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Environmental management — Water footprint — Principles, requirements and guidelines

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National foreword

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 5, *Life cycle assessment*.

Introduction

Water is an essential natural resource.

The issue of water and its management has become increasingly central to the global debate on sustainable development. This interest has been driven by growing water demand, increasing water scarcity in many areas and/or degradation of water quality. This drives the need for a better understanding of water related impacts as a basis for improved water management at local, regional, national and global levels.

It is therefore desirable to have appropriate assessment techniques that can be used in an internationally consistent manner.

One of the techniques being developed for this purpose is the water footprint assessment.

There is a growing demand for assessing and reporting water footprints. Various methodologies exist to do so and currently these methodologies emphasise different aspects related to water. There is therefore a need to ensure consistency in assessing and reporting water footprints.

This International Standard is expected to benefit organizations, governments and other interested parties worldwide by providing transparency, consistency, reproducibility and credibility for assessing and reporting the water footprint of products, processes or organizations.

A water footprint assessment conducted according to this International Standard:

— is based on a life cycle assessment (according to ISO 14044);

— is modular (i.e. the water footprint of different life cycle stages can be summed to represent the water footprint);

— identifies potential environmental impacts related to water;

— includes relevant geographical and temporal dimensions;

— identifies quantity of water use and changes in water quality;

— utilizes hydrological knowledge.

A water footprint assessment can assist in:

a) assessing the magnitude of potential environmental impacts related to water;

b) identifying opportunities to reduce water related potential environmental impacts associated with products at various stages in their life cycle as well as processes and organizations;

c) strategic risk management related to water;

d) facilitating water efficiency and optimization of water management at product, process and organizational levels;

e) informing decision-makers in industry, government or non-governmental organizations of their potential environmental impacts related to water (e.g. for the purpose of strategic planning, priority setting, product or process design or redesign, decisions about investment of resources);

f) providing consistent and reliable information, based on scientific evidence for reporting water footprint results.

A water footprint assessment alone is insufficient to be used to describe the overall potential environmental impacts of products, processes or organizations.

The water footprint assessment according to this International Standard can be conducted and reported as a stand-alone assessment, where only impacts related to water are assessed, or as part of a life cycle

assessment, where consideration is given to a comprehensive set of environmental impacts and not only impacts related to water.

In this International Standard, the term “water footprint” is only used when it is the result of an impact assessment.

The specific scope of the water footprint assessment is defined by the users of this International Standard in accordance with its requirements.

NOTE 1 In this International Standard, the term “product” includes services.

NOTE 2 In this International Standard, the term “environmental impacts” includes categories generally found in impact models used in life cycle assessment, such as impacts on ecosystems, on human health and on resources.

NOTE 3 Reporting is different from communication. Requirements and guidelines for reporting are included in this International Standard, but requirements and guidelines for communication, such as environmental labels or declarations, are outside the scope of this International Standard.

Environmental management — Water footprint — Principles, requirements and guidelines

1 Scope

This International Standard specifies principles, requirements and guidelines related to water footprint assessment of products, processes and organizations based on life cycle assessment (LCA).

This International Standard provides principles, requirements and guidelines for conducting and reporting a water footprint assessment as a stand-alone assessment, or as part of a more comprehensive environmental assessment.

Only air and soil emissions that impact water quality are included in the assessment, and not all air and soil emissions are included.

The result of a water footprint assessment is a single value or a profile of impact indicator results.

Whereas reporting is within the scope of this International Standard, communication of water footprint results, for example in the form of labels or declarations, is outside the scope of this International Standard.

NOTE Specific requirements and guidelines for organizations are given in Annex A.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14044:2006, *Environmental management — Life cycle assessment — Requirements and guidelines*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Terms relating to types and classifications of water

3.1.1
freshwater
water having a low concentration of dissolved solids

Note 1 to entry: Freshwater typically contains less than 1 000 mg/l of dissolved solids and is generally accepted as suitable for withdrawal and conventional treatment to produce potable water.

Note 2 to entry: The concentration of total dissolved solids can vary considerably over space and/or time.

3.1.2
brackish water
water containing dissolved solids at a concentration less than that of *seawater* (3.1.4), but in amounts that exceed normally acceptable standards for municipal, domestic and irrigation uses

Note 1 to entry: The concentration of total dissolved solids in brackish water can vary from 1 000 mg/l to 30 000 mg/l.

Note 2 to entry: The concentration of total dissolved solids of many brackish waters can vary considerably over space and/or time.

3.1.3
surface water
water in overland flow and storage, such as rivers and lakes, excluding *seawater* (3.1.4)

3.1.4
seawater
water in a sea or an ocean

Note 1 to entry: Seawater has a concentration of dissolved solids greater than or equal to 30 000 mg/l.

3.1.5
groundwater
water which is being held in, and can be recovered from, an underground formation

[SOURCE: ISO 11074:2005, 3.2.2, modified — Note has been removed.]

3.1.6
fossil water
groundwater (3.1.5) that has a negligible rate of natural recharge on the human time-scale

Note 1 to entry: The term "non-renewable water" is sometimes used for this concept.

3.1.7
water body
entity of water with definite hydrological, hydrogeomorphological, physical, chemical and biological characteristics in a given geographical area

EXAMPLE Lakes, rivers, groundwaters, seas, icebergs, glaciers and reservoirs.

Note 1 to entry: In case of availability, the geographical resolution of a water body should be determined at the goal and scope stage: it may regroup different small water bodies.

3.1.8
drainage basin
area from which direct surface runoff from precipitation drains by gravity into a stream or other *water body* (3.1.7)

Note 1 to entry: The terms "watershed", "drainage area", "catchment", "catchment area" or "river basin" are sometimes used for the concept of "drainage basin".

Note 2 to entry: Groundwater drainage basin does not necessarily correspond in area to surface drainage basin.

Note 3 to entry: The geographical resolution of a drainage basin should be determined at the goal and scope stage: it may regroup different sub drainage basins.

3.1.9
elementary water flow
water entering the system being studied that has been drawn from the environment, or water leaving the system being studied that is released into the environment

[SOURCE: ISO 14044:2006, 3.12, modified]

3.2 Terms relating to water

3.2.1
water use
use of water by human activity

Note 1 to entry: Use includes, but is not limited to, any *water withdrawal* (3.2.2), water release or other human activities within the *drainage basin* (3.1.8) impacting water flows and/or quality, including in-stream uses such as fishing, recreation, transportation.

Note 2 to entry: The term "water consumption" is often used to describe water removed from, but not returned to, the same drainage basin. Water consumption can be because of evaporation, transpiration, integration into a product, or release into a different drainage basin or the sea. Change in evaporation caused by land-use change is considered water consumption (e.g. reservoir). The temporal and geographical coverage of the *water footprint assessment* (3.3.2) should be defined in the goal and scope.

3.2.2
water withdrawal
anthropogenic removal of water from any *water body* (3.1.7) or from any *drainage basin* (3.1.8), either permanently or temporarily

Note 1 to entry: The term "water abstraction" is sometimes used for this concept.

3.2.3
water degradation
negative change in *water quality* (3.2.4)

3.2.4
water quality
physical (e.g. thermal), chemical and biological characteristics of water with respect to its suitability for an intended use by humans or ecosystems

3.3 Terms relating to life cycle assessment and water footprint assessment

3.3.1
water footprint
metric(s) that quantifies the potential environmental impacts related to water

Note 1 to entry: If water related potential environmental impacts have not been comprehensively assessed, then the term "water footprint" can only be applied with a qualifier. A qualifier is one or several additional words used in conjunction with the term "water footprint" to describe the impact category/categories studied in the water footprint assessment, e.g. "water scarcity footprint", "water eutrophication footprint", "non-comprehensive water footprint".

3.3.2
water footprint assessment
compilation and evaluation of the inputs, outputs and the potential environmental impacts related to water used or affected by a product, process or organization

Note 1 to entry: In this International Standard, the term "study" is often used as synonym for "water footprint assessment".

3.3.3
comprehensive water footprint assessment
water footprint assessment (3.3.2) that fulfils the principle of comprehensiveness

Note 1 to entry: The principle of comprehensiveness implies to consider all environmentally relevant attributes or aspects of natural environment, human health and resources related to water, including *water availability* (3.3.16) and *water degradation* (3.2.3).

3.3.4
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal

[SOURCE: ISO 14044:2006, 3.1]

3.3.5
life cycle assessment
LCA
compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its *life cycle* (3.3.4)

[SOURCE: ISO 14044:2006, 3.2]

3.3.6
life cycle inventory analysis
LCI
phase of *life cycle assessment* (3.3.5) involving the compilation and quantification of inputs and outputs for a product throughout its *life cycle* (3.3.4)

[SOURCE: ISO 14044:2006, 3.3]

3.3.7
water footprint inventory analysis
phase of *water footprint assessment* (3.3.2) involving compilation and quantification of inputs and outputs related to water for products, processes or organizations as stated in the goal and scope definition phase

Note 1 to entry: This includes, where relevant, air, water and soil emissions that impact *water quality* (3.2.4).

3.3.8
system boundary
set of criteria specifying which unit processes are part of a product system or the activities of an organization

[SOURCE: ISO 14044:2006, 3.32, modified]

3.3.9
cut-off criteria
specification of the amount of material or energy flow or the level of environmental significance associated with unit processes or product system to be excluded from a study

[SOURCE: ISO 14040:2006, 3.18]

3.3.10
water footprint impact assessment
phase of a *water footprint assessment* (3.3.2), following the *water footprint inventory analysis* (3.3.7), aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts related to water of a product, process or organization

[SOURCE: ISO 14044:2006, 3.4, modified]

3.3.11
impact category
class representing environmental issues of concern to which *life cycle inventory analysis* (3.3.6) results may be assigned

[SOURCE: ISO 14044:2006, 3.39]

3.3.12
impact category indicator
quantifiable representation of an *impact category* (3.3.11)

Note 1 to entry: The shorter expression "category indicator" can be used for improved readability.

[SOURCE: ISO 14044:2006, 3.40, modified — Note has been modified.]

3.3.13
water footprint profile
compilation of *impact category indicator* (3.3.12) results addressing potential environmental impacts related to water

Note 1 to entry: If a water footprint profile is comprehensive, it can be called "water footprint profile" without any qualifier – the results of this water footprint profile can be called *water footprint* (3.3.1); if a water footprint profile is not comprehensive, it needs to be associated with a qualifier that describes objectively what has been assessed.

3.3.14
characterization factor
factor derived from a characterization model which is applied to convert an assigned *life cycle inventory analysis* (3.3.6) result to the common unit of the *category indicator* (3.3.12)

Note 1 to entry: The common unit allows calculation of the category indicator result.

[SOURCE: ISO 14044:2006, 3.37]

3.3.15
environmental mechanism
system of physical, chemical and biological processes for a given *impact category* (3.3.11), linking the *life cycle inventory analysis* (3.3.6) results to *category indicators* (3.3.12) and to category endpoints

[SOURCE: ISO 14044:2006, 3.38]

3.3.16
water availability
extent to which humans and ecosystems have sufficient water resources for their needs

Note 1 to entry: Water availability depends on the location and timing. The temporal and geographical coverage and resolution for evaluating water availability should be determined at the goal and scope phase.

Note 2 to entry: *Water quality* (3.2.4) can also influence availability, e.g. if quality is not sufficient to meet users needs.

Note 3 to entry: Land and water management (e.g. forestry, agriculture, conservation of wetlands, hydropower) can modify water availability (e.g. regulating river flows and recharging groundwater).

Note 4 to entry: If water availability only considers water quantity, it is called *water scarcity* (3.3.17).

3.3.17
water scarcity
extent to which demand for water compares to the replenishment of water in an area, e.g. a *drainage basin* (3.1.8), without taking into account the *water quality* (3.2.4)

3.4 Terms relating to interpretation and reporting of water footprint results

3.4.1
comparative assertion
environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function

[SOURCE: ISO 14044:2006, 3.6]

3.4.2
interested party
person or organization that can affect, be affected by, or perceive themselves to be affected by the results of a water footprint assessment

3.5 Terms relating to products, product systems, processes and organizations

3.5.1
product
goods or service

Note 1 to entry: The product can be categorized as follows:

— service (e.g. transport, implementation of events);

— software (e.g. computer program, dictionary);

— hardware (e.g. engine mechanical part);

— processed material (e.g. steel);

— agricultural and forest products (e.g. food, lumber, paper).

[SOURCE: ISO 14044:2006, 3.9, modified]

3.5.2
co-product
any of two or more *products* (3.5.1) coming from the same *unit process* (3.5.6) or *product system* (3.5.4)

[SOURCE: ISO 14044:2006, 3.10]

3.5.3
waste
substances or objects which the holder intends or is required to dispose of

Note 1 to entry: The definition is taken from the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* (22 March 1989) but is not confined in this International Standard to hazardous waste.

[SOURCE: ISO 14044:2006, 3.35]

3.5.4
product system
collection of *unit processes* (3.5.6) with elementary and product flows, performing one or more defined functions, and which models the *life cycle* (3.3.4) of a *product* (3.5.1)

[SOURCE: ISO 14044:2006, 3.28]

3.5.5
process
set of interrelated or interacting activities that transforms inputs into outputs

[SOURCE: ISO 14044:2006, 3.11]

3.5.6
unit process
smallest element considered in the *life cycle inventory analysis* (3.3.6) for which input and output data are quantified

[SOURCE: ISO 14044:2006, 3.34]

3.5.7
functional unit
quantified performance of a *product system* (3.5.4), *process* (3.5.5) or *organization* (3.5.11) for use as a reference unit

Note 1 to entry: In the case of a *water footprint assessment* (3.3.2) for organizations, the term "reporting unit" can replace the term "functional unit".

[SOURCE: ISO 14044:2006, 3.20, modified]

3.5.8
reference flow
measure of the outputs from *processes* (3.5.5) in a given *product system* (3.5.4) required to fulfil the function expressed by the *functional unit* (3.5.7)

[SOURCE: ISO 14044:2006, 3.29]

3.5.9
product category
group of products that can fulfil equivalent functions

[SOURCE: ISO 14025:2006, 3.12]

3.5.10
product category rules
set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more *product categories* (3.5.9)

[SOURCE: ISO 14025:2006, 3.5]

Note 1 to entry: Product category rules are compliant with ISO 14044.

3.5.11
organization
person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives

3.5.12
facility
single installation, set of installations or production processes (stationary or mobile), which can be defined within a single geographical boundary, organizational unit or production process

[SOURCE: ISO 14064-1:2006, 2.21]

3.5.13
water footprint inventory
result of a *water footprint inventory analysis* (3.3.7), including elementary flows which are usable for subsequent *water footprint impact assessment* (3.3.10)

3.5.14
direct water footprint inventory
water footprint inventory (3.5.13) considering inputs and outputs resulting from activities within the established organizational boundaries

3.5.15
indirect water footprint inventory
water footprint inventory (3.5.13) considering inputs and outputs which are consequences of an organization's activities but which arises from processes that are owned or controlled by other organizations

3.6 Terms relating to data and data quality

3.6.1
primary data
quantified value of a *unit process* (3.5.6) or an activity obtained from a direct measurement or a calculation based on direct measurements at its original source

Note 1 to entry: Primary data need not necessarily originate from the *product system* (3.5.4) under study because primary data may relate to a different but comparable product system to that being studied.

[SOURCE: ISO/TS 14067:2013, 3.1.7.1, modified — Note 2 removed.]

3.6.2
secondary data
data obtained from sources other than a direct measurement or a calculation based on direct measurements at the original source

Note 1 to entry: Such sources can include databases and published literature validated by competent authorities.

[SOURCE: ISO/TS 14067:2013, 3.1.7.3]

3.6.3
uncertainty analysis
systematic procedure to quantify the uncertainty introduced in the results of a *life cycle inventory analysis* (3.3.6) due to the cumulative effects of model imprecision, input uncertainty or data variability

Note 1 to entry: Either ranges or probability distributions are used to determine uncertainty in the results.

[SOURCE: ISO 14040:2006, 3.33]

4 Principles

4.1 General

These principles are fundamental and shall be used as guidance for decisions relating to the planning, conducting and reporting of a water footprint assessment.

The water footprint assessment according to this International Standard may be conducted and reported as a stand-alone assessment (where only potential environmental impacts related to water are assessed) or as part of a life cycle assessment (where consideration is given to all relevant potential environmental impacts, and not only potential environmental impacts related to water). The water footprint assessment should be comprehensive and consider all relevant attributes or aspects relating to the natural environment, human health and resources. By considering all relevant attributes and aspects within one study in a cross media perspective, potential trade-offs can be identified and assessed.

4.2 Life cycle perspective

A water footprint assessment of a product considers all stages of the life cycle of this product, as appropriate, from raw material acquisition to final disposal. Through such a systematic overview and perspective, the shifting of a potential environmental burden between life cycle stages or individual processes can be identified and possibly avoided. A water footprint assessment of an organization adopts a life cycle perspective based on all of its activities. If appropriate and justified, the water footprint assessment may be restricted to one or several life cycle stages.

4.3 Environmental focus

A water footprint assessment assesses the potential environmental impacts related to water associated with a product, process or organization. Economic or social impacts are, typically, outside the scope of the water footprint assessment. Other tools may be combined with the water footprint assessment for more extensive and complementary assessments.

4.4 Relative approach and functional unit

A water footprint assessment is related to a functional unit and the result(s) calculated relative to this functional unit.

4.5 Iterative approach

A water footprint assessment is an iterative technique. The individual phases of a water footprint assessment use results of the other phases. The iterative approach within and between the phases contributes to the comprehensiveness and consistency of the study and the reported results.

4.6 Transparency

Sufficient and appropriate information is disclosed in order to allow users of the water footprint assessment to make decisions with reasonable confidence.

4.7 Relevance

Data and methods are selected such that they are appropriate to the water footprint assessment.

4.8 Completeness

All data which provide a significant contribution to the water footprint are included in the inventory.

4.9 Consistency

Assumptions, methods and data are applied in the same way throughout the water footprint assessment to arrive at conclusions in accordance with the goal and scope definition.

4.10 Accuracy

Bias and uncertainties are reduced as far as is practicable.

4.11 Priority of scientific approach

Decisions within a water footprint assessment are preferably based on natural science. If this is not possible, other scientific approaches (e.g. from social or economic sciences) may be used or international conventions may be referred to. If neither a scientific basis exists nor a justification based on other scientific approaches or international conventions is possible, then, as appropriate, decisions may be based on value choices.

4.12 Geographical relevance

The water footprint assessment is conducted at a scale and resolution (e.g. a drainage basin), which gives relevant results according to the goal and scope of the study and takes into account the local context.

4.13 Comprehensiveness

A water footprint considers all environmentally relevant attributes or aspects of natural environment, human health and resources related to water (including water availability and water degradation).

NOTE A non-comprehensive assessment brings a risk of not taking into account the transfer of pollution from one impact category to another.

5 Methodological framework

5.1 General requirements

A water footprint assessment addresses the potential environmental impacts related to water associated with a product, process or organization.

A water footprint assessment according to this International Standard shall include the four phases of life cycle assessment:

a) goal and scope definition (see 5.2);

b) water footprint inventory analysis (see 5.3);

c) water footprint impact assessment (see 5.4);

d) interpretation of the results (see 5.5).

See Figure 1.

A water footprint inventory study according to this International Standard shall include the three following phases of life cycle assessment:

— goal and scope definition (see 5.2),

— water footprint inventory analysis (see 5.3), and

— interpretation of the results (see 5.5).

See Figure 1.

For organizations, the additional requirements and guidelines given in Annex A shall apply.

The results of a water footprint inventory analysis may be reported, but shall not be reported as a water footprint.

A water footprint assessment may be performed as a stand-alone assessment or as part of a life cycle assessment.

A water footprint is the result of a comprehensive assessment which results in a profile of impact category indicator results. If weighting is applied, it shall be conducted and reported in accordance with ISO 14044.

When performing a comprehensive assessment, it shall be demonstrated that all significant potential environmental impacts related to water are addressed by the selected impact categories. Lack of data cannot be a justification for not taking into account a relevant impact category.

The results of a non-comprehensive water footprint assessment shall be reported as water footprint with a qualifier, e.g. “water availability footprint”, “water scarcity footprint”, “water eutrophication footprint”, “water ecotoxicity footprint”, “water acidification footprint”, “non-comprehensive water footprint”.

The term water footprint of an organization without qualifier shall only be used when direct and indirect water footprint inventories of the organization are considered in a comprehensive water footprint assessment.

Where relevant product category rules exist, they should be adopted provided that:

— they have been developed in accordance with ISO 14025, and

— they are considered appropriate (e.g. for system boundaries, modularity, allocation or data quality) by the organization applying this International Standard.

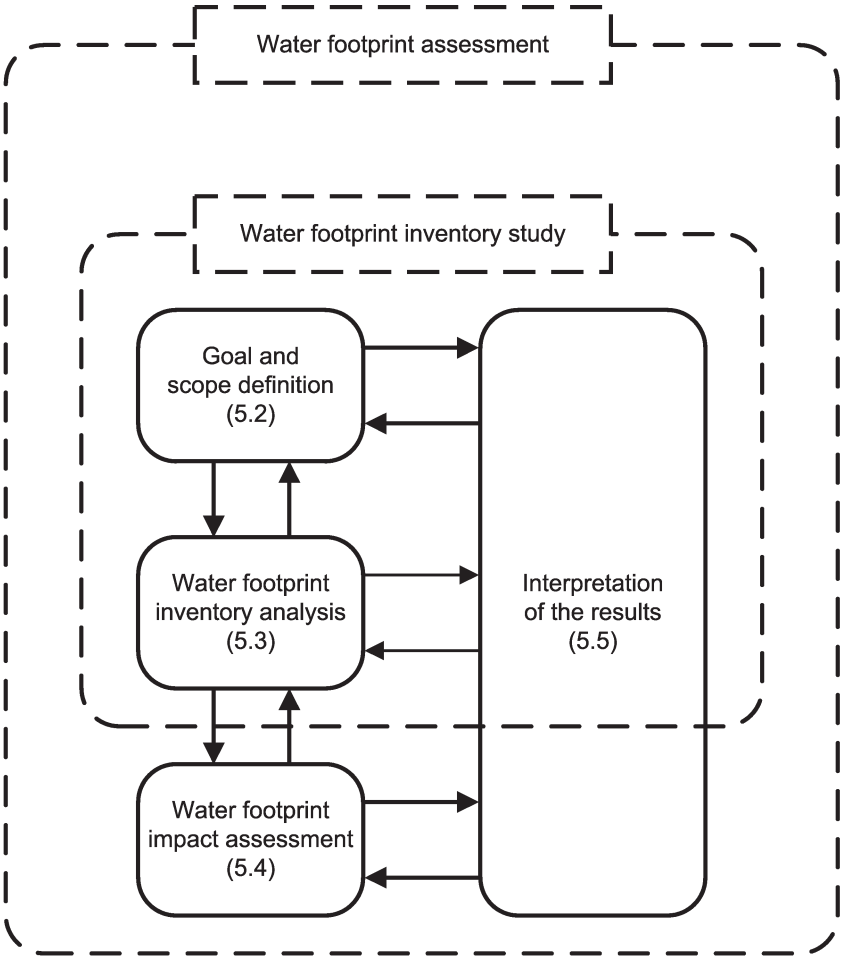


Figure 1 — Phases of a water footprint assessment

5.2 Goal and scope definition

5.2.1 Goal of the study

In defining the goal of a water footprint assessment, the following items shall be unambiguously stated:

— the intended application,

— the reasons for carrying out the study,

— the intended audience, i.e. to whom the results of the study are intended to be reported,

— whether the study is a stand-alone assessment or part of a life cycle assessment, and

— whether the study is part of a life cycle assessment where a comparative assertion is intended.

5.2.2 Scope of the study

The scope of a water footprint assessment shall be consistent with the goal of the water footprint assessment (see 5.2.1). In defining the scope of the study, the following items shall be considered and clearly described, taking into account the requirements and guidance given in the relevant clauses:

a) system under study, system boundary and organizational boundary where relevant (see 5.2.3);

b) functional unit;

c) temporal and geographical coverage and resolution of the study;

d) data and data quality requirements (see 5.2.4);

e) cut-off criteria;

f) allocation procedures (see 5.3.3);

g) assumptions, value choices and optional elements;

h) water footprint impact assessment methodology and selected impact categories (see 5.4);

i) whether the results of the water footprint assessment will include one impact indicator result (and specifying which one), a water footprint profile and/or a water footprint after weighting (see 5.4.1);

j) whether the water footprint assessment is comprehensive (see 5.4);

k) which cause effect chains and potential environmental impacts are covered by the water footprint assessment and identify the foreseen consequences of the excluded potential environmental impacts (see 5.4);

l) uncertainties and limitations (see 5.6);

m) justification for exclusions from the study;

n) baseline conditions with which the current conditions caused by the activities are being compared if applicable;

NOTE Baseline conditions can include the period used as reference for comparison and its inventory.

o) type of reporting (see Clause 6); and

p) type of critical review (see Clause 7), if any.

In some cases, the scope of the study may be revised due to unforeseen limitations, constraints or as a result of additional information. Such modifications, together with their justification/explanation, shall be documented.

5.2.3 System boundary

The system boundary determines which unit processes shall be included within the water footprint assessment. The selection of the system boundary shall be consistent with the goal of the study. The criteria used in establishing the system boundary shall be identified and explained.

The system boundary for the water footprint assessment shall be clearly documented and shall indicate whether the water footprint is to be determined for a specific product, process or organization. If the water footprint is to be determined for a product, the requirements and guidelines of ISO 14044 on system boundary shall be applied.

When undertaking a water footprint assessment of an organization, the organizational boundary and the system boundary shall be determined. The consolidation method applied shall be documented and any changes to the consolidation method shall be explained (see Annex A).

Decisions shall be made regarding which unit processes to include in the study and the level of detail to which these unit processes shall be studied.

Unit processes that are included in the water footprint inventory analysis shall be clearly identified.

Decisions shall also be made regarding which inputs and outputs shall be included and the level of detail of the water footprint inventory analysis shall be clearly stated.

The omission of life cycle stages, processes, inputs or outputs is only permitted if it does not significantly change the overall conclusions of the study. Omitted life cycle stages, processes, inputs or outputs shall be clearly identified and the reasons and implications for their omission shall be explained.

The goal and scope definition phase shall include the identification of:

— unit processes requiring a detailed assessment based on primary data, because of a significant expected contribution to the results, and

— unit processes for which the inventory may be based on secondary data or estimated data, as they are of low significance or if they are difficult to obtain as primary data.

This identification may be revised during the interpretation phase. Consequently, some of the unit processes shall be detailed and based on primary data because of their significant contribution to the results.

When selecting the unit processes to include in the study, it shall be considered that water issues depend on the local water scarcity and local water quality. Unit processes which are located in different areas should be kept separate.

5.2.4 Data and data quality requirements

5.2.4.1 Data to be considered for data collection

Among other data to be collected, the following data related to water shall be considered for data collection:

a) quantities of water used (including water withdrawal and release) (see 5.3.2);

b) types of water resources used (including for water withdrawal and water receiving body) (see 5.3.2);

c) data describing water quality (including for water withdrawal, release and water receiving body) (see 5.3.2);

d) forms of water use (see 5.3.2);

e) changes in drainage, stream flow, groundwater flow or water evaporation that arise from land use change, land management activities and other forms of water interception, where relevant to the scope and boundary of the study being undertaken;

f) locations of water use (including for water withdrawal, water release or influence on water quality) that are required to determine any related environmental condition indicator of the area where the water use takes place (see 5.3.2);

g) seasonal changes in water flows, water withdrawal and release or changes in water quality, when relevant;

h) temporal aspects of water use, including, if relevant, timing of water use and length of water storage.

The following shall be included, if relevant to the impact categories selected within the goal and scope phase:

— emissions to air, water and soil that impact water quality, and

— any other data needed by the water footprint impact assessment method applied.

Both absolute values and difference to a baseline for quantities of water use and emissions should be considered, where appropriate and relevant.

Where any of these items have been considered but not included, the basis for exclusion shall be documented.

Assumptions made in the collection, validation, analysis, aggregation and reporting of data shall be documented.

5.2.4.2 Data quality

Primary data should be collected where practicable.

Secondary data should only be used for inputs where the collection of primary data is not possible or practicable, and may include literature data, calculated data, estimates, model predictions or other representative data. The reasons for using secondary data for significant processes shall be justified and documented.

The data quality requirements should address the following:

a) time-related coverage: age of data and the minimum length of time over which data should be collected;

b) geographical coverage: geographical area from which data for unit processes should be collected to satisfy the goal of the study;

c) technology coverage: specific technology or technology mix;

d) precision: measure of the variability of the data values for each data expressed (e.g. variance);

e) completeness: percentage of data that is measured or estimated;

f) representativeness: qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage);

g) consistency: qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis;

h) reproducibility: qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study;

i) sources of the data, including models when used (including documentation around model assumptions, model variation and accuracy);

j) uncertainty of the information (e.g. data, models and assumptions).

5.2.4.3 Missing data

The treatment of missing data shall be documented. Where assumptions are made, these shall be clearly indicated as such and the basis for the assumptions shall be described. The importance of the missing data should be assessed.

5.2.5 Offsetting

Water footprint results shall not include offsetting.

NOTE Offsetting is a mechanism for compensating the water footprint of a product, process or organization through activities which reduce water impacts in a process outside the boundary of the product system.

5.3 Water footprint inventory analysis

5.3.1 Water footprint inventory calculation

Inventory calculations shall follow the procedures as described in ISO 14044 (see also Figure 2).

a) Calculating data shall be in accordance with ISO 14044:2006, 4.3.3: all calculation procedures shall be explicitly documented and the assumptions made shall be clearly stated and explained. The same calculation procedures should be consistently applied throughout the study.

b) Validation of data shall be in accordance with ISO 14044:2006, 4.3.3.2: a check on data validity shall be conducted during the process of data collection to confirm and provide evidence that the data quality requirements for the intended application have been fulfilled. Validation may involve establishing, for example, mass balances of water and/or comparative analyses of release factors in water. As each unit process obeys the laws of conservation of mass and energy, mass and energy balances provide a useful check on the validity of a unit process description.

c) Relating data to unit processes, reference flows and functional unit evaluation shall be in accordance with ISO 14044:2006, 4.3.3.3: an appropriate flow shall be determined for each unit process. The quantitative input and output data of the unit process shall be calculated in relation to this flow. Based on the flow chart and the flows between unit processes, the flows of all unit processes are related to the reference flow. The calculation should result in all system input and output data being referenced to the functional unit.

d) Care should be taken when aggregating the inputs and outputs. The level of aggregation shall be consistent with the goal of the study.

   NOTE See requirements on data aggregation in 5.3.2.

e) Refining the system boundaries shall be in accordance with ISO 14044:2006, 4.3.3.4: reflecting the iterative nature of water footprint assessment, decisions regarding the data to be included shall be based on a sensitivity analysis to determine their significance, thereby verifying the initial analysis outlined in 5.2. The initial system boundary shall be revised, as appropriate, in accordance with the cut-off criteria established in the definition of the scope. The results of this refining process and the sensitivity analysis shall be documented.

The sensitivity analysis may result in:

— exclusion of life cycle stages or unit processes when lack of significance can be shown by the sensitivity analysis;

— exclusion of inputs and outputs that lack significance to the results of the study;

— inclusion of new unit processes, inputs and outputs that are shown to be potentially significant.

This analysis serves to limit the subsequent data handling to those input and output data that are determined to be significant to the goal of the water footprint assessment.

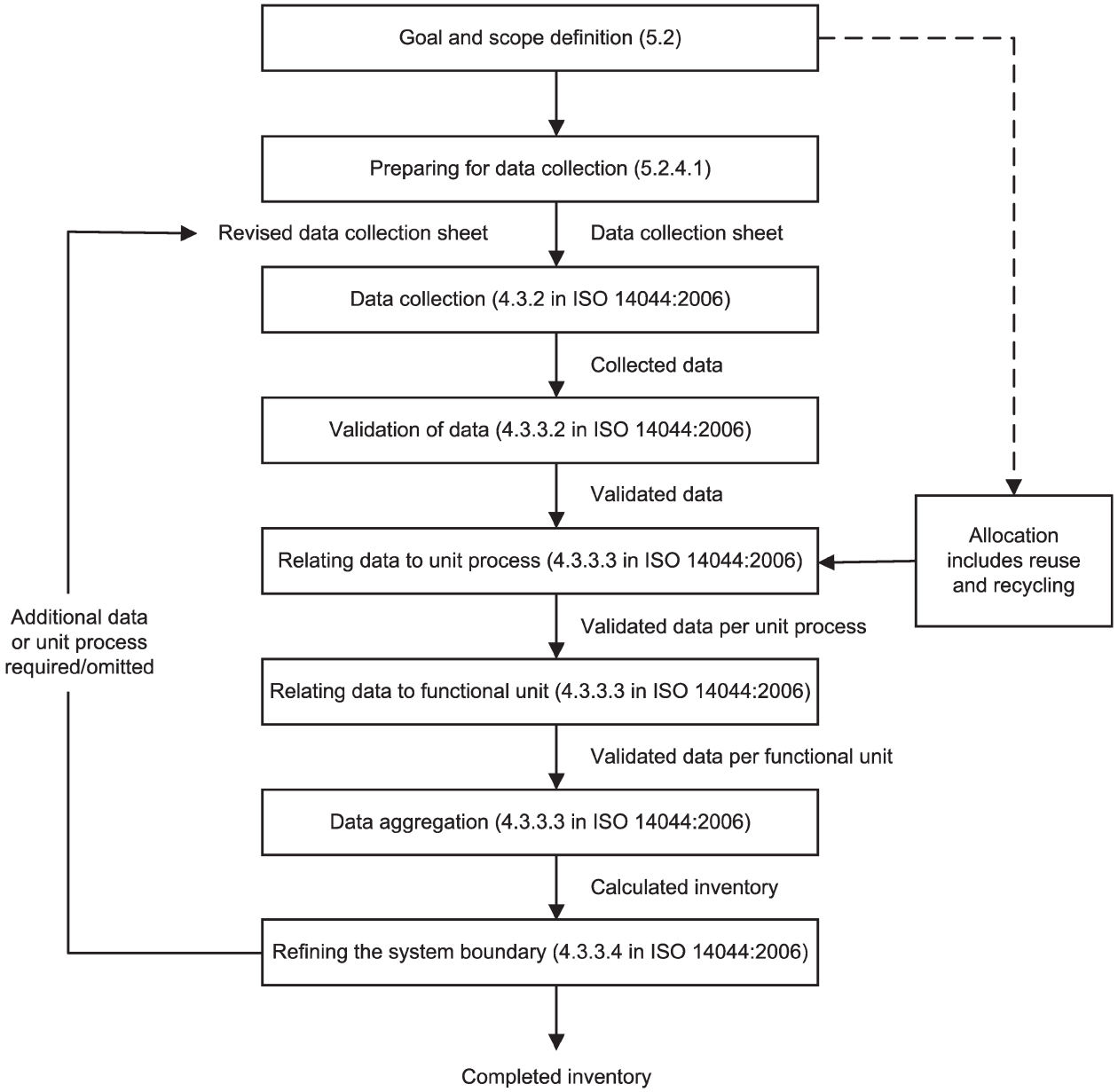


Figure 2 — Procedures for water footprint inventory analysis

5.3.2 Elementary flows

Data related to water which represent elementary flows may be directly collected from unit processes or derived from data which represent material flows, e.g. ancillary material or waste for further processing.

The water footprint inventory shall include inputs and outputs from each unit process being part of the system to be studied. Any discrepancies in the inventory balance shall be explained.

Information on each elementary flow should generally include, where relevant:

a) quantities of water used: mass, or volume (e.g. water inputs and water outputs);

b) resource types of water used, e.g.:

— precipitation;

— surface water;

- seawater;
- brackish water;
- groundwater (excluding fossil water);
- fossil water;

b) water quality parameters and/or characteristics, e.g. physical (e.g. thermal), chemical and biological characteristics, or functional water quality descriptors;

c) forms of water use, e.g.:

- evaporation;
- transpiration;
- product integration;
- release into different drainage basins or the sea;
- displacement of water from one water resource type to another water resource type within a drainage basin (e.g. from groundwater to surface water);
- other forms of water use, e.g. in-stream use;

d) geographical location of water used or affected (including withdrawal and/or release): information on the physical location of water use or affected, including withdrawal and release (as site-specific as needed) or assignment of the physical locations to a category derived from an appropriate classification of drainage basins or regions;

NOTE 1 Some environmental condition indicators (e.g. water scarcity, local level of social development) require information on the location where the water use takes place.

e) temporal aspects of water use, e.g. time of use and release if relevant residence time occurs within the system boundaries;

f) emissions to air, water and soil that impact water quality.

NOTE 2 There can be other emissions to air and soil in the system under study that do not impact water quality, e.g. emissions directly into air that contribute to damage to human health through inhalation only are not included.

Additional data categories may be used based on the scope of the study.

Water inputs or water outputs of different resource types, different quality, different form, different location with different environmental condition indicators, or different timing shall not be aggregated in the inventory phase. Aggregation may be performed at the impact assessment phase.

NOTE 3 Tap water or treated water (e.g. from a water treatment plant), or waste water that is not directly released in the environment (e.g. sent to a wastewater treatment plant) are not elementary water flows, but intermediate flows from a process within the technosphere.

5.3.3 Allocation

5.3.3.1 General

For allocation used in water footprint assessment of products, processes and organizations, the guidance shown below is based on that given in ISO 14044.

Allocation is necessary, when systems or processes produce multiple products or services (co-products) and when other options (e.g. system boundaries expansion) are not possible. Allocation is used to assign the inputs and outputs of a process to the function that is being studied.

Allocation procedures shall be clearly defined in the data collection description. Additional rules, as appropriate, shall be specified in the goal and scope definition phase. The selected allocation method shall be reported in detail.

NOTE ISO/TR 14049 provides several examples of allocation for co-products and recycling.

The inputs and outputs of the process shall be allocated to the different products according to clearly stated procedures that shall be documented and explained together with the allocation procedure.

The sum of the allocated inputs and outputs of a unit process shall be equal to the inputs and outputs of the unit process before allocation.

Whenever several alternative allocation procedures seem applicable, a sensitivity analysis shall be conducted to illustrate the consequences of the departure from the selected approach.

5.3.3.2 Allocation procedure

The study shall identify the processes shared with other product systems and deal with them according to the stepwise procedure presented below.

a) Step 1: Wherever possible, allocation should be avoided by:

   — dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes, or

   — expanding the product system to include the additional functions related to the co-products, taking into account the requirements of the system boundary.

b) Step 2: Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them, i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.

c) Step 3: Where physical relationship alone cannot be established or used as the basis for allocation, the inputs and outputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products.

Some outputs may be partly co-products and partly waste. In such cases, it is necessary to identify the ratio between co-products and waste since the inputs and outputs shall be allocated to the co-products part only.

Allocation procedures shall be uniformly applied to similar inputs and outputs of the system under consideration. For example, if allocation is made to usable products (e.g. intermediate or discarded products) leaving the system, then the allocation procedure shall be similar to the allocation procedure used for such products entering the system.

The inventory is based on material balances between input and output. Allocation procedures should therefore approximate as much as possible such fundamental input/output relationships and characteristics.

5.3.3.3 Allocation procedures for reuse and recycling

The allocation principles and procedures in 5.3.3.2 also apply to reuse and recycling situations when used in water footprint assessment.

Changes in the inherent properties of materials shall be taken into account. In addition, particularly for the recovery processes between the original and subsequent product system, the system boundary shall be identified and explained, ensuring that the allocation principles are observed as described in 5.3.3.2.

However, in these situations, additional elaboration is needed for the following reasons:

— reuse and recycling (as well as composting, energy recovery and other processes that can be assimilated to reuse/recycling) may imply that the inputs and outputs associated with unit processes for extraction and processing of raw materials and final disposal of products are to be shared by more than one product system;

— reuse and recycling may change the inherent properties of materials in subsequent use;

— specific care should be taken when defining system boundary with regard to recovery processes.

Several allocation procedures are applicable for reuse and recycling. The application of some procedures is outlined conceptually in Figure 3 and is distinguished in the following to illustrate how the above constraints can be addressed.

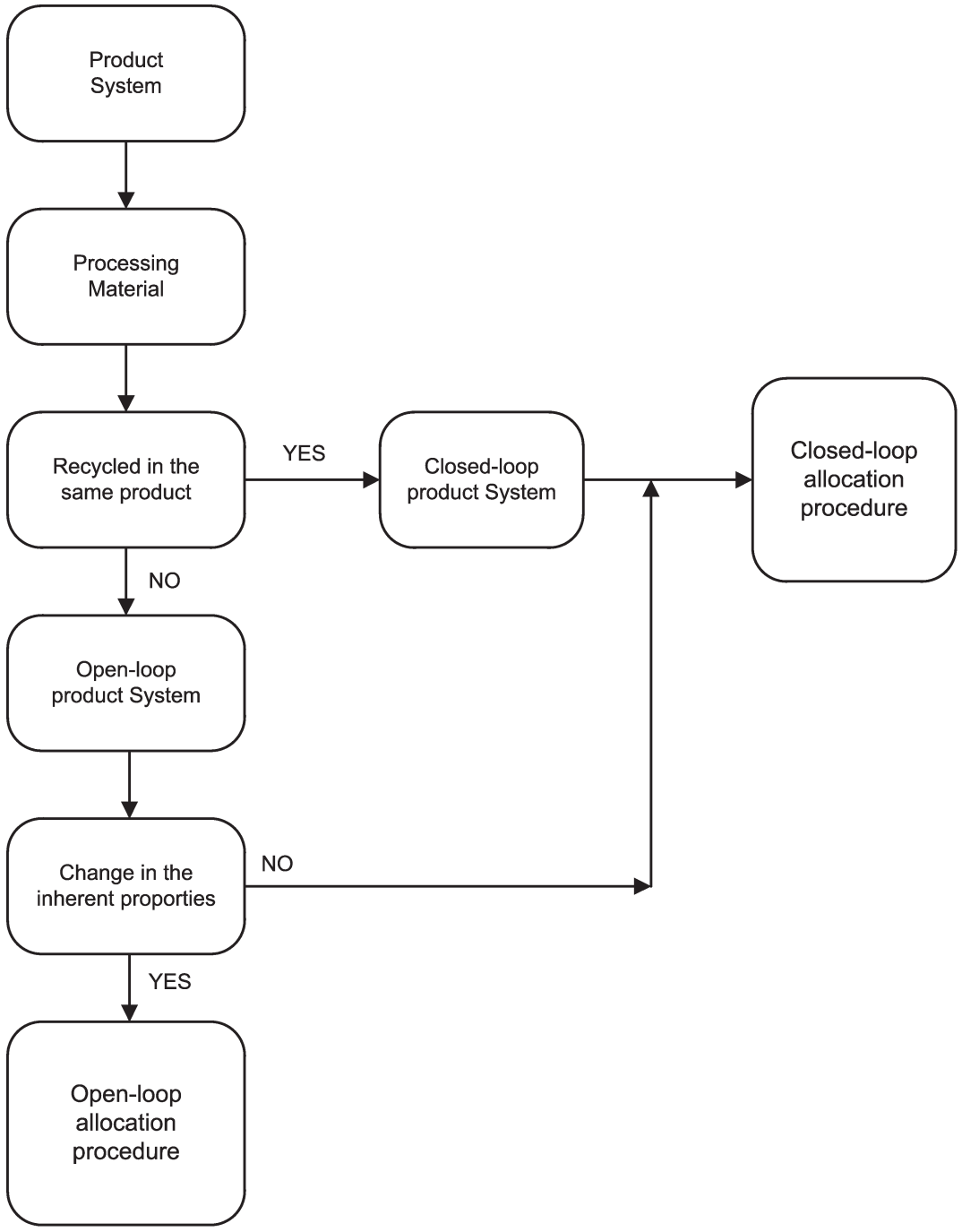


Figure 3 — Relation between product systems and allocation procedures

a) A closed-loop allocation procedure applies to closed-loop product systems. It also applies to open-loop product systems where no changes occur in the inherent properties of the recycled material. In such cases, the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials. However, the first use of virgin materials in applicable open-loop product systems may follow an open-loop allocation procedure outlined in b).

b) An open-loop allocation procedure applies to open-loop product systems where the material is recycled into other product systems and the material undergoes a change to its inherent properties.

The allocation procedures for the shared unit processes mentioned in 5.3.3.3 should use, as the basis for allocation, if feasible, the following order:

— physical properties (e.g. mass);

— economic value (e.g. market value of the scrap material or recycled material in relation to market value of primary material);

— the number of subsequent uses of the recycled material (see ISO/TR 14049).

5.4 Water footprint impact assessment

5.4.1 General

The water footprint impact assessment shall be compliant with ISO 14044.

NOTE See ISO 14044:2006, 4.4.

This International Standard provides further requirements and guidelines for assessing potential environmental impacts related to water.

Impacts related to water can be represented by one or more parameters which quantify the potential environmental impacts of a product system, process or organization related to water, including:

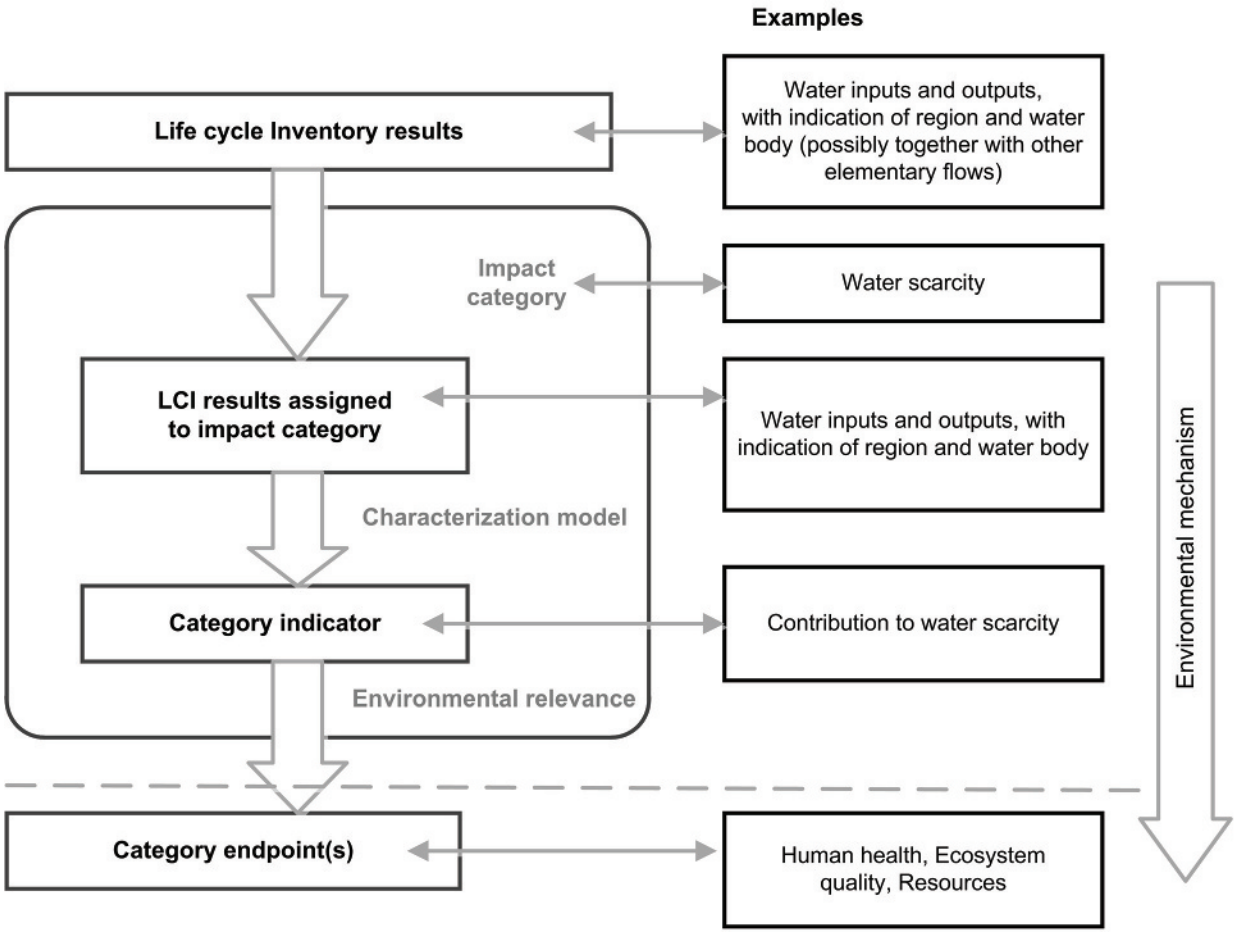
— the water footprint indicator result (e.g. water scarcity footprint), related to one single impact category (e.g. water scarcity) (see Figures 4 and 5);

— the water footprint profile which comprises several indicator results (see Figure 5).

When weighting is applied, it shall be conducted and reported according to ISO 14044.

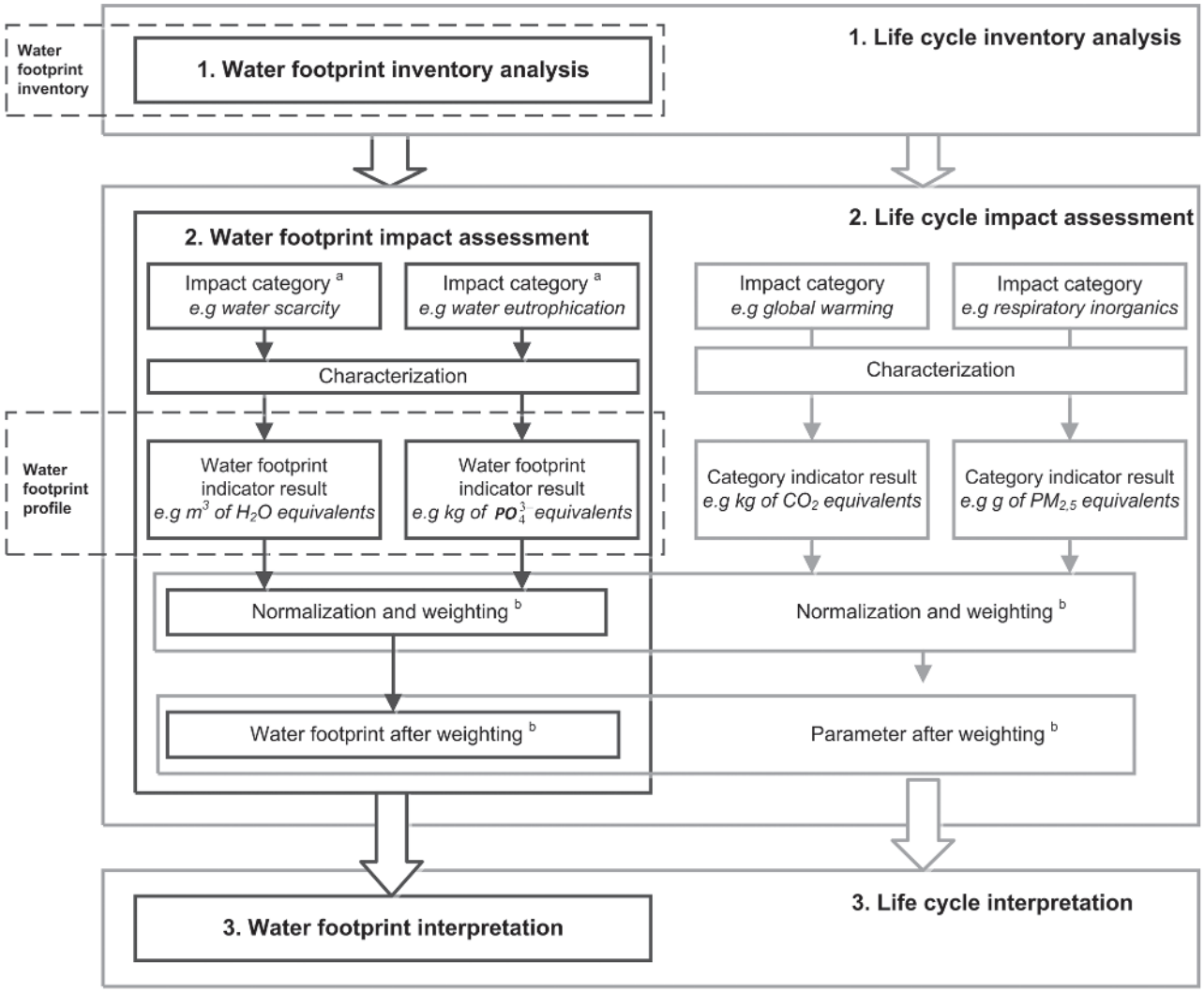
The term water footprint shall only be used to describe the result(s) of a comprehensive water footprint assessment. If water related potential environmental impacts have not been comprehensively assessed, then the term water footprint shall only be used with a qualifier.

It shall be clearly stated which of these parameters are intended to be determined in the impact assessment phase of the study.



NOTE Adapted from ISO 14044:2006, Figure 3.

Figure 4 — Concept of category indicators illustrated for an impact category addressing water scarcity



Key

a Examples of other impact categories include aquatic ecotoxicity, aquatic acidification, thermal pollution, human toxicity (due to water pollution)

b Denotes optional phases

NOTE In the figure, the concept of water footprint as a stand-alone assessment is shown in the black boxes only; the entire life cycle impact assessment phase is shown in grey boxes.

Figure 5 — Concept of water footprint as a stand-alone assessment or part of a life cycle assessment

5.4.2 Selection of impact categories, category indicators and characterization models

Impacts related to water are associated with numerous environmental mechanisms and therefore numerous category indicators are possible. The category indicator(s) and water footprint impact assessment method(s) shall be chosen based on the goal and scope of the study. The water footprint impact assessment method(s) applied shall be clearly described and documented. The description shall include a description of the environmental mechanisms that are considered by the water footprint impact assessment method(s).

A water footprint impact assessment method may include several category indicators related to different environmental mechanisms.

Category indicator(s) may be chosen anywhere along an environmental mechanism of the characterization model(s). The naming of the impact category indicator shall be sufficiently explicit to clearly express to which environmental mechanism it refers. Each impact category indicator shall be documented in order to reflect which environmental mechanism it refers to.

5.4.3 Classification

If the calculation of the water footprint is based on different impact categories, life cycle inventory results shall be assigned to these different impact categories.

5.4.4 Characterization

5.4.4.1 General

The method of calculating indicator results shall be identified and documented, including the value choices and assumptions used.

Water footprint impact assessment method(s) shall consider the potential environmental impacts due to change in water quantity and/or change in water quality caused by the system under study. Any change in water quality may have a direct effect on the subsequent availability or possible uses of returned water (e.g. water withdrawal for human consumption, biodiversity or ecosystem functions).

There are different types of water resources (e.g. groundwater, surface water, seawater). Issues pertaining to the use of each type shall be distinguished as far as practicable. The types of water resources as described in 3.1 should be taken into account, when appropriate, for characterization.

The choice of characterization methods and factors for each impact category assessed shall be explained and justified.

5.4.4.2 Geographical and temporal issues in characterization

Water issues are local in character and related to a specific drainage basin and specific precipitation, hydrological and geographical characteristics and climatic, ecosystemic and socio-economic conditions. The water footprint impact assessment shall consider local conditions and may, if appropriate, be related to wider regional and global issues.

Temporal aspects, including seasonality, shall also be considered, where relevant.

NOTE If a reservoir changes water availability through the year, it is appropriate to reflect this in the inventory calculations.

5.4.5 Water availability footprint

The purpose of a water availability footprint is to give an assessment of the contribution of the product, process or organization to potential environmental impacts related to pressure on water availability.

NOTE 1 Water availability footprint can include pressure on other types of water than freshwater.

The level of temporal and geographical coverage and resolution for evaluating water availability shall be described in adequate detail.

The environmental mechanisms covered by the water availability footprint shall be described and the foreseen consequences of the excluded potential environmental impacts related to water availability shall be identified.

The water availability footprint comprises one or several impact categories.

If water availability footprint only considers water quantity, it should be called water scarcity footprint. The calculation of water scarcity footprints should be performed utilizing characterization factors derived from characterization models that account for local differences in water scarcity.

NOTE 2 Seawater is typically excluded from the calculation of scarcity. However, in some cases, seawater could be subject to scarcity (e.g. for inland seas) and is therefore not excluded by default from the assessment.

NOTE 3 If only one type of water resource is assessed in the water scarcity footprint, a qualifier can be used to clarify what type of resource is used (e.g. "freshwater scarcity footprint").

5.4.6 Water footprints addressing water degradation

The purpose of water footprints addressing water degradation is to give an assessment of the contribution of the product, process or organization to potential environmental impacts related to water quality.

The environmental mechanisms covered by the impact categories chosen to address water degradation (e.g. aquatic eutrophication, aquatic acidification, aquatic ecotoxicity, thermal pollution) shall be described and the foreseen consequences of the excluded potential environmental impacts related to water degradation shall be identified.

NOTE Further information on some impact categories can be found in ISO/TR 14047.

If one impact category (e.g. eutrophication) is selected, then that impact category shall be identified in the qualifier of the water footprint (e.g. "water eutrophication footprint").

5.4.7 Water footprint profile

A water footprint profile considers a range of potential environmental impacts associated with water. A water footprint profile is made of several impact category indicator results which are calculated from several impact categories.

If a water footprint profile is not comprehensive, it should be transparently reported, using a qualifier.

Potential environmental impacts covered by the water footprint profile shall be described and the foreseen consequences of the excluded potential environmental impacts related to water shall be identified.

The water footprint profile may be aggregated into a single parameter. If weighting is applied, it shall be conducted and reported in accordance with ISO 14044.

If weighting is applied, the results shall not be used as a basis for a comparative assertion that is intended to be disclosed to the public.

5.5 Interpretation of the results

The interpretation phase of a water footprint assessment shall include the following:

a) identification of the significant issues based on the results of the water footprint assessment, e.g. processes with a significant contribution to the calculated water footprints, environmental mechanism(s) mainly affected, elementary flows that have highest contribution to the result(s) of the water footprint assessment;

b) evaluation that considers completeness, sensitivity and consistency checks;

c) consideration of geographical and temporal aspects;

d) conclusions of the water footprint assessment;

e) limitations of the water footprint assessment;

f) qualitative and/or quantitative assessment of uncertainty, for example through the application of Monte-Carlo simulation;

g) consideration of sensitivity analysis to provide ranges around the reported results.

NOTE ISO 14044:2006, B.3.3, provides additional guidance for performing a sensitivity check.

5.6 Limitations of water footprint

A water footprint assessment alone is insufficient to be used to describe the overall potential environmental impacts of products, processes or organizations (see Introduction). Decisions about impacts that are only based on a single environmental issue can be in conflict with goals and objectives related to other environmental issues.

Water footprint cannot always demonstrate significant differences between impact categories and the related indicator results of alternative products, processes or organizations. This may be due to

— limitations associated with the establishment of a functional unit,

— limited development of the characterization models, sensitivity analysis and uncertainty analysis for the water footprint impact assessment,

— limitations of the water footprint inventory analysis, such as setting the system boundary, that do not encompass all possible unit processes for a product, process or organization or do not include all inputs and outputs of every unit process, since there are cut-offs, data gaps and associated assumptions,

— limitations of the water footprint inventory analysis, such as inadequate water footprint inventory data quality which may, for instance, be caused by uncertainties or differences in allocation and aggregation procedures, and

— limitations in the availability of appropriate and representative inventory data for each impact category.

Uncertainties are associated with spatial and temporal characteristics of each impact category. Differences in spatial and temporal resolution may lead to different water footprint results.

There is currently no consensus on one accepted methodology for consistently and accurately associating inventory data with specific potential environmental impacts. Models for impact categories are in different stages of development.

NOTE Based on ISO 14040:2006, 5.4.3.

6 Reporting

6.1 General

Reporting of water footprint assessment and water footprint results should follow the rules prescribed in ISO 14044.

If water related potential environmental impacts have not been comprehensively assessed, then the term water footprint shall only be reported with a qualifier. A qualifier is one or several additional words used in conjunction with the term “water footprint” to describe the impact category/categories studied in the water footprint assessment, e.g. “water availability footprint”, “water scarcity footprint”, “water eutrophication footprint”, “water ecotoxicity footprint”, “water acidification footprint”, “non-comprehensive water footprint”.

The type and format of the report shall be defined in the goal and scope definition phase of the study.

The results and conclusions of the water footprint assessment shall be completely and accurately reported without bias to the intended audience. The results, data, methods, assumptions and limitations shall be transparent and presented in sufficient detail to allow the reader to comprehend the complexities

and trade-offs inherent in the water footprint assessment. The report shall also allow the results and interpretation to be used in a manner consistent with the goals of the study.

Types of water resource use and water related potential environmental impacts addressed by the water footprint impact assessment method(s) used shall be explicit.

Reporting of water footprint inventory should be transparent by giving the information about each elementary flow, specified in 5.3.2, as well as data sources.

Reporting of water footprint impact assessment should be transparent.

Redundant impact category indicators (i.e. indicators containing double counting) shall not be reported in parallel without clear indication of redundancy.

Results of the interpretation shall be reported.

If applicable, initiatives to improve the environmental performance related to water associated with products, processes or organizations at various points in the life cycle should be reported.

When the water footprints of different product systems, processes or organizations are compared, a consistency check as described in ISO 14044 should be performed.

6.2 Additional requirements and guidance for third-party reports

When results of the water footprint assessment are to be reported to any third party (i.e. interested party other than the commissioner or the practitioner of the study), a third-party report shall be prepared.

The third-party report can be based on study documentation that contains confidential information that may not be included in the third-party report.

The third-party report constitutes a reference document and shall be made available to any third party to whom the water footprint assessment and the water footprint results are reported. The third-party report shall cover the following aspects:

a) general aspects:

   1) commissioner or practitioner of the study (internal or external);

   2) date of report;

   3) statement that the study has been conducted according to the requirements of this International Standard;

b) goal of the study:

   1) reasons for carrying out the study;

   2) its intended applications;

   3) the target audiences;

   4) whether the study is a stand-alone assessment or a part of a life cycle assessment;

   5) whether the study is part of a life cycle assessment where a comparative assertion is intended;

c) scope of the study:

   1) function, including:

      i) statement of performance characteristics;

ii) any omission of additional functions in comparisons;

2) functional unit, including:

i) consistency with goal and scope;

ii) definition;

iii) result of performance measurement;

3) system boundary, including:

i) geographical and temporal dimensions of the study;

ii) omissions of life cycle stages, processes or data needs;

iii) quantification of energy and material inputs and outputs;

iv) assumptions about electricity production, if relevant;

v) type of inputs and outputs of the system as elementary flows;

vi) decision criteria;

vii) organizational boundary where relevant;

4) cut-off criteria for initial inclusion of inputs and outputs, including:

i) description of cut-off criteria and assumptions;

ii) effect of selection on results;

iii) inclusion criteria;

5) justification of any modifications made to the initial scope;

d) water footprint inventory analysis:

1) data collection procedures;

2) qualitative and quantitative description of unit processes, including details about individual data;

3) sources of data, including model(s) used and published literature;

4) calculation procedures;

5) validation of data, including:

i) data quality requirements;

ii) data quality assessment;

iii) treatment of missing data;

6) sensitivity analysis for refining the system boundary;

7) allocation principles and procedures, including:

i) documentation and justification of allocation procedures;

ii) uniform application of allocation procedures;

8) inventory of the period used as baseline, where relevant;

e) water footprint impact assessment, where applicable:

1) the impact assessment procedures, calculations and results of the study;

2) the limitations of the impact assessment results relative to the defined goal and scope;

3) the relationship of impact assessment results to the defined goal and scope;

4) the relationship of the impact assessment results to the inventory results;

5) the impact categories and category indicators considered, including a rationale for their selection and a reference to their source;

6) descriptions of or reference to all characterization models, characterization factors and methods used, including all assumptions and limitations;

7) descriptions of or reference to all value choices used in relation to impact categories, characterization models, characterization factors, normalization, grouping, weighting and, elsewhere in the impact assessment, a justification for their use and their influence on the results, conclusions and recommendations;

8) a statement that the impact assessment results are relative expressions and do not predict impacts on category end points, the exceeding of thresholds, safety margins or risks;

9) when included as a part of the water footprint assessment, also:

i) a description and justification of the definition and description of any impact categories, category indicators or characterization models used for the impact assessment;

ii) a statement and justification of any grouping of the impact categories;

iii) any further procedures that transform the indicator results and a justification of the selected references, weighting factors, etc.;

iv) any analysis of the indicator results, for example sensitivity and uncertainty analysis or the use of environmental data, including any implication for the results;

v) uncertainty of the water footprint impact assessment method;

vi) data and indicator results reached prior to any normalization, grouping or weighting shall be made available together with the normalized, grouped or weighted results;

f) interpretation:

1) the results,

2) conclusions;

2) assumptions and limitations associated with the interpretation of results, both methodology and data related;

3) data quality assessment;

4) transparency in terms of value choices, rationales and expert judgements;

5) if relevant, description of the positive aspects if any;

NOTE An example of a positive aspect can be a production site which withdraws river water, then removes organic matter from the water before it is being used in the processes. Most of the treated water is returned to the river with less organic content.

g) critical review, where applicable:

   1) name and affiliation of reviewers;

   2) critical review reports;

   3) responses to recommendations.

6.3 Comparative assertion and comparative studies

6.3.1 Comparative assertions

Comparative assertions, as defined in ISO 14044, shall not be based on a stand-alone water footprint assessment as the stand-alone water footprint assessment assesses only limited impact categories.

A water footprint assessment which is part of a life cycle assessment study which is intended to be used for a comparative assertion intended to be disclosed to the public shall apply the relevant requirements of ISO 14044 and be subject to critical review.

6.3.2 Comparative studies

In a comparative study, the equivalence of the systems being compared shall be evaluated before interpreting the results. Consequently, the scope of the study shall be defined in such a way that the systems can be compared. Systems shall be compared using the same functional unit and equivalent methodological considerations, such as performance, geographical scope, system boundary, data quality, allocation procedures, decision rules on evaluating inputs and outputs, and decision rules on impact assessment. Any differences between systems regarding these parameters shall be identified and reported.

7 Critical review

7.1 General

The scope and type of critical review desired shall be defined in the scope phase of a water footprint assessment, and the decision on the type of critical review shall be recorded.

A water footprint assessment which is part of a life cycle assessment study which is intended to be used for a comparative assertion intended to be disclosed to the public shall apply the relevant requirements of ISO 14044 and notably be subject to critical review. In that case the same procedure and requirements for critical review in ISO 14044 shall apply.

NOTE Additional information can be found in ISO/TS 14071.

For studies not intended to be used for comparative assertions, though a critical review is not required, a critical review is also possible and this information could be of assistance as appropriate.

The critical review process shall check whether:

— the methods used to determine the water footprints are consistent with this International Standard,

— the methods and inventory modelling used to carry out the water footprint assessment are scientifically and technically valid,

— the data and model results used are appropriate and reasonable in relation to the goal of the study,

— the interpretations reflect the limitations identified and the goal of the study, and

— the study report is transparent and consistent with the goal and scope of the study.

7.2 Need for critical review

A critical review may facilitate understanding and enhance the credibility of a study, for example by involving interested parties.

If the results (or part of the results) of a water footprint assessment are intended to be reported to third parties:

— a critical review of the study should be conducted, and

— the critical review statement should be made available to third parties.

7.3 Critical review by internal or external expert

A critical review may be carried out by an internal or external expert. In such a case, an expert independent of the water footprint assessment shall perform the review. The review statement, comments of the practitioner and any response to recommendations made by the reviewer shall be included in the water footprint assessment report.

7.4 Critical review by panel of interested parties

A critical review may be carried out as a review by interested parties. In such a case, an external independent expert should be selected by the original study commissioner to act as chairperson of a review panel of at least three members. Based on the goal and scope of the study, the chairperson should select other independent qualified reviewers. This panel may include other interested parties affected by the conclusions drawn from the water footprint assessment, such as government agencies, non-governmental groups, competitors and affected industries.

For water footprint impact assessment, the expertise of reviewers in the scientific disciplines relevant to the important impact categories of the study, in addition to other expertise and interest, shall be considered.

The review statement and review panel report, as well as comments of the expert and any responses to recommendations made by the reviewer or by the panel, shall be included in the water footprint assessment report.

The critical review shall verify whether the water footprint assessment has been undertaken in compliance with the requirements of this International Standard.

Annex A
(normative)

Additional requirements and guidelines for organizations

A.1 Goal and scope definition for organizations

The requirements in 5.2 apply.

A.2 Organizational boundaries

The organization may comprise one or more facilities. Potential environmental impacts related to water may result from one or more physical units or processes.

The organization shall consolidate its facility potential environmental impacts related to water by one of the following approaches:

a) control: the organization assesses potential environmental impacts related to water of processes and physical units from facilities over which it has financial or operational control;

b) equity share: the organization assesses potential environmental impacts related to water of processes and physical units from respective facilities, according to its share of equity interest.

When a facility is controlled by several organizations, these should adopt the same consolidation approach.

The organization shall document which consolidation method it applies.

The organization shall explain any change to the selected consolidation method.

A.3 Specific requirements for water footprint assessment of an organization

According to its goal and scope an organization can be interested in developing a water footprint assessment adopting different perspectives. See Figure A.1.

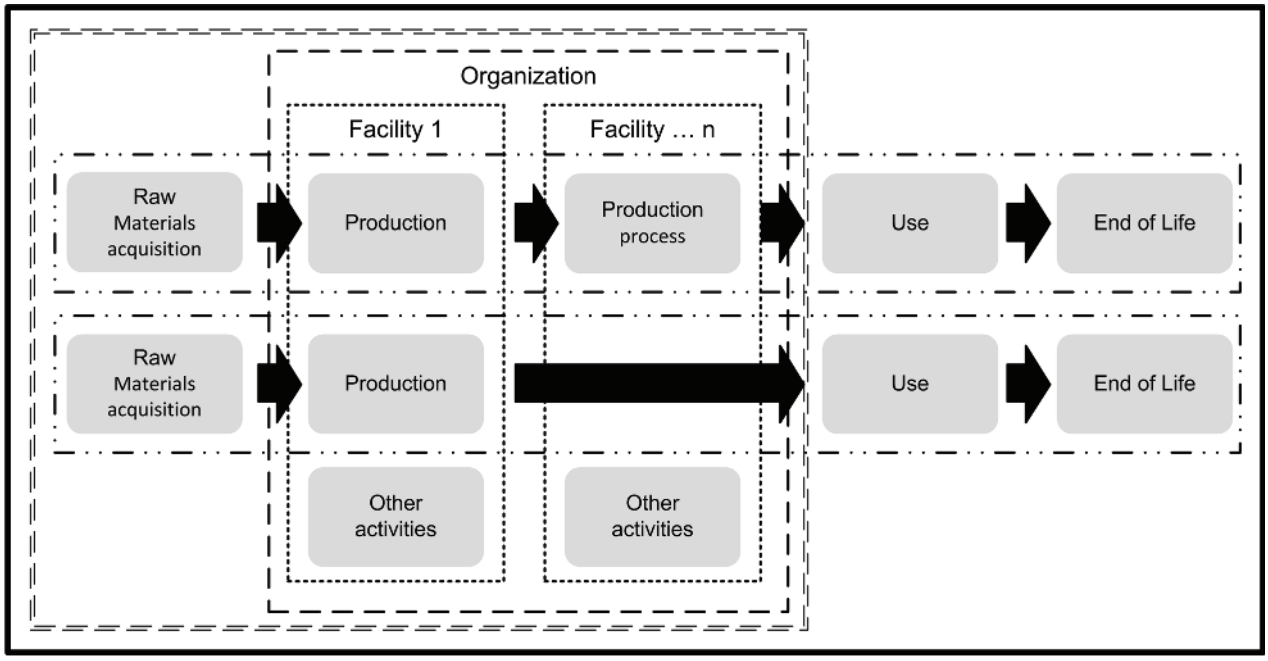


Figure A.1 — Examples of different system boundaries for water footprint assessment of an organization

Water footprint inventory at organizational level or facility level shall consider the direct water footprint inventory of the activities under the direct control of the organization or its specific facility/facilities under study.

Water footprint inventory using a life cycle perspective for an organization shall consider direct and indirect water footprint inventories of the activities associated with the organization adopting a life cycle perspective.

The organization shall consider the complete life cycle to cover all inputs and outputs related to the organization's activities and disclose and justify any exclusion.

A complete "cradle-to-grave" assessment of an organization as shown in Figure A.1 includes the use and end-of-life treatment of sold products by the reporting organization in the reference period. This includes use-stage emissions of sold products over their expected lifetime and the waste disposal and treatment of products sold by the reporting organization (in the reference period) at the end of their life. Use-stage flows should be included if products use water, consume energy or generate emissions with potential environmental impacts on water during use like e.g. washing machines, dishwashers, apparel (requires washing and drying), food (requires cooking and refrigeration) or soaps and detergents (require heated water).

Calculating input and outputs for the use stage typically requires product design specifications and assumptions about how consumers use products (e.g. use profiles, assumed product lifetimes).

If justified at the goal and scope definition phase of a water footprint study, a "cradle-to-gate" study may be undertaken where the use and end-of-life stages are excluded.

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