation, Step 3

[1] Accessible here: https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/11/Science-Based-Targets-for-Nature-Initial-Guidance-for-Business.pdf

[2] A key term used in SBTN, pressures are anthropogenic activities that have changed the state of the environment and ecosystem, including the addition or removal of substances or organisms to the environment, or direct changes to the structure, function, or composition of ecosystems.

[3] Another key term using SBTN, state of nature indicators describe the general conditions of nature in physical, chemical, or biological terms

guidance will be provided for freshwater pressures of water use and water pollution. Step 3 guidance for land pressures will also be available in SBTs for nature v1, launching in Q1 of 2023.

These documents follow a rigorous internal review and piloting process with our NGO and corporate partners conducted over the last year.

Together, the release of this new technical guidance will guide companies through the target-setting process, enabling them to process, assess, and manage key material pressures within their value chains.

Connection with external frameworks
We highlight points of alignment between SBTN and existing climate and nature-based frameworks within the Technical Guidance documents including the Science Based Targets Initiative (SBTi), the Taskforce on Nature-Related Financial Disclosure (TNFD), the Natural Capital Protocol (NCP), CDP, the Biological Diversity Protocol (BDP) and Global Reporting Initiative (GRI).

SBTN ultimately intends to facilitate a streamlined target-setting process for companies, and enable companies to make progress towards multiple sustainability objectives in tandem. Making points of alignment explicit in SBTN documents is therefore intended to enable companies to use information already collected for other purposes when setting SBTs for nature.

Use of SBTN methods, alongside those from SBTi
Please note that all SBTN guidance and methods are intended to complement those developed by SBTi to facilitate target setting for climate. These methods do not override the guidance and requirements provided by SBTi, e.g. for assessing GHG impacts throughout all material value chain activities.

Language used in SBTN publications
SBTN uses terms such as "*shall*," "*must*," "*should*" and "*may*" in alignment with the Science Based Targets Initiative (SBTi).[4] These terms should be interpreted as indicating the following meanings:

- The terms "*shall*" or "*must*" are used throughout this document to indicate what is required for targets to be in conformance with the criteria.
- The related term "*required*" is used to indicate what is necessary to be in conformance with the criteria.
- The terms "*should*" or "*recommended*" are used to indicate a recommendation, but not a requirement.

[4] See https://sciencebasedtargets.org/resources/files/SBTi-criteria.pdf

- The related terms "*may*" or "*can*" are used to indicate an option that is permissible or allowable.

Details on the public consultation

The public consultation period

- September 15th-October 14th
- During the consultation period, SBTN is soliciting targeted feedback on a suite of questions. Readers can access the feedback form here: https://forms.gle/r8o9S9mAqZk1a75E8
- Further questions should be directed to info@sciencebasedtargetsnetwork.org

What's next after the public consultation?

After the 4-week public consultation is completed, SBTN technical teams will review and integrate feedback into guidance which will then be submitted to an Expert Review Panel. Pending requests for revision from this panel, the technical guidance will be finalized, and a thematic summary of the feedback received and how it was addressed will be shared.

To support the use of the technical guidance, SBTN will create a "how to" corporate manual which can serve as the primary reference point for companies on their target-setting journey.

The corporate manual and technical guidance will be published as part of the first release of SBTs for nature in early 2023, which will provide a limited set of methods and coverage. Subsequent releases will increase the scope of target setting methods that SBTN, in line with the latest science and technical developments.

1. Introduction

1.1 General Approach

Science-based targets (SBTs) are defined as measurable, actionable, and time-bound objectives based on the best available science that allow actors to align with Earth's limits and societal sustainability goals. The approach to setting SBTs for nature is based on the concept that certain human activities place stresses (called "pressures") on the state of nature, as shown at the top of Figure 1. For example, the pressure of freshwater pollution can impair the state of nature corresponding to freshwater quality.

The bottom of Figure 1 illustrates the role of target-setting, which uses a predictive tool such as a model to define the maximum level of pressure that will maintain a desired state of nature. Using pollution as an example, the target would define the maximum amount of pollutants that a company could discharge while maintaining acceptable freshwater quality for species or ecosystems to remain viable within a given basin.[5]

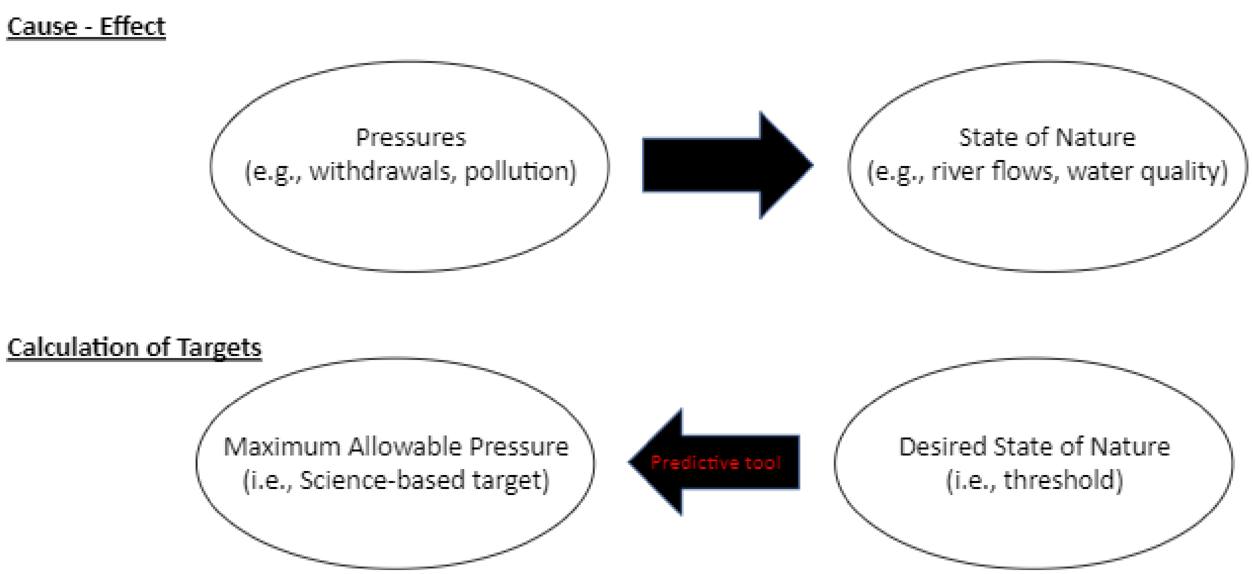


Figure 1. Relationships among pressures on nature, state of nature, and targets.

Setting targets for pressures based on the desired state of nature requires three components:

1. Specific indicators to represent the pressure(s) and state of nature: For example, the rate at which phosphorus (P) is loaded into a water body is an indicator of pressure. In this

[5] The concept of setting quantitative pressure targets at a level necessary to protect water is not new. It is based on existing accepted approaches to target-setting (e.g., the United States' Total Maximum Daily Loads program).

example, the P concentration in the body of water would be an indicator of the state of nature.

2. Threshold value representing the desired state of nature: Continuing with the above example, this threshold corresponds to the maximum limit on P concentration below which a healthy aquatic ecosystem can be maintained (threshold P concentration).
3. A method to relate the desired state of nature to the level of pressure: Completing the example, this method would consist of using an analytical tool (e.g., a freshwater quality model) capable of answering the question "What is the maximum P load (pressure) that will result in staying below the threshold P concentration?"

The remainder of this chapter defines the specific indicators to be used, their threshold values representing the desired state of nature, and the predictive tool to be applied in calculating targets.

1.2 Method Scope

There is a five-step process to set SBTs for nature: (Step 1) Assess (screen and estimate impacts); (Step 2) Interpret & Prioritize Impacts (set target boundary); (Step 3) Measure, Set, & Disclose; (Step 4) Act; and (Step 5) Track.[6]

This document focuses on technical guidance for Measure, Set & Disclose (Step 3) for companies to measure baselines for specific indicators and set freshwater science-based targets. These are the first methods released by the Science Based Targets Network (SBTN) for Measure, Set & Disclose (Step 3) and are not expected to be usable by all companies for managing their impacts on freshwater. Table 1 summarizes what is and what is not included in this version of the methods [for the first version of methods to set SBTs for nature: Freshwater].

This version focuses on the following pressures on nature:

- Water quantity: Freshwater withdrawals from surface water bodies and groundwater
- Freshwater quality: Load of nitrogen (N) and phosphorus (P) to surface water bodies

These pressures are selected because 1) they are the pressures most relevant to the impacts that a large percentage of corporations pose on freshwater, and 2) methods are available to define science-based targets that link these pressures to a healthy state of nature. Furthermore, this version considers only direct operations and upstream scope (not downstream scope), as methods to define quantitative target levels are currently available for these aspects of business scope.

Readers should note that this document uses the terms "*shall*," "*must*," "*should*,'" and "*may*" in alignment with Science Based Target initiative (SBTi). Following SBTi:

[6] Refer to "Science-Based Targets for Nature, Initial Guidance for Business (September 2020)" for a detailed description of the five-step process and for technical guidance for Steps 1 and 2. Guidance for Steps 4 and 5 is anticipated to be published in SBTs for nature v2.

- The terms "*shall*" or "*must*" are used throughout this document to indicate what is required for targets to be in conformance with the criteria.
- The term "*should*" is used to indicate a recommendation, but not a requirement.
- The term "*may*" is used to indicate an option that is permissible or allowable.

Table 1. Summary of content included in this first version of methods to set SBTs for nature: Freshwater

Content included	**Content *not* included** (i.e., to be included in subsequent versions)
Freshwater Quantity	
⇒ Surface water flows ⇒ Groundwater levels (only basins where local model/ thresholds exist)	⇒ Groundwater levels (all basins)
Freshwater Quality	
⇒ Nutrient pollution (N and P)	⇒ Toxic chemicals ⇒ Other freshwater quality parameters
Scope	
⇒ Upstream ⇒ Direct operations	⇒ Downstream
Biodiversity and Ecosystems	
	Freshwater biodiversity and direct conversion of freshwater ecosystems
Future projections	
	Consideration of forward-looking scenarios, including how future climate change will impact water availability and quality

1.3 Method Applicability

The Sectoral Materiality Tool applied in Assess (Step 1) defined which sectors are likely to have material impacts on freshwater quantity and freshwater quality. In general, business sectors that rely on agricultural products in parts of their value chain are likely to be subject to freshwater SBTs for freshwater quantity and freshwater quality. In addition, sectors where water is incorporated into a product (e.g., food and beverage industry) and/or used for industrial processes or cooling purposes are likely to be subject to freshwater SBTs for freshwater quantity (at least).

These methods are best suited to companies that know or can estimate the geographical location of their operations (direct operations and upstream value chain activities), so that pressures on freshwater quantity and freshwater quality can be located in specific water basins. Future iterations of these methods will expand the set of issues and impacts that can be addressed.

1.4 Document Version

This document is the first version of methods to set SBTs for nature: Freshwater, henceforth referred to as the "freshwater SBTs methods, version 2023," and contains methods and guidance related to Measure, Set & Disclose (Step 3). Users of this document should complete Assess (Step 1) and Interpret & Prioritize (Step 2) and have the outputs of these steps on hand prior to starting with Measure, Set & Disclose (Step 3). SBTs for nature v2 will be released with guidance related to Act (Step 4) and Track (Step 5).

This document is to be shared in September 2022 for public consultation. Once this document is finalized and approved by SBTN for public use, companies will be able to use it to set freshwater SBTs as part of the first release of SBTs for nature in early 2023. Until the official release of SBTs for nature v1, companies should not use this draft document to set freshwater SBTs. SBTN will not recognize claims, public statements, or any targets coming from the use of this document before public approval.

2. Minimum Data Requirements

Setting freshwater SBTs requires data collection. Companies are required to collect data in order to define their baseline level of pressure for freshwater quantity and/or quality for all their direct operations and upstream scope in each basin for which targets will be set.[7] The minimum data requirements for pressure baseline measurements are summarized in Table 2. Note that the time frame for calculating each baseline pressure measurement should include the last five full years of operation of a given site, or purchase of a given commodity/reliance on an upstream activity.[8]

Table 2. Minimum data requirements for pressure baseline measurements

	Data Requirement	Data Sources	Unit of Measurement
Water Quantity			
Direct Operations	Primary	Water meter	Volume per month, e.g., ML/month

[7] Freshwater quantity and/or freshwater quality data collection depends on the water aspects that were prioritized in Interpret & Prioritize (Step 2) for a specific basin.

[8] If operations or purchase of a given commodity/reliance on upstream activity have been in existence less than five years (or have collected data for less than five years), then the time frame should be over the length of existence (or the period of data collection for less than five years). If sourcing locations for commodities varied over the last five years, then refer to Steps 1 and 2 for guidance. However, if the shifts in sourcing locations occurred within the same basin, then the pressure data from each of these locations should be averaged.

Upstream Activities	Primary (preferred, if available)	Water meter or water diversion	Volume per month, e.g., ML/month
	Secondary	Blue water footprint	Volume per year, e.g., ML/year
Freshwater Quality			
Direct Operations and Upstream Activities	Primary (*point sources*)	Discharge flow and nutrient concentration	Volume per month, e.g., ML/month *(for discharge flow)* Mass of nutrient per volume, e.g., mg P/L *(for nutrient concentration)*
	Secondary (*nonpoint sources*)	Locally Developed model results or Grey water footprint	Mass of nutrient load per month *(if based on Locally Developed model results)* or Volume per year, e.g., ML/year *(if based on Grey water footprint)*

2.1 Freshwater Quantity Pressures

Water quantity pressures from direct operations must be calculated from primary data, i.e., direct site-specific measurements from water meters. The required units are average withdrawal volumes over the course of each month. Sites that have nonconsumptive water use, such as cooling water, may report net withdrawals (i.e., gross withdrawals minus return flow), but only in cases where the nonconsumptive flow is returned at the same time and location as the withdrawal and does not significantly impact key freshwater quality parameters.

Water quantity pressures from upstream scope can be calculated either from primary data or from secondary data using blue water footprint(s). The required units for primary data are average withdrawal volumes over the course of each month. The units for secondary data sources are annual average water consumption.

Use the last five full years of operation to calculate baseline freshwater quantity pressures. If data from the last five full years of operation is not available, a duration of less than five years can be used.

2.2 Freshwater Quality Pressures

The data required to determine freshwater quality pressures depends on the nature of the pollutant source.

Point sources (i.e., discharges from a single identifiable conduit, such as a discharge pipe from a wastewater treatment facility) require primary data consisting of monthly average discharge flow and nutrient concentration.

Pressures for nonpoint sources may be estimated from secondary data, either from the results of the Locally Developed model used for target-setting or from grey water footprint(s). The required units for primary data (Locally Developed model) are average nutrient load over the course of each month. The required units for secondary data [grey water footprint(s)] are the annual average water volume required to assimilate the nutrient load.

Use the last five full years of operation to calculate baseline freshwater quantity pressures. If data from the last five full years of operation is not available, a duration of less than five years is acceptable.

3. Process for Setting Freshwater SBTs

Measure, Set & Disclose (Step 3) for freshwater includes four components (Figure 2). The same approach is followed for setting both freshwater quantity and freshwater quality targets. Specifically, a company must first *determine its freshwater quantity and/or quality modeling approach* (Locally or Globally Developed modeling approach) and the respective *threshold values* representing the desired state of nature. For this reason, the company must consult with relevant stakeholders to determine the availability (or absence) of models specific to a given basin (i.e., developed for this basin) paired with locally based thresholds. Then, the company shall *aggregate the total pressures* (i.e., water consumption and/or nutrient load) from all its activities across this basin for the specified time period and shall record the *baseline values for these pressures*. The last component is the target-setting, where the company *sets company-specific freshwater quantity and/or quality targets* for the given basin.

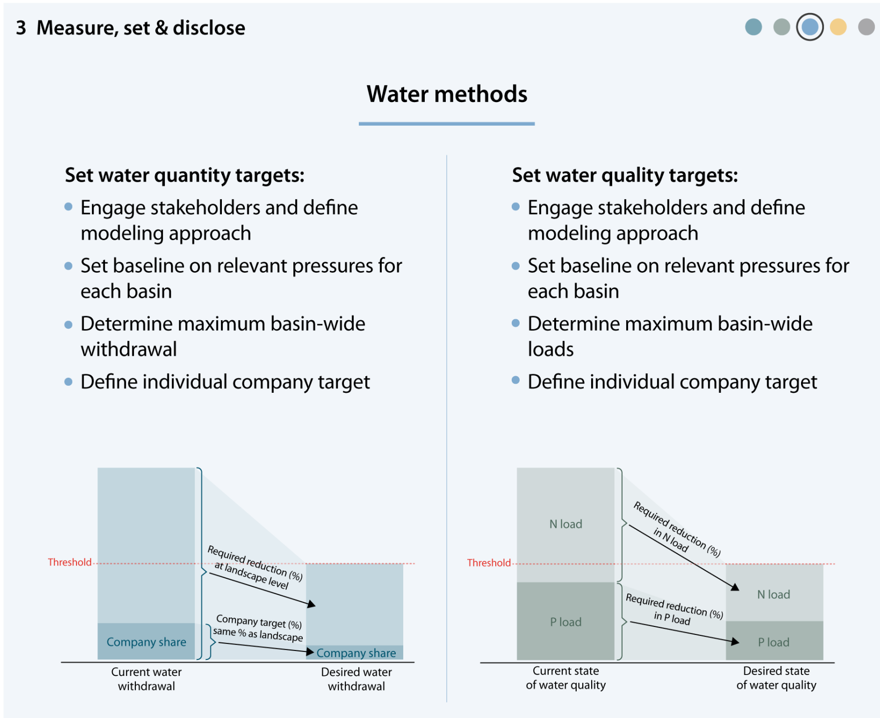


Figure 2. Process for setting freshwater SBTs (Step 3).

3.1 Stakeholder Consultation for Modeling Approach Selection

SBTs for climate allow companies to reduce their overall contributions to human-induced climate change which will increase our chances of maintaining a livable planet. SBTs for climate are set in reference to global data sets on global mean temperature and atmospheric accumulation of greenhouse gasses; respectively, these can be understood as the reference state and the reference pressure budget that underpin a target ambition level. Freshwater SBTs rely more on local information to indicate what a given ecosystem and its users need. The location-specific nature of freshwater target-setting includes the following, for example:

- The environmental flow requirements representing the desired state of nature in a lowland river will be different from the environmental flow requirements for a headwater stream.
- The level of nutrients resulting in acceptable plant growth will differ in a clear lake with high levels of sunlight penetration and a turbid stream with little sunlight penetration.
- The relationship between nutrient load and the resulting state of nature will depend on the hydraulic characteristics of the receiving water body. Much of the P load delivered to a slow-moving water body may settle out of the water column prior to being carried to downstream reaches, while the P load delivered to fast-moving streams may not settle out.

In addition, freshwater SBTs differ from SBTs for climate in that mitigation actions for freshwater only directly benefit conditions in the applied local basin.[9] Referencing basin-specific conditions is therefore required to determine the threshold values representing the desired state of nature, define the relationship between the pressures and the desired state of nature, and ultimately set company-specific freshwater SBTs.

3.1.1 Outline of Locally and Globally Developed Modeling Approach

The level of resources (i.e., data, time, and effort) required to accurately define freshwater SBTs can be substantial, depending on the science and data availability.[10] Companies should begin setting freshwater SBTs for their sites (direct operations) and upstream activities that have been identified as priority sites under Interpret & Prioritize (Step 2) (refer to Step 1:Assess and Step 2: Prioritize methods for more information on how to determine which sites and activities must be included, and which factors can be used to prioritize).

Because locally endorsed and validated models and thresholds for freshwater quantity and quality are not yet available in many parts of the world, SBTN has developed two modeling approaches that are to be used by companies, depending on data availability, when setting freshwater SBTs:

- *Locally Developed Modeling Approach:* Targets are based on hydrological and/or freshwater quality models specific to a given basin (i.e., developed for this basin), paired with locally based thresholds, all of which are recognized by the local basin management authority or water resources management agency.
- *Globally Developed Modeling Approach:* Targets are based on global hydrological and/or freshwater quality models and paired with thresholds that are either globally defined (i.e., freshwater quality thresholds) or based on the results of global models (i.e., freshwater quantity thresholds).

Identifying and consulting with relevant local stakeholders is critical to the selection of the modeling approach. Section 3.1.2 provides more information on the stakeholder consultation process for selecting the appropriate modeling approach.

Figure 3 shows a decision tree guiding the selection of a Locally or Globally Developed modeling approach. Companies are required to follow this decision tree to determine which approach is to be applied for each basin in which priority sites have been identified under Interpret & Prioritize (Step 2). For example, if local models and locally based thresholds are available, companies must use these model results and local thresholds to calculate freshwater SBTs[11] for freshwater

[9] Further information and reasoning for the importance of taking a local approach when setting freshwater SBTs can be found here.
[10] It is expected that end-user resources required for target-setting will decrease in the future as a result of (a) additional SBTN tools to make models more accessible to end users and (b) companies becoming more familiar with both the impacts of their operations and the target-setting methods.
[11] Section 3.1.3 provides validation criteria for demonstrating that an adequate search was made for the presence of Locally Developed models and thresholds.

quantity. Otherwise, companies must take a Globally Developed modeling approach.

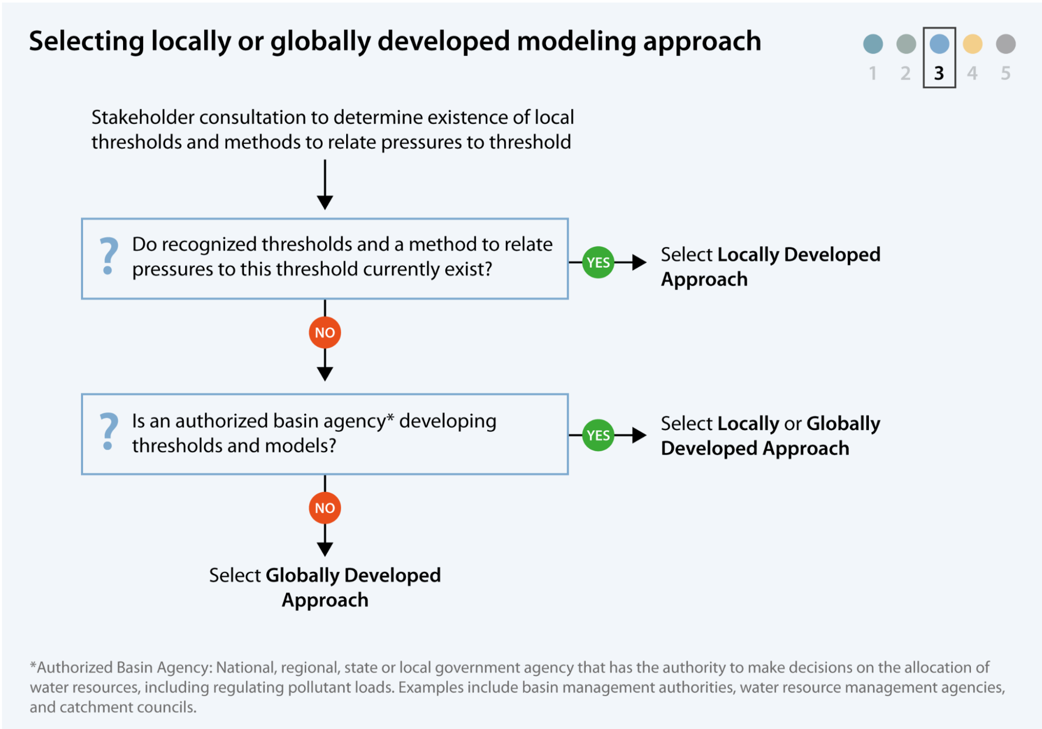


Figure 3. Decision tree illustrating the process of selecting a modeling approach.

3.1.2 Stakeholder Consultation Process

Note that stakeholder consultation in this section aims to support a company in its modeling approach selection decision. This section does not refer to the broader stakeholder engagement process that a company should undertake throughout its SBTN journey. More information regarding the broader SBTN stakeholder engagement process will be released in a separate Stakeholder Engagement Guidance document.

The following three-step process should take place at the beginning of Measure, Set & Disclose (Step 3) to determine if local models and locally based thresholds are available in a given basin (Figure 3):[12]

a) Participants: Identify relevant local stakeholders.

b) Process: Consult with the identified relevant local stakeholders.

c) Outcomes: Select Locally or Globally Developed modeling approach.

[12] We anticipate that this process should take no longer than one month to reach out to relevant stakeholders in the basin of interest and to hear back from them.

These three steps are further described below.

a) Participants: Identify relevant local stakeholders

Companies must first identify relevant local stakeholders (i.e., those with specialized knowledge and insights relevant to the basin or hydrological science). Companies should start with an internal consultation within their company and/or supply chain to identify the stakeholders that may have relevant information to inform the modeling approach selection (refer to Section 3.1.1).

Based on the OECD guide on stakeholders in the water sector,[13] SBTN derived a list of five key basin stakeholder groups that may have relevant information to inform the modeling approach selection. Companies should consider representatives of the following groups in their stakeholder identification process:[14]

i. Water management agencies/basin authorities

ii. Governmental regulators (water quantity/quality)

iii. Scientists and academics involved in the basin

iv. Local water-related NGOs or local chapters of international NGOs (WWF, TNC, etc.)

v. Local communities and/or indigenous groups or their representatives

b) Process: Consult with the identified relevant local stakeholders

Companies must consult with a minimum of two relevant local stakeholders identified in step a) (with at least one being a government agency) at a given basin to determine whether a Locally Developed modeling approach is possible.

Through this stakeholder consultation, companies are required to document whether stakeholders were able to do the following:

i. Identify existing local thresholds or targets (at the outset of the process).

ii. Identify scientific model/approach (Locally Developed modeling approach).

iii. Provide/share local models, thresholds, and/or data (Locally Developed modeling approach).

c) Outcomes: Select Locally or Globally Developed modeling approach

Consultation with relevant local stakeholders will help inform a company's decision on selecting a Locally or Globally Developed modeling approach to target-setting. There are differences in further stakeholder consultation depending on the selected approach.

A Locally Developed modeling approach focuses on accessing and obtaining necessary models and data from local stakeholders. Further stakeholder consultation will be required to ensure that

[13] OECD. 2015. "Stakeholder engagement for inclusive water governance," *OECD Studies on Water*, OECD Publishing, Paris.
[14] An initial literature review around freshwater quantity and freshwater quality modeling in the basin could facilitate the stakeholder identification process.

an appropriate local model or scientific approach is identified up front and that corporate data can be combined with other local data for target-setting purposes.

A Globally Developed modeling approach focuses on consulting local stakeholders to ensure alignment on the relevance and application of a global model within the basin.

Both approaches must ground their consultation process in building trust with the model and ultimately with the resulting freshwater SBTs.

3.1.3 Validation Criteria for Stakeholder Consultation

A company must document the following:

A. A stakeholder mapping exercise within the basin of interest [refer to Section 3.1.2; a) Participants: Identify *relevant local stakeholders*], prioritizing stakeholders that are knowledgeable about existing models and thresholds in the given basin
B. *(If relevant local stakeholders are identified)* Documentation summarizing whether relevant local stakeholders (a minimum of two, with at least one being a government agency) are able to support the i) identification of any existing local thresholds/targets, ii) identification of scientific model/approach, and iii) provision/sharing of local models, thresholds, and/or data[15] [refer to Section 3.1.2; b) Process: Consult with the identified *relevant local stakeholders*]
C. A record of the person(s) contacted at the basin management authority (or water resources agency) for the given basin, and their response, regarding the existence of local models/thresholds for freshwater quantity and/or quality; this information is required for the justification of the modeling approach selection

3.2 Baseline Values on Relevant Pressures

3.2.1 Spatial Scale

Freshwater SBTs are to be set for priority sites at a basin level. In this section, a company defines the spatial scale (i.e., basin and level of aggregation) for which targets will be set. Basins are defined at different degrees of spatial aggregation (i.e., Pfafstetter Coding System, a hierarchical method of coding river basins; see Glossary for further definition) depending on the number of tributaries feeding into the downstream water body.

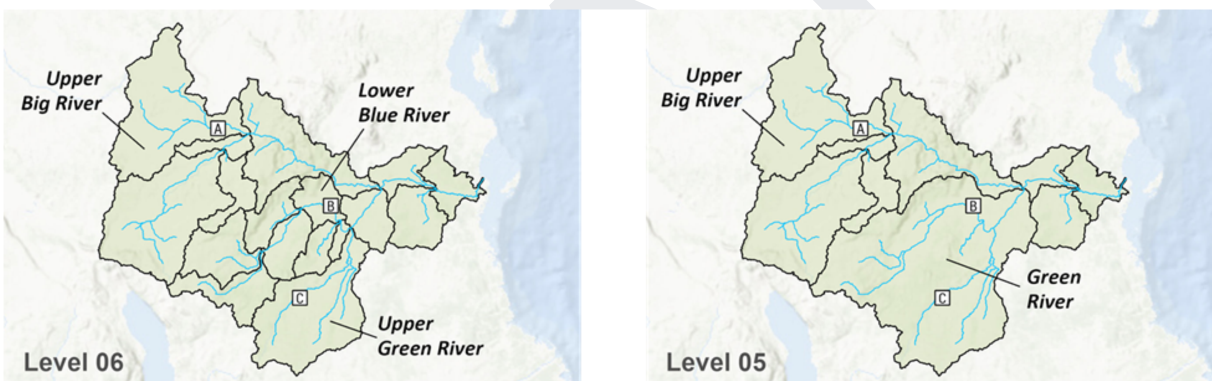
The basin level will be determined by the modeling approach selected in Section 3.1 and the pressure targeted (i.e., withdrawals and/or pollution). For example, in the Globally Developed approach for freshwater quantity that applies Hogeboom (in preparation), Pfafstetter Level 5 basins would be used; whereas in the Globally Developed approach for freshwater quality that

[15] Future iterations of the methods may include the option to use local models beyond those that have been approved for use by a basin management authority or water resources management agency and criteria to validate use of those models/thresholds.

applies McDowell et al. (2022), Pfafstetter Level 4 basins would be selected. The basin level for the Locally Developed approaches will depend upon the specific local model.

Companies will need to compile their sites by the basin level used in the model to ensure that targets consider all sites at the selected spatial scale. The concept of compiling sites by basin level is illustrated in Figure 4 for a company with three priority sites (sites are shown as lettered squares in Figure 4). At Level 6, each of these sites is located in a different basin. At Level 5, Sites B and C are located in the same basin, while Site A is located in a separate basin. At Level 4, all three sites are located in the same basin.

The table in Figure 4 shows the compilation of sites and the basins they reside in at the different Pfafstetter levels. Once the appropriate basin level is determined, this compilation can be used to identify the specific basins within which to set targets. For example, the Globally Developed modeling approach to freshwater quantity using Hogeboom (in preparation) requires the use of Pfafstetter Level 5, dictating that targets will be set specifically for the Upper Big and Green River basins. The Globally Developed modeling approach to freshwater quality requires the use of Pfafstetter Level 4, dictating that targets for all three priority sites will be set as part of a single basin.



Operation	Basin by Pfafstetter Level		
	6	5	4
Site A	Upper Big River	Upper Big River	Big River
Site B	Lower Blue River	Green River	Big River
Site C	Upper Green River	Green River	Big River

Figure 4. Compiling priority sites by basins at different Pfafstetter levels

Locally Developed Modeling Approach

There is no fixed requirement regarding the basin level for setting freshwater SBTs using the Locally Developed modeling approach because the spatial domain for this approach will largely be dictated by the available model(s). The Alliance for Water Stewardship (2019) recommends that the scope of the analysis be large enough to do all of the following:

- Contain the upstream land area or aquifer contributing to your sites' water source(s).
- Contain the downstream areas affected by your sites' nutrient loads.
- Contain the upstream and downstream areas of impacts for other actors that are contributing to the water challenge.

When determining the scope of analysis, the maximum allowable distance from a pressure in the basin of interest can be defined as the distance at which a site's actions can still be distinguished from background conditions, in terms of either freshwater quantity or freshwater quality. As noted by the CEO Water Mandate's "Setting Site Water Targets Informed By Catchment Context: A Guide For Companies", consideration may also be given to 1) using the same catchment boundaries as the appropriate water governing body, and 2) soliciting stakeholders' input on an appropriate spatial scope. If a large basin (i.e., Pfafstetter Level 4) is selected, companies must demonstrate that targets protect thresholds at each of the Pfafstetter Level 5 sub-basins.

Globally Developed Modeling Approach

The basin levels for setting freshwater SBTs using a Globally Developed modeling approach are directly specified and vary depending on the pressure targeted and chosen model. For freshwater quantity targets, use either Level 5 basins if the global model of the Water Footprint Network (Hogeboom, in preparation)[16] is selected or Level 6 basins if the global model of World Resources Institute (WRI, in preparation)[17] is selected.

Use Level 4 basins for setting freshwater quality targets, consistent with the scale of data provided by the global nutrient modeling of McDowell et al. (2020).

3.2.2 Freshwater Quantity Baseline Value

Once the spatial scale is selected, the company is required to calculate its freshwater quantity baseline value. The aggregation of total water withdrawals from all the company's activities within a specified basin level and time period is recorded as its "water quantity baseline value" in this basin. The company must define its freshwater quantity baseline value for each of its priority basins.

[16] The Water Footprint Network is currently developing a global database of model results based on the work of Hogeboom et al. (2020). This database will be ready for distribution by the time of public release of the final freshwater target-setting method in Q1 2023.

[17] World Resources Institute is currently updating the Aqueduct Water Risk Atlas to include an indicator for baseline water stress that incorporates consideration of environmental flow requirements. This will be ready for distribution by the time of public release of the final freshwater target-setting method in Q1 2023.

Water withdrawal is defined as the total amount of water (in units of volume per time, such as ML/month) used by a site associated with products or processes. Withdrawals can be specified in terms of net withdrawals[18] (i.e., gross withdrawals minus return flow), as long as the return flow is returned at the same time and location as the withdrawal and does not significantly impact key freshwater quality parameters. Net withdrawals were chosen as a metric to provide consistency with available data sources such as blue water footprint(s).

For a company's direct operations, the freshwater quantity baseline value must be defined based on primary data (i.e., metering of water use) for all priority sites (refer to Table 2; Section 2).

For a company's upstream value chain, the baseline value can be calculated based on either primary or secondary data sources. For companies using secondary data sources (particularly the case for agricultural suppliers), companies can use information from Assess (Step 1) and Interpret & Prioritize (Step 2), (e.g., the number of products/commodities produced) to estimate the amount of water withdrawn using tools like blue water footprint(s) to convert product/commodity production into units of volume of blue water used per time (see Table 2; Section 2).[19] This data should be recorded on a monthly basis whenever possible, recognizing that secondary data sources may only provide data on an annual basis.

Companies must use the average aggregate withdrawals[20] over the last five full years of operation to represent the baseline. Operations that have been in existence for less than five years (or have collected data for less than five years) should use the average aggregate withdrawals over the length of their existence (or period of data collection). This period accounts for both interannual variations and ongoing investment in water reductions that companies have achieved prior to setting SBTs.

The output of this section is a measurement of a company's baseline withdrawals as an indication of its overall water use. Future withdrawals will be compared to the calculated freshwater quantity baseline value to assess progress on the company's freshwater quantity targets.

3.2.3 Freshwater Quality Baseline Value

Similar to the freshwater quantity baseline value (refer to Section 3.2.2), once the spatial scale is selected, the company is required to calculate its freshwater quality baseline value. The aggregation of the total present-day load of nutrients from all the company's facilities/sourcing locations within a specified basin level and time period is recorded as its "freshwater quality baseline value." The company must define its freshwater quality baseline value for each of its priority basins. Total present-day load of nutrients is defined as the rate at which nutrients are delivered to a receiving water body, specified in units of mass per time (e.g., kg P/day).

[18] Net withdrawals also apply to sites that have nonconsumptive water use (e.g., cooling water).
[19] Water use for agricultural commodities' production considers only blue water footprint (see Glossary for definition) and not the green water footprint (consumption of water sourced from precipitation and stored in soil as soil moisture).
[20] Either by month or annually, depending on the spatial resolution selected to set targets.

Point Sources

The data requirements for defining freshwater quality baseline values depend on how pollutants are delivered to the water body. Pollutants discharged from a facility via a confined discharge pipe (i.e., a point source) must be calculated from primary data. In such a case, loads are calculated by multiplying primary data on discharge flow (i.e., volume per time at the point source) by primary data on discharge concentration (mass per volume), resulting in units of mass per time (e.g., kg P/month).

For direct operations, the freshwater quality baseline value must be based on primary data for all point source discharges (refer to Table 2; Section 2) and calculated separately for both N and P. In particular, a company must aggregate the nutrient loads, mass of N, or mass of P[21] per time unit (such as kg P/month) from all its facilities/sourcing locations within a specified basin level and time period. For example, a company with three facilities/sourcing locations in a given basin will be required to sum the P loads across these three facilities/sourcing locations and report the cumulative P load in units of mass of nutrient per time (e.g., kg P/month). The same procedure is to be repeated for the N loads across these three facilities/sourcing locations to calculate the cumulative N load (in kg N/month).

Indirect Point Sources

Indirect point source nutrient loads (i.e., situations in which a company's nutrient load is routed to a non-company wastewater treatment plant prior to discharge to the water body) are out of scope for this version of the SBT freshwater methods.

Nonpoint Sources

It may be difficult to obtain primary data on nutrient loads from nonpoint sources,[22] so secondary data sources may be used to calculate baseline freshwater quality values for nonpoint sources (refer to Table 2; Section 2). Locally Developed modeling approaches serve as one potential secondary data source for calculating baseline freshwater quality values, as they must consider all nutrient loads to the water body (including nutrient loads from different companies in this basin). These Locally Developed modeling approaches can be used for priority sites within a company's direct operations or upstream activities (i.e., upstream agricultural suppliers) when the company cannot otherwise get primary data.

Companies may also use the secondary data sources used in Assess (Step 1) and Interpret & Prioritize (Step 2), where information on the number of commodities purchased from suppliers and produced at different sites in a company's upstream value chain (e.g., Grey water footprint, specified in units of volume of water per time) is used to estimate the amount of nutrient load associated with the company's sourcing/upstream activities. This data should be recorded on a

[21] Note that this load represents the mass of a nutrient (N or P) and not the mass of a nutrient-containing compound such as ammonia or bulk fertilizer.

[22] Nonpoint sources are sources of pollution that are delivered to the receiving water body in a diffuse manner (e.g., runoff from agricultural operations).

monthly basis whenever possible, recognizing that secondary data sources may only provide data on an annual basis.

Companies must use the average aggregate nutrient load (N and P) over the last five full years of operation to represent the baseline. Operations that have been in existence for less than five years (or have collected data for less than five years) should use the average aggregate nutrient loads over the length of their existence (or period of data collection). This period accounts for both interannual variations and ongoing investment in nutrient loads that companies have achieved prior to setting SBTs.

The output of this section is a measurement of a company's baseline nutrient loads as an indication of its overall freshwater pollution (for N and P). Future nutrient loads will be compared to the calculated freshwater quality baseline value to assess progress on the company's freshwater quality targets.

3.3 Setting Freshwater Quantity Targets

After freshwater quantity baseline values have been calculated for all priority sites in a given basin, a company must define its targets for freshwater quantity. Freshwater quantity target-setting begins by calculating the maximum allowable level of basin-wide withdrawals (water withdrawals corresponding to all water users in a given basin), specified in terms of the required percentage reduction in the present-day rate of withdrawal. Target-setting concludes by allocating a portion of this amount to the company's operations. Targets are to be set for each basin in which priority sites have been identified.

3.3.1 Maximum Allowable Level of Basin-Wide Withdrawals

The process for calculating the maximum allowable level of basin-wide withdrawals depends on the modeling approach selected. This is described specifically below.

<u>Locally Developed Modeling Approach</u>[23]

If a Locally Developed model and locally based threshold values exist, they are applied to determine the required percent reduction in basin-wide rate of withdrawal that is in compliance with the threshold[24] stream flow (or groundwater recharge) regime.

The threshold values used for this approach must be endorsed by the authorized basin agency (refer to Sections 3.1 and 3.1.3) and not independently determined. Two options exist for determining the maximum allowable level of basin-wide withdrawals for a Locally Developed modeling approach:

- <u>Back-Calculation from Existing Results:</u> This option uses specific equations for calculating the required percent reduction in the level of basin-wide withdrawals, using information on

[23] Note that this section is designed to produce results that are at the upper limit of what would be acceptable, such that there is no buffer built in as a margin of error. Ideally, a company would be more ambitious than these targets (i.e., set a freshwater quantity target that aims at reducing freshwater withdrawals more drastically than what is to be required through the targets).
[24] This is the threshold value that represents the desired state of nature (see Section 1.1).

environmental flow requirements and modeled (or historically observed) stream flow regimes. It allows freshwater quantity targets to be set without requiring a new application of the Locally Developed model. However, it assumes that freshwater withdrawals are the dominant cause of non-attainment of desired flow conditions and lacks flexibility for considering factors such as groundwater depletion or dam operations. It is most suited for situations where it is not possible and/or feasible to apply the Locally Developed model and/or where factors such as groundwater depletion or dam operations are not relevant.

- Application of Locally Developed Model: This option provides more flexibility in terms of consideration of groundwater and dam operations. However, it requires that a company be able to apply the Locally Developed model to explicitly demonstrate that the proposed target will result in the attainment of environmental flow requirements. This approach will require a company to gain access to the Locally Developed model and have the in-house technical expertise to independently conduct model simulations. It is most suited for situations where it is possible and feasible to apply the Locally Developed model and where factors such as groundwater depletion or dam operations are relevant.

Note that if the "Application of Locally Developed Model" option is not available, the "Back-Calculation from Existing Results" option is still preferred over the Globally Developed modeling approach.

Back-Calculation from Existing Results

This option provides a specific equation for calculating the maximum allowable level of basin-wide rate of withdrawals (volume per time, e.g., ML/month) that will attain the desired environmental flow conditions (refer to Equation 1 below). This option is reliant on environmental flow information and based on the assumption[25] that the rate of withdrawal at any given time is directly reflected as a reduction in stream flow (or environmental flow gap); therefore, the necessary reduction in withdrawals is the same percentage as the desired increase in stream flow (to meet the environmental flow gap). This assumption allows the present required basin-wide withdrawal reduction to be directly calculated from

- Present-day stream flows (representing current withdrawals)
- Natural stream flows (representing the absence of withdrawals)
- Locally derived environmental flow requirements

The specification of the required basin-wide withdrawal reduction is based on the concept of "excess withdrawals," i.e., the amount by which present-day withdrawals exceed the level necessary to attain environmental flow requirements. The percentage reduction required to attain environmental flow requirements is calculated as *the ratio of excess withdrawal to present-day withdrawal* [Equation 1]:

[25] This assumption is best made when factors such as groundwater depletion or dam operations are not dominant in affecting the flow regime, as has been documented in some cases (e.g., Döll et al., 2009).

$$\%\ Reduction\ in\ Basinwide\ Withdrawal\ Required\ =\ 100\ x\ \frac{(Excess\ Withdrawal = Environmental\ Flow\ Requirement - Present\text{-}Day\ Stream\ Flow)}{(Present\text{-}Day\ Withdrawal = Natural\ Flow - Present\text{-}Day\ Stream\ Flow)} \quad (1)$$

This concept is illustrated in Figure 5 using hypothetical hydrographs. The upper line in Figure 5 (Natural Stream Flow; green line) represents the natural stream flow regime, the middle line (Environmental Flow Requirement; blue line) represents the environmental flow requirements, and the lower line (Present-Day Stream Flow; orange line) represents present-day stream flows.

For this example, present-day stream flows are consistently less than the respective environmental flow requirements, indicating that the present level of withdrawal exceeds what is desired. The excess withdrawal for any given month is defined as the difference between the environmental flow requirement and the present-day flow (for this example, $30\text{x}10^6$ ML/month). The present-day withdrawal for any given month is defined as the difference between the natural stream flow and the present-day stream flow (for this example, $50\text{x}10^6$ ML/month). The application of Equation 1 to this example shows that the “ratio of excess withdrawal to present-day withdrawals” is 0.6 (i.e., $30\text{x}10^6 \div 50\text{x}10^6$), which means that the basin-wide withdrawals need to be reduced by 60% to attain environmental flow requirements.

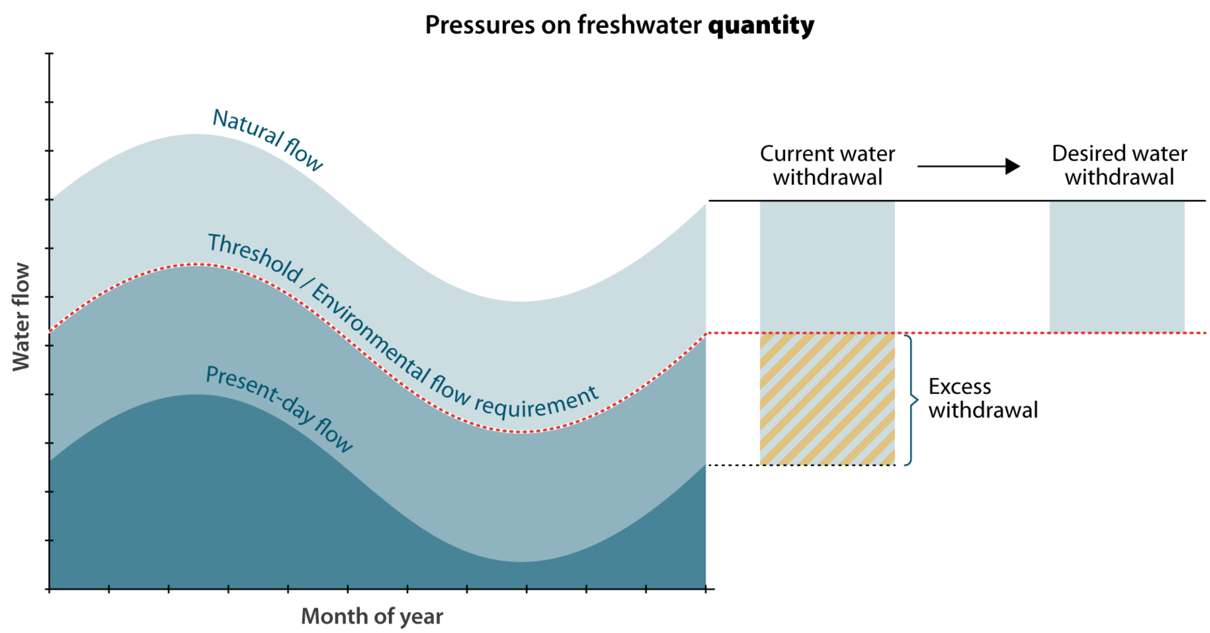


Figure 5. Illustration of the concept for determining the required reduction in withdrawal[12]

Equation 1 must be applied for each basin, over the entire period for which flows are available,[26] with results tracked for each month of each year. This will generate a matrix of required reduction

[26] A period of record of at least 20 years is required to capture interannual variability in precipitation.

percentages for each month and year. The 75th percentile reduction percentage[27] for each month (i.e., the value that is exceeded in 25% of all months simulated) and the present-day level of a company's rate of withdrawal are used in Section 3.3.2 to define company-specific freshwater quantity SBTs. Section 3.3.5 provides a hypothetical example demonstrating how results from Equation 1 are used to calculate a 75th percentile reduction percentage and freshwater quantity SBTs.

Application of Locally Developed Model

The second option for determining the maximum allowable level of basin-wide withdrawals within the Locally Developed modeling approach can be used in cases where the local model is available for purposes of evaluating specific basin-wide withdrawal reduction scenarios. For this option, the company defines the maximum allowable level of withdrawal by demonstrating that the desired stream flows (and/or aquifer level, if targets are being set for the protection of groundwater) will be attained for the company's targeted level of withdrawal over the entire period of simulation. Similar to the Back-Calculation from Existing Results option, allowable withdrawals should be set at a level where environmental flow requirements are attained for at least 75% of each of the months over the simulation period.

In contrast with the Back-Calculation from Existing Results option, the Application of Locally Developed Model option does not require the assumption that the rate of withdrawal at any given time is directly reflected as a reduction in stream flow. This makes the Application of Locally Developed Model option suitable for situations where the protection of groundwater levels is an important consideration. Furthermore, this option is better suited for situations where pressures other than withdrawals (e.g., dams) are responsible for the non-attainment of environmental flow requirements, as it allows the effect of alternate dam operations to be considered.

Globally Developed Modeling Approach

Globally Developed freshwater quantity targets must be defined using results from either of two global hydrologic models and environmental flow requirements described by Hogeboom (in preparation, Option 1) or WRI (in preparation, Option 2) to define the required reduction percentage in basin-wide withdrawals that will attain the desired stream flows.[28] Either model is considered acceptable for the Globally Developed modeling approach.

The approach is similar to that described for the Locally Developed approach, where the required reduction percentage is based on the ratio of excess withdrawals to present-day withdrawals (i.e., Equation 1). The difference is that the Globally Developed approach uses the results of global hydrologic models to calculate excess and present-day withdrawals rather than locally developed

[27] This percentile was suggested by Hogeboom (in preparation) as a level that balances ambitious reduction goals with the realization that a certain amount of freshwater must be made available for use.

[28] While this version of the methodology mandates the use of Hogeboom or WRI as the only acceptable tools for the Globally Developed modeling approach to freshwater quantity, additional sources of models will be considered (and might be added) in future versions.

data and therefore may reflect an over- or underestimation of actual water scarcity/availability conditions. As discussed below, all technical steps are being automatically conducted such that a company only needs to specify the basin(s) of interest, and the required basin-wide reduction will be provided.

Option 1: Hogeboom et al. (2020) estimated natural stream flow by extracting results from three global hydrologic models[29] to define ensemble mean monthly flow regimes for streams worldwide in the absence of any withdrawals. They determined environmental flow requirements based on the ensemble mean results of three widely accepted methods[30] for establishing environmental flow requirements to be set aside in each basin to ensure proper aquatic ecosystem functioning on a monthly basis. They then calculated the amount of water available for human use by subtracting environmental flow requirements from natural flow regimes, for each basin in the world and each month in the period 1970–2005.

Hogeboom (in preparation) is updating the above analysis to calculate the required reduction percentage at the basin level for each month of the period 1971–2010 using Equation 1, and subsequently to define the percent reduction required for each month such that environmental flow requirements would be attained 75% of the time.[31] These results will be provided for each Pfafstetter Level 5 basin worldwide in an easy-to-use format by the time of the public release of the final freshwater target-setting method in Q1 2023. These reduction percentages are to be used as the basis for target-setting if the Globally Developed approach is taken using the Hogeboom model.

Option 2: World Resources Institute is developing a new indicator for its Aqueduct Water Risk Atlas that will build upon baseline water stress (BWS) by incorporating environmental flow requirements. BWS measures the ratio of total water withdrawals to available renewable surface and groundwater supplies (Hofste et al., 2019). Available water supplies and water withdrawals, which represent demand across four sectors (industrial, domestic, irrigation, and livestock), are obtained from the PCR-GLOBWB 2 hydrological model for each month between 1960 and 2014 (Hofste et al., 2019). The new indicator will incorporate sectoral demand along with environmental flow requirements based on the ensemble mean results of Pastor et al. (2014), Richter et al. (2012), and Smakhtin et al. (2004) to specify the required withdrawal reduction percentage at the basin level such that environmental flow requirements are protected each month.

[29] The global hydrologic models currently being used are H08 (Hanasaki et al., 2008); PCR-GLOBWB 2 (Sutanudjaja et al., 2018); and WaterGAP-2C (Müller Schmied et al., 2016).
[30] The methods used to define environmental flow requirements are described in Pastor et al. (2014), Richter et al. (2012), and Smakhtin et al. (2004).
[31] The same 75th percentile value is used as for the Locally Developed approach, with no additional safety factor, consistent with the previously stated objective of balancing ambitious reduction goals with the realization that a certain amount of water must be made available for use.

3.3.2 Determine Company-Specific Freshwater Quantity Target

Section 3.3.1 explains how a company calculates the basin-wide reductions in water withdrawals needed in order to meet environmental and social requirements. Once the company has determined this value (on both a yearly and a monthly basis for each site targeted), the company then defines a target level for its individual withdrawals, consistent with the maximum allowable level of basin-wide withdrawals defined above.

The conversion of allowable basin-wide withdrawals into individual company-specific targets requires a decision on how the water pressure reduction burden will be shared among water users. Within the Science Based Targets Network, the determination of individual contributions (reduction of negative, and increase of positive) within the context of a societal goal (e.g., water flows that meet environmental needs) is referred to as "allocation." Many different approaches are available for determining a company's share of an allocated resource, or allocated responsibility for action. For this target-setting method, the allocation approach called "equal contraction of efforts" is used.[32] This approach assumes that all water users in the basin will reduce their withdrawals by the same percentage.

Results from Equation 1 (for the Locally Developed Back-Calculation from Existing Results approach) or from Hogeboom or WRI (for the Globally Developed approach) are converted into the individual company's maximum amount of withdrawals (in terms of volume per time, such as ML/month) that will attain the desired state of nature (Equation 2). This is accomplished by multiplying the required basin-wide percentage reduction with the company's present-day level of withdrawal (in the same units of volume per time):

$$Company\ Target\ Withdrawal = \frac{100 - \%\ Reduction\ in\ Withdrawal\ Required}{100}\ x\ Present\text{-}Day\ Level\ of\ Company\ Withdrawal \quad (2)$$

The allocation approach of "equal contraction of efforts" effectively gives every stakeholder the same level of reduction ambition, defined as a percentage, relative to its starting position (i.e., the moment when the stakeholder calculates its baseline). This allocation approach was chosen for its simplicity, as the only input data required is the baseline level of an individual company's impacts. For practical reasons, this version of the methodology does not address potential allocation factors such as social, economic, technological, or political aspects.

The equal contraction of efforts approach has the potential to penalize companies that are leading on water withdrawal reduction ambitions *before* calculating the baseline. To help mitigate this problem, companies should define their baseline, taking into account the last five years of impacts. Future iterations of this methodology will consider other allocation approaches to deal with the known limitations of equal contraction of effort (e.g., locking in an unfair share for users that have been using a greater proportion of the resource).

[32] Alternative allocation approaches will be considered in future versions of this method.

3.3.3 Timestep for Freshwater Quantity Targets

Companies can use annual or monthly time periods for their surface freshwater quantity targets. Freshwater quantity targets based on groundwater levels should be specified on an annual basis.

If companies choose to set their targets on an annual basis, the required reduction must be equal to the largest reduction required across all individual months. For example, if the required reductions are 50% for certain months of the year and zero for other months, a company could set targets on an annual basis requiring a blanket 50% reduction across the entire year. It could also set monthly targets and require reductions only for those months where they are necessary (without increasing withdrawals in any of the other months) (see Tables 4 and 5). The decision to use monthly vs. annual targets may depend on the sector. For example, agricultural irrigation withdrawals that vary widely on a seasonal basis may be better suited to monthly targets than are some types of direct operations whose water withdrawals are relatively constant over the course of the year.

3.3.4 Template Statement for Freshwater Quantity Targets

The target will be stated in the form of "Company X will reduce its water withdrawal in the _ Basin to _ ML/year by the year _" for situations where the target is set on an annual basis. For cases where monthly targets are used, the target will be stated in the form of "Company X will reduce its water withdrawal in the _ Basin to _ ML/month for each of the following months. The reductions will occur by the year _."

3.3.5 Hypothetical Examples of Setting Freshwater Quantity Targets

This section provides hypothetical examples of how a company would set freshwater quantity SBTs using both the Locally and Globally Developed modeling approaches.

<u>Locally Developed Modeling Approach</u>

For the first example, local environmental flow requirements and results from a basin-specific hydrologic model are available in the basin containing its operations, so a company chooses to set a locally based freshwater quantity SBT using these tools and the Back-Calculation from Existing Results approach. The company begins by calculating the cumulative pressures of its operations over the spatial domain considered in the model. One facility directly monitors its water use for irrigation, withdrawing water at a rate of $8x10^6$ ML/month. The company also has an agricultural supplier in the basin for which it used secondary data (i.e., blue water footprint) to calculate water use of $2x10^6$ ML/month. The sum of these two numbers results in a cumulative water withdrawal of $10x10^6$ ML/month.

Existing environmental flow requirements had been specified in the Locally Developed model on a monthly basis. Hydrologic model results were available representing the natural stream flow regime and present-day stream flow regime and were compiled into monthly averages. These values are shown in Table 3 for a single year, along with the required reduction percentage for each month, calculated using Equation 1. For the example year depicted in Table 3, no reductions are required for 10 months of the year because present-day stream flows exceed environmental flow requirements for those months.

Table 3. Local environmental flow requirements and model-predicted flows by month for single hypothetical example year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Environmental flow requirement (x10^{-6} ML/month)	64	146	152	136	120	104	75	54	42	49	58	65
Natural stream flow (x10^{-6} ML/ month)	80	183	190	170	150	130	93	67	52	61	72	81
Present-day stream flow (x10^{-6} ML/month)	70	173	180	160	140	115	78	52	37	51	62	71
Required reduction in withdrawal (%)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11%	31%	n/a	n/a	n/a

The final step in this example is to repeat the calculations in Table 3 for each year in the period of simulation and rank the required reduction percentage by month and year as shown in Table 4. The rank of the 75th percentile reduction percentage is calculated based on the length of the simulation as:

$$75^{th} \text{ percentile rank} = 0.75 * (\text{Number of years evaluated} + 1)$$

For this example simulation of 40 years, the 31st-highest reduction percentage corresponds to the 75th percentile. Should the company choose a single annual target, it would base it on the most stringent 75th percentile monthly reduction in Table 4 (39%). Application of Equation 2 indicates that, with a present-day pressure of 10x10^{6} ML/month and a required reduction of 31%, they have a target of 6.9x10^{6} ML/month for their aggregate withdrawals across all operations. Alternatively, they could specify monthly targets using each month's 75th percentile reduction percentage in Equation 2.

Table 4. Ranked reduction percentages by month for 40-year period of record

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rank	Required reduction in withdrawal (%)											
1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	0%	0%	0%	0%	0%	0%	0%	3%	5%	0%	0%	0%
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
31	0%	0%	0%	0%	0%	0%	5%	20%	39%	8%	0%	0%
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
39	2%	5%	9%	13%	16%	21%	26%	31%	59%	27%	9%	1%
40	3%	6%	11%	15%	18%	24%	29%	54%	68%	35%	14%	2%

<u>Globally Developed Modeling Approach</u>

No site-specific hydrologic model or local environmental flow requirements have been developed in the catchment containing its operations, so our company chooses to set an SBT for freshwater quantity using a Globally Developed approach. The company determines that it has a single supplier located in the basin defined by Hogeboom et al. (2020) with a calculated blue water footprint of 6x10^6 ML/month. The company extracts monthly time series information on required reduction percentages from the database to be provided by Hogeboom et al. These values are shown in Table 5 on the next page.

Table 5. Required reductions based on global model results from Hogeboom

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Required reduction in withdrawal (%)	5%	12%	8%	5%	10%	16%	18%	34%	30%	28%	20%	23%

The company chooses a single annual target, based on the most stringent monthly reduction in the table above (34%). Application of Equation 2 indicates that its SBT for freshwater quantity with a present-day withdrawal of $6x10^6$ ML/month and a required reduction of 34% results in a target of $4.08x10^6$ ML/month to be applied for the entire year.

3.3.6 Validation Criteria for Freshwater Quantity Targets

<u>Locally Developed Modeling Approach</u>

The validation criteria for Locally Developed freshwater quantity SBTs consists of ensuring the following:

- Models and thresholds were developed by an authorized basin agency. An authorized basin agency is a national, regional, state, or local government agency that has the authority to make decisions on the allocation of water resources. Examples include basin management authorities, water resource management agencies, and catchment councils.
- Documentation was provided demonstrating that the existing flow requirements considered the desired state of nature (and not just human needs). This documentation must be authored or endorsed by the authorized basin agency explicitly showing that freshwater quantity targets explicitly consider environmental flow requirements in their formulation.
- The spatial domain (i.e., basin) for taking a baseline impact measurement and for setting targets was explicitly identified based on the spatial scale defined in the model.
- For the baseline impact measurement at each basin, all company operations (direct and upstream) that materially affect water availability were identified as defined in Step 1: Assess.
- For the baseline impact measurement at each basin, baseline water withdrawals were aggregated across all company operations, using the last five years (or period of existence, if less than five years) of data.
- The specified required percent reduction in basin-wide withdrawals was calculated in one of the following ways:

    - The company's reduction was set using basin-wide percent reductions as calculated using Equation 1 (if using the back-calculation approach).
    - The results from a hydrologic model and allocation scheme approved by an authorized basin agency demonstrate that the level of withdrawal used to set the company's targets complies with local environmental flow requirements (if using the Direct Application of Model approach).
- Targets for the company were calculated using Equation 2 and specified in terms of maximum water extraction in terms of volume of water per time, to be achieved within a specified time frame.
- Progress on the target—in Track (Step 5 of the SBTN Action Framework)—will be based on changes to gross withdrawals, unless an explicit demonstration is provided that any credited return flows are present in the stream at the location, time, and quality that they are being applied.

<u>Globally Developed Modeling Approach</u>

The validation criteria for Globally Developed freshwater quantity SBTs consists of ensuring the following:

- Written documentation is provided that demonstrates that an adequate search was conducted for existing models and thresholds. Specific criteria for this documentation consist of
    - a record of the person(s) contacted at the basin authority (or water resources agency) for the basin in question and their response regarding the existence of models/thresholds for quality and/or quantity parameters
    - in cases where no basin management authority or water resources agency exists, a record of request and response to relevant academic agencies or nongovernmental agencies working on water issues within the basin in question
- The spatial domain (i.e., basin) of the target was explicitly identified based on the spatial scheme provided by the Water Footprint Network based on Hogeboom et al. (in preparation) or WRI (in preparation).
- All company activities in direct operations or upstream that materially affect freshwater quantity in the spatial domain were identified.
- Baseline water withdrawals were defined for each activity, using the last five years (or period of existence, if less than five years) of data.
- The specified required percent reduction in basin-wide withdrawals was calculated using results for the basin provided by Hogeboom et al. (in preparation) or WRI (in preparation).
- Targets were calculated using Equation 2 and specified according to maximum water extraction in terms of volume of water per time, within a specified time frame.

3.4 Setting Freshwater Quality Targets

Target-setting for freshwater quality follows a similar process to that which is recommended for freshwater quantity. Companies begin by calculating the maximum allowable load of nutrients for all nutrient sources in a basin and then defining the portion of that amount of pollution (at basin level) to be allocated to the company's operations.

3.4.1 Maximum Allowable Level of Basin-Wide Nutrient Load

Locally Developed Modeling Approach

Under this step, the company applies a method to relate the magnitude of nutrient loads within a basin to the resulting freshwater quality within that spatial domain in order to then determine the maximum amount of basin-wide nutrient load that will be within the specified freshwater quality threshold. Note that these methods produce results that are at the upper limit of what would be acceptable, such that there is no buffer built in as a margin of error. Thus, ideally companies would be more ambitious than these targets (i.e., reduce load contributions even more drastically than what is to be required through the targets).

Two options exist for calculating the maximum allowable level of nutrient loads for the Locally Developed approach:

- Back-Calculation from Existing Results: This option provides specific equations for calculating allowable loads using the information on existing recognized nutrient thresholds and model results for present-day nutrient concentration. It allows targets to be set without requiring new application of the Locally Developed model but lacks flexibility for considering factors such as nutrient-related freshwater quality thresholds specified in terms other than nutrient concentration (e.g., chlorophyll a, dissolved oxygen). It is most suited for situations where it is not feasible to conduct new applications of the local model and/or where thresholds for parameters other than nutrients are not relevant.
- Direct Application of Model: This approach provides more flexibility in terms of the use of freshwater quality indicators other than nutrient concentration, but it requires the application of the Locally Developed model to explicitly demonstrate that the proposed nutrient load target will result in attainment of freshwater quality consistent with the threshold concentration representing the desired freshwater quality. It is most suited for situations where it is feasible to conduct new applications of the local model and where thresholds for parameters other than nutrients are relevant.

The Back-Calculation from Existing Results method provides specific equations for calculating the maximum amount of nutrient load (in terms of mass per time, such as kg/year) that will attain the desired instream nutrient concentration. It is based on the assumption that instream nutrient concentrations at any given time are directly proportional to the rate of nutrient loading (e.g., Preston et al. 2011). This assumption allows the required basin-wide reduction in load to be directly calculated from the output of the freshwater quality model representing present-day nutrient concentrations (which will be provided by essentially all Locally Developed models) and the threshold nutrient concentration, thus representing the maximum concentration consistent with the desired state of nature.

The extent to which basin-wide nutrient loads must be reduced to meet the desired nutrient concentration is based on the same concept of comparing the ratio of excess pressure to present-day pressure described above for freshwater quantity SBTs. For quality, pressures are expressed as nutrient concentration (by assuming a proportional relationship between loads and concentrations), and the resulting equation is:

$$\%\,Reduction\ in\ Basinwide\ Load\ Required = \frac{Present\text{-}Day\ Nutrient\ Concentration - Threshold\ Nutrient\ Concentration}{Present\text{-}Day\ Nutrient\ Concentration} \quad (3)$$

Equation 3 is applied over the entire time period of existing Locally Developed model results to determine the 75th percentile largest individual required reduction percentage. Note that the temporal resolution of the threshold nutrient concentration may vary by basin (e.g., specified as an instantaneous, never-to-be-exceeded value; as a seasonal average; or as an annual average) and that the temporal resolution required for this assessment should be consistent with the temporal resolution considered by the threshold. The percent reduction provided by Equation 3 is used in the next step in conjunction with the present-day level of nutrient loads to define company-specific freshwater SBTs.

The Direct Application of Model option for defining maximum allowable nutrient load applies in cases where a Locally Developed model and freshwater quality thresholds are available to be applied for purposes of evaluating specific reduction scenarios. For this option, the company defines its maximum allowable level of nutrient load by demonstrating with model results that the desired instream nutrient concentration will be attained for their targeted level of nutrient load over the entire period of simulation. This option avoids the simplifying assumption of the Back-Calculation from Existing Results approach that nutrient concentrations are proportional to nutrient loads. It also allows for targets to be set considering freshwater quality endpoints (e.g., chlorophyll a, dissolved oxygen) reflecting the impact of nutrient pollution rather than the instream nutrient concentration.

Globally Developed Modeling Approach

For Globally Developed freshwater quality targets, the company uses results from a global freshwater quality model to define the maximum amount of nutrient load that will attain the desired instream nutrient concentration. The required percent reduction in nutrient loads for Globally Developed targets is based on results from the modeling work described in McDowell et al. (2020).[33] Based on global models of N and P concentrations using data from thousands of sites sampled worldwide between 1990 and 2016, their work defined

[33] While this version of the methodology mandates the use of McDowell as the only acceptable tool for the Globally Developed approach to freshwater quality, additional sources of models may be added in the future.

- Present-day median growing season total N and total P concentrations for basins worldwide
- Which nutrient (N or P) is the limiting factor (i.e., in the lowest supply relative to needs) for algal growth in each basin; they determined the limiting nutrient by comparing the predicted N:P ratio to the Redfield ratio (Redfield et al., 1963) of 7 (as specified on a mass basis; predicted N:P ratios greater than 7 were taken as an indicator of P limitation, whereas N:P ratios less than 7 were taken as an indication of N limitation)
- That global concentration threshold values for total N (0.70 mg-N/L) and total P (0.046 mg-P/L) represent acceptable levels of algal growth; these concentrations were based on a literature review of studies defining local N and P thresholds related to periphyton growth

The extent to which basin-wide loads must be reduced in order to meet the desired state of nature is based on Equation 3, described above for the Locally Developed approach. All the data required to apply Equation 3 can be obtained from McDowell et al. (2020).[34] Note that Equation 3 is applied only to the basin-specific limiting nutrient as identified by McDowell et al. (2020). Section 3.4.5 provides a hypothetical example demonstrating how results from McDowell et al. (2020) are used to calculate freshwater quality SBTs.

3.4.2 Allocation Approach

At this point in the process, the company defines a target level for its nutrient loads, consistent with the maximum allowable basin-wide load defined above. This is accomplished by multiplying the required percentage reduction (as calculated either via Equation 3 or via a Direct Application of Model approach) with the present-day nutrient load:

$$Company\ Target\ Load = \frac{(100 - \%\ Reduction\ in\ Basinwide\ Load\ Required)}{100}\ x\ Present\text{–}Day\ Company\ Load \quad (4)$$

The targets set using Equation 4 assume the same "equal contraction of efforts" allocation approach as described earlier for freshwater quantity in Section 3.4.2.

3.4.3 Timestep for Freshwater Quality Targets

Companies can use annual or finer (e.g., seasonal) time periods for their targets as long as the selected percent reduction reflected in the target is consistent with the most stringent required reduction. For example, if the threshold nutrient concentration applies only to the summer growing season and the required reductions are 25%, companies could set targets on an annual basis, requiring a blanket 25% reduction across the entire year. They could also set targets on a seasonal basis and require reductions only for those months where the threshold concentration is applicable.

[34] McDowell (in preparation) is updating the above analysis to provide improved model predictions. These results will be provided for Pfafstetter Level 4 basins worldwide by the time of the public release of the final freshwater target-setting method in Q1 2023.

3.4.4 Template Statement for Freshwater Quality Targets

Depending on the method and units of measurement used to calculate pressures, freshwater quality targets will be stated in the following forms:

- Pressures specified using direct or secondary measurement with units of nutrient load will be stated in the form of "Company X will reduce its nutrient load in the _ Basin to _ kg P (or N)/year by the year _" for situations where the target is set on an annual basis. For cases where seasonal targets are used, the target will be stated in the form of "Company X will reduce its nutrient load in the _ Basin to _ kg P (or N)/month for each of the following months. The reductions will occur by the year _."
- Pressures specified using grey water footprint(s) will be stated in the form of "Company X will reduce its grey water footprint in the _ Basin to _ ML/year by the year _". The reductions will occur by the year _.

3.4.5 Hypothetical Examples of Setting Freshwater Quantity Targets

This section provides hypothetical examples of how a company would set freshwater quality SBTs using both the locally based and globally based approaches.

<u>Locally Developed Modeling Approach</u>

For this example, a local nutrient threshold and results from an approved freshwater quality model are available in the basin containing its operations, so a company chooses to set a locally based freshwater quality SBTs using these tools and the Back-Calculation from Existing Results approach. The spatial domain of the company's assessment is defined by the scale of the local model, which was Pfafstetter Level 5. The company begins by calculating the cumulative pressures of its operations over the spatial scale considered in the model. One facility directly monitors its nutrient discharges to the basin. Both facilities used primary data on their discharge flow rate and effluent P concentration to calculate their P load. One facility discharges P at a rate of 5 kg P/month, and the second facility discharges P at a rate of 3 kg P/month. The sum of these two numbers results in a cumulative P load of 8 kg P/month.

The company has access to results from the freshwater quality model but does not have the resources to conduct additional model simulations. For this reason, it uses the Back-Calculation from Existing Results approach, which combines existing model results with information on the freshwater quality threshold, to define the required reduction percentage. The local nutrient threshold is specified by the basin authority as a seasonal (May through September) average P concentration of 0.1 mg/L, as shown in the first row of Table 6. Freshwater quality model results were available representing the monthly instream nutrient concentration associated with present-day nutrient load over a 20-year period of historical stream flows. These values are shown in the second row of Table 6 for a single year of simulation. The third row of Table 6 converts each of the five monthly average concentrations into a single May–September average, to allow direct comparison to the time period specified by the threshold.

The final row of Table 6 applies Equation 3 to calculate the required reduction percentage for the May–September period. For the example year depicted, existing nutrient loads must be reduced by 33% (i.e., [0.15 - 0.10]/0.15) to meet the seasonal average threshold.

Table 6. Freshwater quality nutrient threshold and model-predicted flows by month and season for single hypothetical example year.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Threshold P concentration (mg P/L)	n/a	n/a	n/a	n/a	0.10					n/a	n/a	n/a
Present-day P concentration (mg P/L)	0.12	0.13	0.11	0.11	0.14	0.14	0.15	0.16	0.16	0.14	0.14	0.13
May–September P concentration (mg P/L)	n/a	n/a	n/a	n/a	0.15					n/a	n/a	n/a
Required reduction in withdrawal (%)	n/a	n/a	n/a	n/a	33%					n/a	n/a	n/a

The final step in this example is to repeat the calculations in Table 6 for each year in the period of simulation and rank the required reduction percentage by year as shown in Table 7. The rank of the 75th percentile reduction percentage is calculated based on the length of the simulation as:

$$75^{th} \text{ percentile rank} = 0.75 * (\text{Number of years evaluated} + 1)$$

For this example simulation of 20 years, the 16th-highest reduction percentage corresponds to the 75th percentile, indicating a required nutrient load reduction of 35%. Application of Equation 4 indicates that with a present-day pressure of 8 kg/month and a required reduction of 35%, the company has a target of 5.2 kg/month for its aggregate load across all operations. Because the nutrient threshold applies only during the May–September period, the company has the option of meeting the target only for the May–September period or for the entire year.

Table 7. Ranked seasonal reduction percentages by month for a 40-year period of record.

Rank	Required reduction in load (%)
1	0%
2	3%
. . .	. . .
16	35%
. .	. .
19	41%
20	43%

<u>Globally Developed Modeling Approach</u>

No site-specific freshwater quality model or local nutrient concentration thresholds have been developed in the catchment containing its operations, so our company chooses to set an SBT for freshwater quality using a Globally Developed approach. The company has a single facility located in western France and used primary data on discharge flow rate and effluent nutrient concentrations to determine that the facility discharges N at a rate of 71 kg/year and P at a rate of 11 kg/year. The company determines the basin in which its facility is located and (until the updated database is available) extracts site-specific information on present-day nutrient concentrations and the limiting nutrient from the maps provided by McDowell et al. (2020), shown in Figures 6 and 7 on the next page.

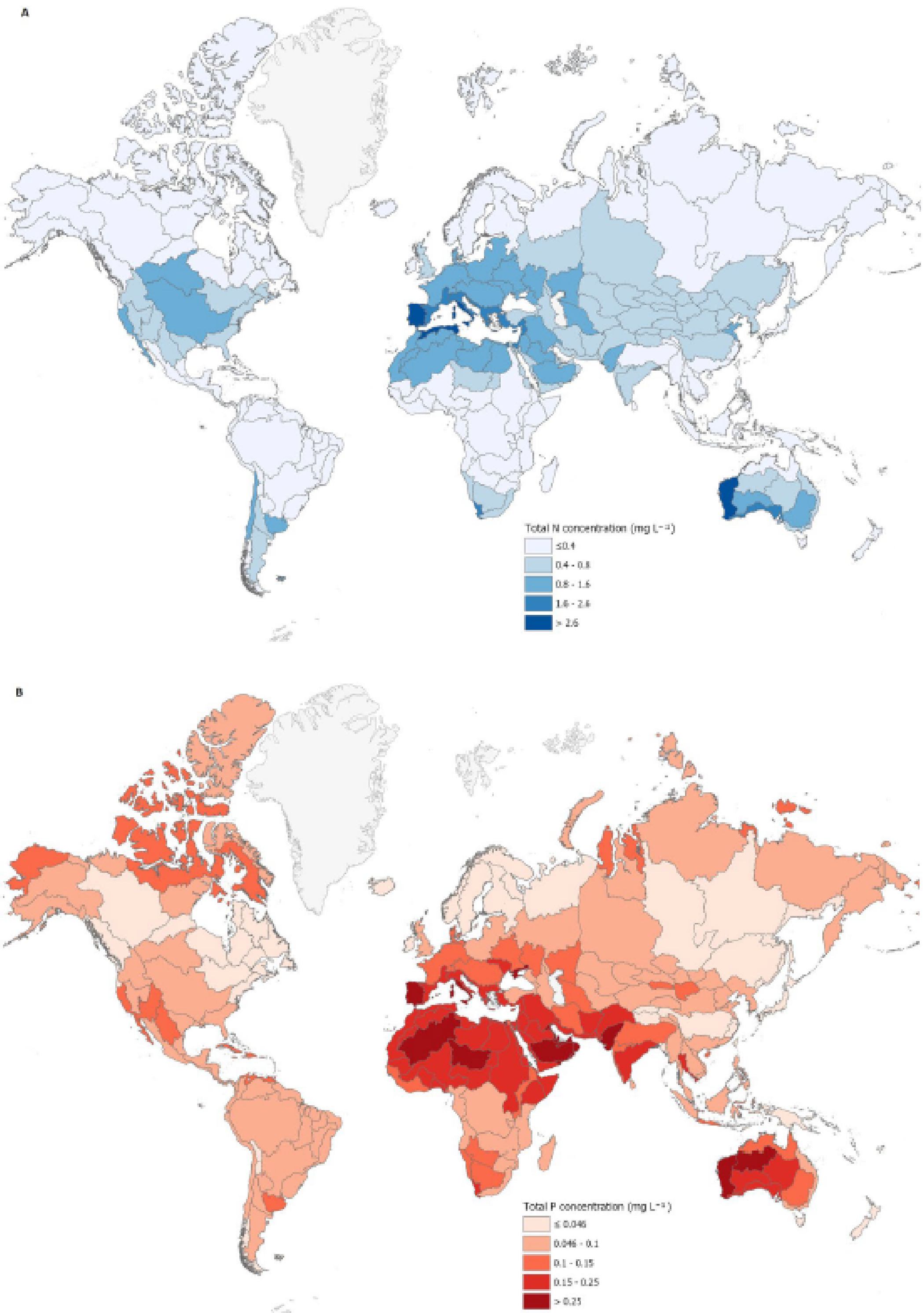


Figure 6. Modeled total N (A) and total P (B) concentrations (mg/L) from McDowell et al. (2020).

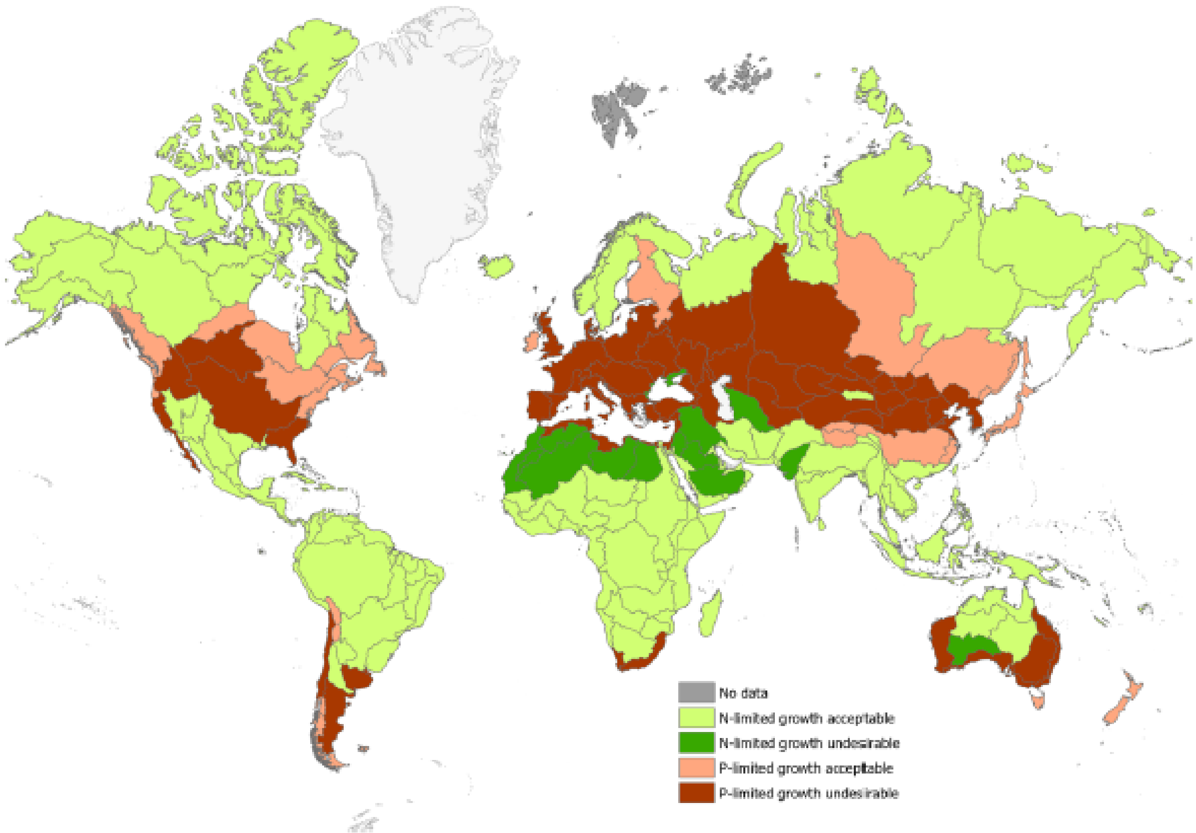


Figure 7. Modeled limiting nutrient from McDowell et al. (2020).

These values are as follows:

- N concentration range from Figure 6 is 0.8 to 1.6 mg/L, so a midpoint value of 1.2 mg/L is selected.
- P concentration range from Figure 6 is 0.1 to 0.15 mg/L, so a midpoint value of 0.125 mg/L is selected.
- Limiting nutrient from Figure 7 is P.

Because P is the limiting nutrient, the company applies Equation 3 to define the required reduction percentage using the site-specific predicted total P concentration of 0.06 mg/L and the global P threshold provided by McDowell et al. (2020) of 0.046 mg/L. The required reduction percentage is 63% ([0.125 – 0.046] ÷ 0.125).

Globally Developed freshwater quality targets are specified on an annual basis, so the application of Equation 4 indicates that the company's SBT for freshwater quality for a present-day pressure of 11 kg/year and a required reduction of 63% results in a target of 4.0 kg P/year.

3.4.6 Validation Criteria for Freshwater Quality Targets

Locally Developed Modeling Approach

The validation criteria for Locally Developed Freshwater Quality SBTs consist of ensuring the following:

- Models and thresholds were developed by an authorized basin agency. An authorized basin agency is a national, regional, state, or local government agency that has the authority to make decisions on the allocation of water resources, including regulating pollutant loads. Examples include basin management authorities, water resource management agencies, and catchment councils.
- The spatial domain (i.e., basin) of the target was explicitly identified based on the spatial scale used in the model.
- All company operations (direct and upstream) that materially affect freshwater quality in the spatial domain were identified.
- Baseline nutrient loads were defined for each operation, using the last five years (or period of existence, if less than five years) of data.
- The specified required percent reduction in basin-wide loads was used if available from the model application; otherwise, percent reductions were calculated using Equation 3 or Direct Application of Model approach as described in Section 3.4.1.
- Targets were calculated using Equation 4 and specified in terms of maximum nutrient load in terms of mass of nutrient per time, within a specified time frame.

Globally Developed Modeling Approach

The validation criteria for Globally Developed freshwater quality SBTs consist of ensuring the following:

- Written documentation is provided that demonstrates that an adequate search was conducted for existing models and thresholds. Specific criteria for this documentation consist of
  - a record of the person(s) contacted at the basin authority (or water resources agency) for the basin in question and their response regarding the existence of models/thresholds for quality and/or quantity parameters
  - in cases where no basin management authority or water resources agency exists, a record of request and response to relevant academic agencies or nongovernmental agencies working on water issues within the basin in question
- The spatial domain (i.e., basin) of the target was explicitly identified based on the spatial scheme provided by McDowell et al. (2020).
- All company operations (direct and upstream) that materially affect freshwater quality in the spatial domain were identified.

- Baseline nutrient loads were defined for each operation, using the last five years (or period of existence, if less than five years) of data.
- The specified required percent reduction in basin-wide loads was calculated using Equation 3.
- Targets were calculated using Equation 4 and specified according to maximum nutrient load in terms of mass of nutrient per year, within a specified time frame.

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5. Glossary

(Adapted and expanded upon from SBTN, 2020)

Allocation: Assignment of a given company's portion of effort toward issue/impact mitigation.[35]

AR^{3}T: SBTN's Action Framework is named AR^{3}T because it covers actions to avoid future impacts, reduce current impacts, regenerate and restore ecosystems, and transform the systems in which companies are embedded.

Authorized basin agency: National, regional, state, or local government agency that has the authority to make decisions on the allocation of water resources, including regulating pollutant loads. Examples include basin management authorities, water resource management agencies, and catchment councils.

Back-calculation: The process of determining the required percent reduction in basin-wide withdrawals or nutrient load by examination of existing results from an approved Locally Developed model and environmental thresholds.

Baseline: Value of impacts (on nature) or state (of nature) against which an actor's targets are assessed in a particular previous year or particular previous years.

Basin: The area of land that provides all surface runoff and subsurface waters to a given waterbody. Also referred to as a "watershed" or "catchment."

Basin management authority: The agency or authority within a basin that is officially designated for the management of the water resources, including decisions on freshwater quality standards and freshwater quantity allocations.

Blue water availability: Natural runoff (through groundwater and rivers) minus environmental flow requirements. Blue water availability typically varies within the year and from year to year.

Blue water footprint: Volume of surface and groundwater consumed as a result of the production of a good or service.

Catchment: The area of land that provides all surface runoff and subsurface waters to a given waterbody. Also referred to as a "watershed" or "basin."

Concentration: The amount of a substance in a given volume of water, specified in units of mass per volume (e.g., mg P/L).

Consumption: The net use of water, i.e., the volume of water withdrawn minus the volume of water discharged/returned.

Cumulative impacts: Impacts that result from incremental changes caused by other actions along with the entity of interest.

[35] The use of this term in this guide is not to be confused with the use of "allocation" related to water rights.

Dependencies: Aspects of nature's contributions to people that a person or organization relies on to function, including water flow and quality regulation; regulation of hazards like fires and floods; pollination; carbon sequestration.

Desired state of nature: A state of nature consistent with the safe operating space defined by Planetary Boundaries, either for direct indicators (species, ecosystems, and nature's contributions to people) or for surrogates representing these indicators.

Direct application: The process of determining the required percent reduction in basin-wide withdrawals or nutrient loads by directly applying an approved Locally Developed model and confirming that the resulting state of nature is consistent with approved environmental thresholds.

Direct operations: All activities and sites (e.g., buildings, farms, mines, retail stores) over which the enterprise has operational or financial control. This includes majority-owned subsidiaries.

Downstream: All activities that are linked to the sale of products and services produced by the company setting targets. This includes the use and reuse of the product and its end of life, including recovery, recycling, and final disposal.

Environmental flows: Environmental flows describe the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems, which, in turn, support human cultures, economies, sustainable livelihoods, and well-being (Arthington et al., 2018).

Effluent: The outflow of water from a structure such as a wastewater treatment plant, sewer pipe, or industrial outfall.

Freshwater: Water containing less than 1,000 mg/L of dissolved solids, most often salt.[36]

Grey water footprint: the volume of freshwater that is required to assimilate the load of pollutants based on natural background concentrations and existing ambient freshwater quality standards. It is calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed freshwater quality standards.

Impacts: Can be positive or negative contributions of a company or other actor toward the state of nature, including pollution of air, water, or soil; fragmentation or disruption of ecosystems and habitats for nonhuman species; and alteration of ecosystem processes.

Indicator: A measurable entity related to a specific information need, such as the state of nature, change in a pressure, progress toward a target, or association between two or more variables. Example: Red List Index (SDG Target 15.5; Aichi Target 12).

Load: The rate at which a pollutant such as nutrients is delivered to a receiving water, specified in units of mass per time (e.g., kg P/day).

Measurement: The process of collecting data for baseline setting, monitoring, and reporting.

Monitoring: The periodic collection and evaluation of data relative to stated targets.

[36] https://www.usgs.gov/special-topics/water-science-school/science/freshwater-lakes-and-rivers-and-water-cycle#overview

Nature: All nonhuman living entities and their interactions with other living or nonliving physical entities and processes.

Nature loss: The loss and/or decline of the state of nature, as defined above.

Nonpoint source: Sources of pollution that are delivered to the receiving water in a diffuse manner, i.e., not through a confined channel or discharge pipe.

Pfafstetter Coding System: A hierarchical method of coding river basins such that Level 1 basins correspond to continental scale basins draining to the ocean. Higher levels (Levels 2, 3, 4, etc.) represent ever-finer divisions of the landscape into smaller basins.

Planetary boundary: The framework following Steffen et al. (2015) that defines a "safe operating space" for humanity, based on nine key natural processes that regulate the stability and resilience of the Earth system as a whole. The assumption underlying the concept is that remaining within these boundaries can help humanity to avoid unacceptable global environmental change.

Point source: Any single identifiable source of pollution from which pollutants are discharged, such as a confined channel or discharge pipe.

Prescriptive approach: An approach that must fully adhere to all aspects of the specified method.

Pressures: A human activity that directly or indirectly degrades nature. Following Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), five key pressures contribute most to the loss of nature globally: land and sea use change; direct exploitation of organisms; climate change; pollution; and invasion of alien species. While we generally follow IPBES definitions for these categories, we take a slightly broader conceptualization of "direct exploitation" to include both biotic and abiotic resources, such as water use. We thus use the term "resource exploitation."

Primary data: Data collected specifically for the assessment being undertaken. Generally, primary data will be collected from site-level measurement on a specific issue area through the use of direct measurement (e.g., volume of freshwater used for irrigation each month).

Relevant local stakeholders: Any individual, group, or institution that has a vested interest in or can influence the natural resources of the project area and/or that potentially will be affected by project activities and has something to gain or lose if conditions change or stay the same.

Reporting: The preparation of a formal written document that is typically connected to desired objectives, outcomes, or outputs, such as those connected to targets and goals.

Restore: To initiate or accelerate the recovery of an ecosystem with respect to its health, integrity, and sustainability, with a focus on permanent changes in state (adapted from Society of Ecological Restoration).

Science-based targets (SBTs): Measurable, actionable, and time-bound objectives based on the best available science, that allow actors to align with Earth's limits and societal sustainability goals.

Secondary data: Data that was originally collected and published for another purpose or a different assessment, e.g., derived from modeled or proxy-level data.

Site(s): Operational locations within a company's value chain/spheres of control and influence (including direct operations). Sites can include operations from any phase of a product's life cycle, from extractive operations (e.g., mines), material processing (e.g., mills), production facilities (e.g., factories), logistics facilities (e.g. warehouses), wholesale and retail (e.g. stores), and recycling/end of life (e.g. material recovery).

Site-level targets, value chain-level targets, corporate-level targets: Different commonly defined boundaries for SBTs, representing different types of sites within or beyond a value chain. Site-level targets occur at a specific site. Value chain-level targets occur throughout the company's entire value chain. Corporate-level targets can be a mix of site-level, value chain-level, or other levels (e.g., systems- and/or scape-level); this depends on the specific methodology/issue area.

Spatial domain: The specific land area (i.e., basin) being covered by the target, which includes all company activities occurring in the basin. In the case of this method, the spatial domain is the basin.

State of nature: The quality of the environment in relation to the functions that it fulfills. For SBTs, "state of nature" typically refers to three key categories: species (abundance and extinction risk), ecosystems (extent, integrity, and connectivity), and nature's contributions to people.

Sustainability goals: Targets that define a just future for nature and people.

Target: In global (e.g., UN) sustainability framings, a more specific quantitative objective, usually nested under a goal, with defined measurement and an associated indicator.

Target boundary: The corporate scope of the target, specific to each issue area. The target boundary may be defined in terms of the value chain aspect covered, as well as the specific locations, products, brands, etc., that will be in focus in a given time period.

Threshold: Level of an environmental indicator representing attainment of the desired state of nature.

Upstream: All activities associated with suppliers, e.g., production or cultivation, sourcing of commodities of goods, transportation of commodities to manufacturing facilities.

Validation: An independent process involving expert review to ensure the target meets the required criteria and methods of science-based targets.

Verification: Assessment and validation of compliance, performance, and/or actions relative to a stated commitment, standard, or target. With respect to SBTs, an independent third-party confirmation of either or both a) baseline values of a target indicator (e.g., a company's water or GHG inventory) and b) progress made toward achieving the target.

Water challenge: Water-related issues including physical water scarcity, insufficient freshwater quality, and/or regulatory restrictions on water use.

Water use: A general term that can represent either gross or net consumption (i.e., water withdrawn minus volume of water discharged/returned).

Watershed: The area of land that provides all surface runoff and subsurface waters to a given waterbody. Also referred to as a "basin" or "catchment".