



**BSI Standards Publication**

# **Sustainability of construction works — Sustainability assessment of civil engineering works — Calculation methods**

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## National foreword

This British Standard is the UK implementation of EN 17472:2022.

The UK participation in its preparation was entrusted to Technical Committee B/558, Sustainability of construction works.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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assessment of civil engineering works -  
Calculation methods

Contribution des ouvrages de construction  
au développement durable - Évaluation de la  
contribution au développement durable des  
ouvrages de génie civil - Méthodes de calcul

Nachhaltigkeit von Bauwerken -  
Bewertung der Nachhaltigkeit von  
Ingenieurbauwerken - Rechenverfahren

This European Standard was approved by CEN on 1 November 2021.

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## European foreword

This document (EN 17472:2022) has been prepared by Technical Committee CEN/TC 350 “Sustainability of construction works”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2022, and conflicting national standards shall be withdrawn at the latest by August 2022.

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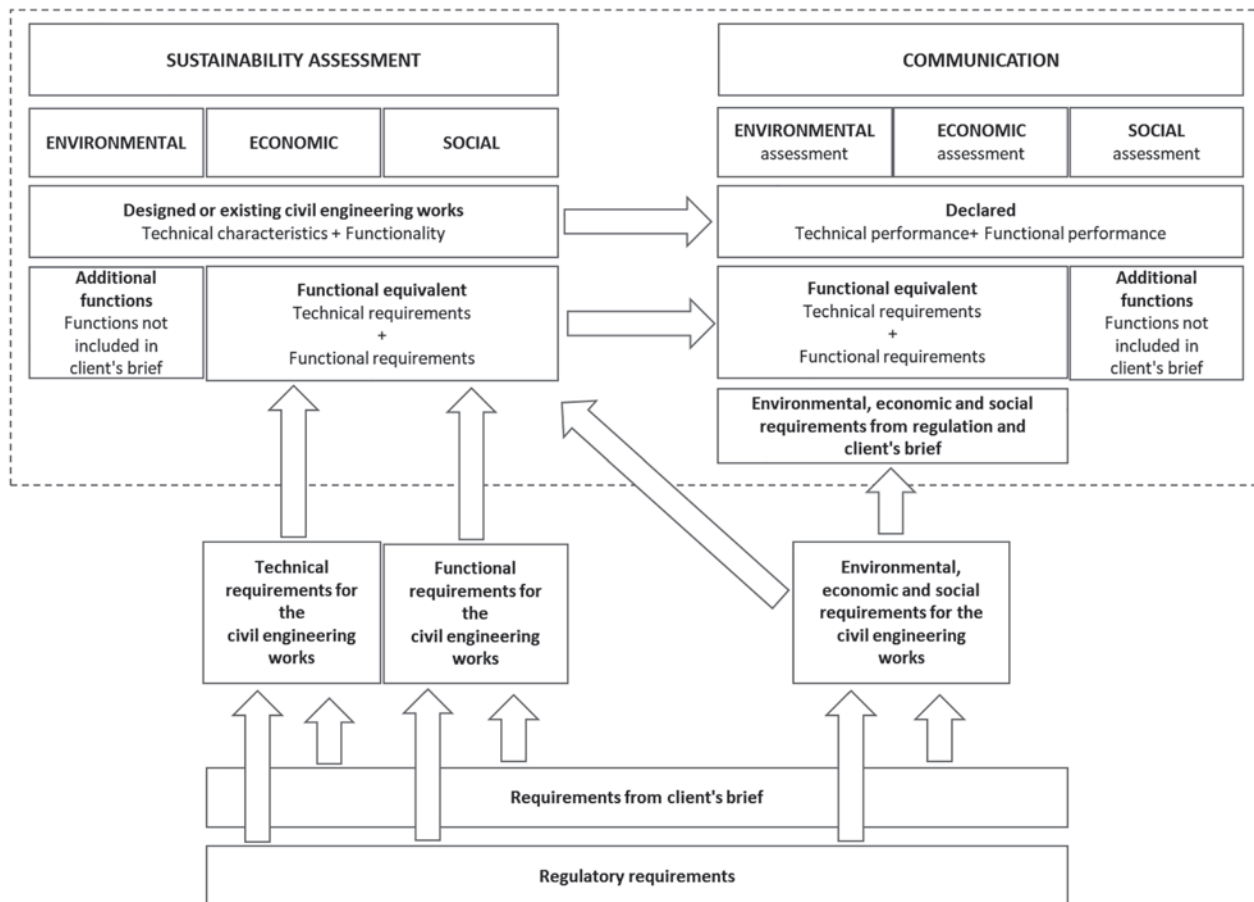
Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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# Introduction

This document provides rules for the assessment of the sustainability of civil engineering works including environmental, economic and social aspects.

**Figure 1** illustrates how the assessment of the environmental, economic and social performances fits within the concept of the sustainability assessment of a civil engineering works.



NOTE The outer box with the dashed line represents the area standardized by CEN/TC 350 – Sustainability of construction works.

**Figure 1 — Concept of sustainability assessment of civil engineering works**

Those economic, social or environmental requirements not expressed in the sustainability assessment are communicated, too.

This document supports quantification of the contribution of the assessed civil engineering works to sustainable construction and sustainable development.

The evaluation of technical and functional performance is beyond the scope of this document. Technical and functional characteristics are taken into account here by reference to the functional equivalent, which also forms a basis for comparison of the results of assessments.

Although the assessment of technical and functional performance does not form part of this series of standards, their interrelationship with environmental, social and economic performance is a prerequisite for an assessment of sustainability of construction works and, therefore, is taken into account, as illustrated in [Figure 1](#).

The method of assessment of sustainability described in this document is based on a life cycle approach and provides a consistent model for describing and recording the civil engineering works and its life cycle for assessing the environmental, economic and social performance. For the assessment of the three aspects, the same reference study period is used.

The assessment of social performance differs from the assessment of economic and environmental aspects because it requires both quantitative and descriptive approaches.

The document sets requirements for:

- the description of the object of assessment;
- the system boundary that applies at the civil engineering works level;
- the procedure to be used for the analysis;
- definition of the indicators to be declared, information to be provided and the way in which they are collated and reported;
- presentation of the results in reporting and communication; and
- the data necessary for the application of the standard and calculation.

The economic assessment is undertaken at the civil engineering works level. However, it requires technical and cost information about individual products and components within the civil engineering works and its services and systems, including service life data, type and frequency of maintenance, replacement and repair, and deconstruction and disposal. This information is used as input quantities for the calculation of cost in the life cycle of the civil engineering works.

The framework and the general requirements for sustainability assessments of civil engineering works are specified in EN 15643. Further documents on sustainability assessment have already been developed by CEN/TC 350 or are currently under development. [Table 1](#) gives an overview on relevant standards related to sustainability of construction works. Each standard has been assigned to either the framework level, the works level, or the product level according to the specifications it contains.

**Table 1 — Overview on relevant sustainability of construction works standards**

|                        | Sustainability assessment                                                  |                                                       |                                                         | Technical characteristics                      | Functionality |
|------------------------|----------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------|------------------------------------------------|---------------|
|                        | environmental                                                              | social                                                | economic                                                |                                                |               |
| <b>Framework level</b> | EN 15643 Framework for assessment of buildings and civil engineering works |                                                       |                                                         | ISO 15686-1 <sup>c</sup> Service life planning | <sup>a</sup>  |
| <b>Works level</b>     | prEN 15978-1 Environmental performance of buildings                        | EN 16309 <sup>b</sup> Social performance of buildings | EN 16627 <sup>b</sup> Economic performance of buildings | EN ISO 52000-1 Energy performance of buildings |               |
|                        | prEN 17680 Evaluation of potential for sustainable building refurbishment  |                                                       |                                                         |                                                |               |
|                        | EN 17472 Sustainability assessment of civil engineering works              |                                                       |                                                         |                                                |               |

|                                                                                                                          | Sustainability assessment                                   |        |          | Technical characteristics                                              | Functionality |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------|----------|------------------------------------------------------------------------|---------------|
|                                                                                                                          | environmental                                               | social | economic |                                                                        |               |
| <b>Product level</b>                                                                                                     | EN 15804                                                    |        |          |                                                                        |               |
|                                                                                                                          | EPD core rules                                              |        |          |                                                                        |               |
|                                                                                                                          | CEN/TR 16970<br>Guidance for<br>EN 15804                    |        |          | ISO 15686-2 <sup>c</sup>                                               |               |
|                                                                                                                          | prEN 15941<br>data quality                                  |        |          | Service life prediction procedures                                     |               |
|                                                                                                                          | EN 15942 Communication format<br>B-to-B                     |        |          | ISO 15686-7 <sup>c</sup>                                               |               |
|                                                                                                                          | prEN 17672 Horizontal rules for<br>B-to-C communication     |        |          | Performance evaluation for feedback of service life data from practice |               |
|                                                                                                                          | prEN ISO 22057<br>Data templates for the use of EPDs in BIM |        |          | ISO 15686-8 <sup>c</sup>                                               |               |
|                                                                                                                          | CEN/TR 17005<br>Additional impact categories and indicators |        |          | Reference service life and service-life estimation                     |               |
| NOTE 1 The complete titles of the documents shown above can be found in <a href="#">Clause 3</a> or in the Bibliography. |                                                             |        |          |                                                                        |               |
| NOTE 2 The documents in the grey fields are part of the current CEN/TC 350 work programme.                               |                                                             |        |          |                                                                        |               |
| <sup>a</sup> Functional requirements are part of the client's brief and building regulations.                            |                                                             |        |          |                                                                        |               |
| <sup>b</sup> The revision of EN 16309 and EN 16627 as parts 2 and 3 of EN 15978 is under preparation in CEN/TC 350.      |                                                             |        |          |                                                                        |               |
| <sup>c</sup> The document has been developed by ISO/TC 59/SC 14 "Design life".                                           |                                                             |        |          |                                                                        |               |

## 1 Scope

This document establishes the requirements and specific methods for the assessment of environmental, economic and social performances of a civil engineering works while taking into account the civil engineering works' functionality and technical characteristics. By the means of this document the decision making for a project is supported by providing a standardized method for enabling comparability of scheme options.

The assessment of environmental and economic performances of a civil engineering works is based on Life Cycle Assessment (LCA), Life Cycle Cost (LCC), Whole-Life Cost (WLC) and other quantified environmental and economic information. The approach to the assessment covers all stages of the civil engineering works life cycle and includes all civil engineering works related construction products, processes and services, used over its life cycle.

This document is applicable to new and existing civil engineering works and refurbishment projects. The environmental performance is based on data obtained from Environmental Product Declarations (EPD) and additional indicators.

This document is not applicable for the assessment of the environmental, social and economic performance of building(s) as part of the civil engineering works; instead, EN 15978, EN 16309 and EN 16627 apply.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15804, *Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products*

EN 16309, *Sustainability of construction works — Assessment of social performance of buildings — Calculation methodology*

EN ISO 52000-1, *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1)*

ISO 15686-1, *Buildings and constructed assets — Service life planning — Part 1: General principles and framework*

ISO 15686-2, *Buildings and constructed assets — Service life planning — Part 2: Service life prediction procedures*

ISO 15686-5, *Buildings and constructed assets — Service life planning — Part 5: Life-cycle costing*

ISO 15686-7, *Buildings and constructed assets — Service life planning — Part 7: Performance evaluation for feedback of service life data from practice*

ISO 15686-8, *Buildings and constructed assets — Service-life planning — Part 8: Reference service life and service-life estimation*

ISO 1996-2, *Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels*

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

**3.1**  
**accessibility**  
ability for users to access the service(s) that the civil engineering works is providing and/or to access nature

NOTE Examples of services that can be provided include water or energy supply and mobility service.

**3.2**  
**adaptability**  
ability of the object of assessments or parts thereof to be changed or modified to make suitable for a particular use

[SOURCE: ISO 21929-1:2011, 3.4, modified – “of the object of assessments or parts thereof” has been added.]

**3.3**  
**adaptation to climate change**  
climate change adaptation  
process of adjustment to actual or expected climate and its effects

Note 1 to entry: In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.

Note 2 to entry: In some natural systems, human intervention can facilitate adjustment to expected climate and its effects.

[SOURCE: ISO 14090:2019, 3.1]

**3.4**  
**appliance**  
device or piece of equipment designed to perform a specific task

**3.5**  
**area of influence**  
area or combination of areas surrounding a civil engineering works that can be affected with changes to their economic, environmental or social conditions by the civil engineering works' operations throughout its life cycle

Note 1 to entry: The area of influence is variable and dependent on the civil engineering works project, its location and its life cycle stage.

Note 2 to entry: The area of influence is defined per aspect.

Note 3 to entry: The area of influence concerns only the civil engineering works and not construction products. Example: Stones coming from China, China is not in the influence area.

[SOURCE: ISO/TS 21929-2:2015, 3.2, modified – The second sentence from Note 1 has been removed, the Notes 2 and 3 have been added.]

**3.6**  
**assembled system**  
**part of works**  
component or a set of components incorporated in the civil engineering works

### 3.7

#### **brief**

document that states the client's requirements for a construction project

[SOURCE: ISO 6707-2:2017, 3.2.18, modified – “client's” and “construction” has been added.]

### 3.8

#### **building**

construction works that has the provision of shelter for its occupants or contents as one of its main purposes, usually enclosed and designed to stand permanently in one place

[SOURCE: ISO 6707-1:2020, 3.1.1.3, modified – “partially and totally” and Note 1 have been removed.]

### 3.9

#### **civil engineering works**

construction works comprising a structure, such as a dam, bridge, road, railway, runway, utilities, pipeline, or sewerage system, or the result of operations such as dredging, earthwork, geotechnical processes, but excluding a building and its associated site works

[SOURCE: ISO 6707-1:2020, 3.1.1.2, modified – Note 1 has been removed.]

### 3.10

#### **climate**

statistical description of weather in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years

Note 1 to entry: The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization.

Note 2 to entry: The relevant quantities are most often near-surface variables such as temperature, precipitation and wind.

[SOURCE: ISO 14090:2019, 3.4]

### 3.11

#### **climate change**

change in climate that persists for an extended period, typically decades or longer

Note 1 to entry: Climate change can be identified by such means as statistical tests (e.g. on changes in the mean, variability).

Note 2 to entry: Climate change might be due to natural processes, internal to the climate system, or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use.

[SOURCE: ISO 14090:2019, 3.5]

### 3.12

#### **client**

person or organization initiating and financing a project and approving the brief

[SOURCE: ISO 6707-1:2020]

### 3.13

#### **construction product**

item manufactured or processed for incorporation in civil engineering works

NOTE Construction products are items supplied by a single responsible body.

[SOURCE: ISO 6707-1:2020, 3.4.1.2, modified – “construction works” has been replaced by “civil engineering works”; Note 1 has been replaced.]

### 3.14

#### **component**

construction product manufactured as a distinct unit to serve a specific function or functions

### 3.15

#### **construction site**

area of land or water where construction work or civil engineering works is undertaken

[SOURCE: ISO 6707-1:2020, 3.1.1.5, modified – “other development” has been replaced by “civil engineering works”.]

### 3.16

#### **construction work**

activities of forming a civil engineering works

[SOURCE: ISO 6707-1:2020, 3.5.1.1, modified – “construction works” has been replaced by “a civil engineering works”.]

### 3.17

#### **construction works**

everything that is constructed or results from construction operations

NOTE Refers to both building and civil engineering works.

[SOURCE: ISO 6707-1:2020, 3.1.1.1, modified – Note 1 has been removed.]

### 3.18

#### **decommissioning**

activities that change a building or a civil engineering works or an assembled system from an operational status to a non-operational status

### 3.19

#### **design life**

service life intended by the designer

[SOURCE: ISO 15686-1:2011, 3.3]

### 3.20

#### **discount rate**

factor or rate used to convert future expenses or incomes to their present value reflecting the time value of money

### 3.21

#### **disposal**

waste treatment operation other than recovery even where the operation has a secondary consequence the reclamation of substances or energy

[SOURCE: Directive 2008/98/EC, modified – “disposal means any operation which is not” has been replaced by “waste treatment operation other than” in the definition; “Annex I sets out a non-exhaustive list of disposal operations” has been removed.]

### 3.22

#### **downstream process**

process that is carried out after the designated process in the stream of relevant processes

[SOURCE: ISO 21931-1:2010, 3.2]

### 3.23

#### **economic aspect**

characteristic of civil engineering works, part of works, processes or services related to their life cycle that can cause change to economic conditions

[SOURCE: ISO 15392:2019, 3.12, modified – “construction works” has been replaced by “civil engineering works”.]

### 3.24

#### **economic impact**

result of a change to the economic conditions, whether adverse, neutral or beneficial, wholly or partially resulting from economic aspects

[SOURCE: ISO 15392:2019, 3.13.1, modified – definition of “impact” has been integrated in the definition.]

### 3.25

#### **economic performance**

performance related to economic impacts and economic aspects

### 3.26

#### **environmental aspect**

characteristic of civil engineering works, part of works, processes or services related to their life cycle that can cause change to the environment

[SOURCE: ISO 15392:2019, 3.13, modified – “construction works” has been replaced by “civil engineering works”.]

### 3.27

#### **environmental impact**

result of a change to the environment, whether adverse, neutral or beneficial, wholly or partially resulting from environmental aspects

[SOURCE: ISO 15392:2019, 3.17.2, modified – definition of “impact” has been integrated in the definition.]

### 3.28

#### **environmental performance**

performance related to environmental impacts and environmental aspects

[SOURCE: ISO 15392:2019, 3.16, modified – Note 1 has been removed.]

### 3.29

#### **escalation rate**

positive or negative factor or rate reflecting an estimate of differential increase/decrease in the general price level for a particular commodity, or group of commodities, or resource

[SOURCE: ISO 15686-1:2011, 3.3.2, modified – Note 1 has been removed.]

### 3.30

#### **estimated service life**

service life that a building or civil engineering works or an assembled system would be expected to have in a set of specific in-use conditions, determined from reference service life data after taking into account any differences from the reference in-use conditions

[SOURCE: ISO 15686-1:2011, 3.7, modified – “civil engineering works or an assembled system” has been added in the definition.]

**3.31**  
**exported energy**

energy, expressed per energy carrier, supplied by the technical building systems or integrated technical systems of works through and beyond the system boundary

NOTE The term “exported utilities” is used in this document to describe utilities, such as electricity, water, heat, which may be exported.

[SOURCE: EN ISO 52000-1:2017, 3.4.20, modified – “or integrated technical systems of works”, and “and beyond” have been added; “assessment boundary” has been replaced with “system boundary”; Note 1 has been replaced and Note 2 has been removed.]

**3.32**  
**functional equivalent**

quantified functional requirements and/or technical requirements for a building or civil engineering works or an assembled system for use as a basis for comparison

[SOURCE: ISO 21931-1:2010, 3.7, modified – “or civil engineering works or an assembled system” has been added.]

**3.33**  
**functional performance**

performance related to the functionality of a civil engineering works or an assembled system which is required by the client, users and/or by regulations

**3.34**  
**functional requirement**

type and level of functionality of a building, civil engineering works or assembled system which is required by the client, users and/or by regulations

**3.35**  
**functionality**

suitability or usefulness for a specific purpose or activity

[SOURCE: ISO 15686-10:2010, 3.13]

**3.36**  
**gate**

point at which the construction product or material leaves the factory before it becomes an input into another manufacturing process or before it goes to the distributor, a factory or a construction site

[SOURCE: ISO 21930:2017, 3.3.8]

**3.37**  
**ground works**

work done to prepare sub-surfaces for the start of construction work

**3.38**  
**handover**

step at which possession of the civil engineering works is surrendered to the client upon completion with or without reservation

[SOURCE: ISO 6707-2:2017, 3.5.28 – “construction works” has been replaced by “civil engineering works”.]

**3.39**  
**impact category**

class representing environmental issues of concern to which life cycle inventory analysis results may be assigned

[SOURCE: EN ISO 14044:2006, 3.39]

### 3.40

#### **impact category indicator**

quantifiable representation of an impact category

[SOURCE: EN ISO 14044:2006, 3.40]

### 3.41

#### **information module**

compilation of data to be used as a basis for a Type III environmental declaration, covering a unit process or a combination of unit processes that are part of the life cycle of a product

[SOURCE: ISO 14025:2006, 3.13]

### 3.42

#### **integrated technical systems**

installed technical equipment to support operation and maintenance of a building or civil engineering works

NOTE This includes technical building systems and other systems for sanitation, security, fire safety, internal transport, building automation and control, and IT communications.

[SOURCE: EN 15643:2021, 3.51]

### 3.43

#### **internal rate of return**

IRR

discount rate, which makes the net present value equal to zero

### 3.44

#### **in-use condition**

any circumstance that can impact the performance of a civil engineering works or assembled system (part of works) under normal use

[SOURCE: ISO 15686-8:2008, 3.5]

### 3.45

#### **level of functionality**

number indicating the relative functionality required for a users group or customer for one topic on a predetermined demand scale from the level of the least (functionality) to the level of the most (functionality)

NOTE The level of functionality can be the consequence of several distinct functions required to act in combination.

EXAMPLE Scale of integers from 0 to 9.

[SOURCE: ISO 15686-10:2010, 3.15]

### 3.46

#### **life cycle**

consecutive and interlinked stages in the life of the object under consideration

### 3.47

#### **life cycle assessment**

LCA

compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

NOTE In this context, a civil engineering works or assembled system is considered a “product” and a part of a “product system”.

[SOURCE: EN ISO 14044:2006, 3.2, modified – Note 1 to entry has been added.]

**3.48**

**life cycle cost**

**LCC**

cost of a civil engineering works or part of works throughout its whole life cycle

**3.49**

**life-cycle costing**

technique for estimating the cost of civil engineering works, systems and/or civil engineering works components and materials, and for monitoring the cost incurred throughout the life cycle

**3.50**

**life cycle impact assessment**

**LCIA**

phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product

NOTE In this context, a civil engineering works or assembled system is considered a “product” and a part of a “product system”.

[SOURCE: EN ISO 14044:2006, 3.4, modified – Note 1 to entry has been added.]

**3.51**

**life cycle inventory analysis**

**LCI**

phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle

NOTE In this context, a civil engineering works or assembled system is considered a “product” and a part of a “product system”.

[SOURCE: EN ISO 14044:2006, 3.3, modified – Note 1 to entry has been added.]

**3.52**

**maintainability**

ability of a component, an assembled system (part of works) or civil engineering works to be retained in a state in which it can perform its required functions or be restored to such a state when a fault occurs

[SOURCE: ISO 6707-1:2020, 3.7.3.90, modified – “or construction” has been replaced by “an assembled system (part of works) or civil engineering works”.]

**3.53**

**maintenance**

combination of all technical and associated administrative actions during the service life to retain a civil engineering works or an assembled system in a state in which it can perform its required functions

NOTE Maintenance includes cleaning, servicing, repainting, replacing parts of the civil engineering works where needed, etc.

[SOURCE: ISO 15686-1:2011, 3.13, modified – “building, or its parts,” has been replaced by “civil engineering works or an assembled system”; Note 1 has been added.]

**3.54**

**neighbourhood**

people, their living space and social networks in the area of influence

**3.55**

**net present value**

**NPV**

sum of the discounted expenses and incomes related to an investment including initial investment cost

### 3.56

#### **operational energy use**

energy use of civil engineering works technical system during use and operation of the civil engineering works

EXAMPLE In a case of a road, the use concerns traffic and the operation concerns maintenance, lighting.

### 3.57

#### **operational water use**

water use of technical civil engineering works system or users during use and operation of the civil engineering works

### 3.58

#### **performance**

expression relating the magnitude of a particular aspect of the object of consideration relative to specified requirements, objectives and/or targets

### 3.59

#### **primary energy**

energy that has not been subjected to any conversion or transformation process

[SOURCE: EN ISO 52000-1:2017, 3.3.10]

### 3.60

#### **process**

series of operations performed to achieve a desired result

[SOURCE: ISO 21931-1:2010, 3.11]

### 3.61

#### **project**

unique process, consisting of a set of coordinated and controlled activities undertaken to achieve an objective

[SOURCE: ISO 6707-1:2020, 3.5.2.4]

### 3.62

#### **project specification**

specification of civil engineering works for a specific project that prescribes the construction work and the construction products to be used and how they are to be applied

[SOURCE: ISO 6707-2:2017, 3.2.23, modified – “of civil engineering works” and “and how they are to be applied” have been added.]

### 3.63

#### **re-use**

any operation by which products or components that are not waste are used again for the same purpose for which they were conceived or used for other purposes without reprocessing

[SOURCE: Directive 2008/98/EC, Art. 3 no. 13, modified – “or used for other purposes without reprocessing” has been added.]

### 3.64

#### **recovery**

any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy

[SOURCE: Directive 2008/98/EC, Art. 3, no. 15]

### 3.65 recycling

recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes

Note 1 to entry: Recycling does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

Note 2 to entry: [SOURCE: Directive 2008/98/EC, Art. 3, no. 17, modified – the Note has been added.]

### 3.66 reference in-use conditions

in-use conditions under which the reference service life data are valid

NOTE The reference in-use conditions can be based upon information gathered through testing or from recorded performance and actual service life data of a component.

[SOURCE: ISO 15686-8:2008, 3.9]

### 3.67 reference service life RSL

service life of a construction product, component, assembly or system which is known to be expected under a set of reference in-use conditions and which may form the basis of estimating the service life under other in-use conditions

NOTE The RSL is described as part of the functional unit and considered in the calculation of replacements at both the construction product level and construction works level (B4) and refurbishment (B5).

[SOURCE: ISO 15686-1:2011, 3.22, modified – “construction” has been added in the definition; “particular set, i.e. a reference set of” has been replaced with “a set of reference” in the definition; Note 1 to entry has been added.]

### 3.68 reference service life data

RSL data  
information that includes the reference service life and any qualitative or quantitative data describing the validity of the reference service life

EXAMPLE Typical data describing the validity of the reference service life include the description of the component for which they apply, the reference in-use conditions under which they apply, and their quality.

[SOURCE: ISO 15686-8:2008, 3.8, modified – Notes 1 and 2 have been removed.]

### 3.69 reference study period

period of time over which the relevant aspects and impacts of the civil engineering works are analysed

Note 1 to entry: The reference study period is determined by the client.

Note 2 to entry: In some cases, the reference study period may differ significantly from the design life of the civil engineering works.

### 3.70 refurbishment

planned large scale (substantial) modification and improvements to an existing construction works

NOTE Refurbishment can be undertaken to facilitate continuation of the current function, including technical modernization and a change of space plan, or a change of function to new use.

[SOURCE: ISO 6707-1:2020, 3.5.1.44, modified – “planned large scale (substantial)” has been added in the definition; “plant, building or civil engineering works” has been replaced with “construction works”]

in the definition; “to bring it up an acceptable condition” has been removed from the definition; Note 1 to entry has been added.]

### 3.71

#### **renewable energy**

energy from renewable sources  
energy from renewable non-fossil sources

EXAMPLE Wind, solar (photovoltaic), solar thermal, geothermal, hydrothermal, ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

### 3.72

#### **repair**

actions outside planned maintenance to return component or assembled system to an acceptable condition by renewal, replacement or mending worn, damaged or degraded parts, but not changing its original parameters

NOTE Repair refers to unplanned action because the component or assembled system has lost its function, this can happen because of a lack of correct planned maintenance.

[SOURCE: ISO 6707-1:2020, 3.5.1.47, modified – “item” has been replaced with “actions outside planned maintenance to return component or assembled system”; “but not changing its original parameters” has been added; Note 1 to entry has been added.]

### 3.73

#### **replacement**

installation of a new product, component or assembled system, which incorporates the function of the replaced product, component or assembled system

[SOURCE: ISO 24516-3:2017, 3.21, modified – “asset” has been replaced with “product, component or assembled system” in the definition.]

### 3.74

#### **required service life**

service life required by the client or through regulation

### 3.75

#### **risk**

quantifiable effect of an event that can be given with a certain range of probability

Note 1 to entry: An effect is a deviation from the expected. It can be positive, negative or both. An effect can arise as a result of a response, or failure to respond, to an opportunity or to a threat related to objectives.

Note 2 to entry: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood.

### 3.76

#### **scenario**

collection of assumptions and information concerning an expected sequence of possible future events

### 3.77

#### **secondary material**

material recovered from previous use or from waste which substitutes primary materials

Note 1 to entry: Secondary material is measured at the point (i.e. system boundary) where the secondary material enters the product system from another product system.

Note 2 to entry: Materials recovered from previous use or from waste from one product system and used as an input in another product system are secondary materials.

Note 3 to entry: Examples for secondary materials (to be measured at the system boundary) are recycled metal, crushed concrete, glass cullet, recycled wood, recycled plastic granulates.

[SOURCE: EN 15804:2012+A2:2019, 3.30 modified – “(i.e. system boundary)” has been added to Note 1, “scrap” and “chips” have been removed from and “granulates” has been added to Note 3.]

### 3.78

#### **service life**

period of time after installation during which a civil engineering works or an assembled system meets or exceeds the technical performance and functional requirements

[SOURCE: ISO 15686-1:2011, 3.25, modified – “facility or its component parts” has been replaced by “civil engineering works or an assembled system” in the definition.]

### 3.79

#### **social aspect**

characteristic of a civil engineering works, part of works, processes or services related to their life cycle that can cause change to society or quality of life

[SOURCE: ISO 15392:2019, 3.14, modified – “construction works” has been replaced by “civil engineering works”.]

### 3.80

#### **social impact**

result of a change to society or quality of life (including health and well-being) of individuals or at the level of neighbourhoods or other areas of influence, whether adverse, neutral or beneficial, wholly or partially resulting from social aspects

[SOURCE: ISO 15392:2019, 3.17.3, modified – definition of “impact” has been integrated in the definition; “(including health and well-being) of individuals or at the level of neighbourhoods or other areas of influence” has been added in the definition.]

### 3.81

#### **social performance**

performance related to social impacts and social aspects

### 3.82

#### **stakeholder**

interested party

person or *organization* that can affect, be affected by, or perceive itself to be affected by a decision or activity  
EXAMPLES Customers, communities, suppliers, regulators, non-governmental organizations, investors and employees

[SOURCE: ISO 15392:2019, 3.23]

### 3.83

#### **sustainability**

state of the global system, including environmental, social and economic aspects, in which the needs of the present are met without compromising the ability of future generations to meet their own needs

Note 1 to entry: The environmental, social and economic aspects interact, are interdependent and are often referred to as the three dimensions of sustainability.

Note 2 to entry: In construction of buildings and civil engineering works, it relates to how the attributes of the activities, products or services used in the construction work, or the use of the construction works, contribute to the maintenance of ecosystem components and functions for future generations.

Note 3 to entry: While the challenge of sustainability is global, the strategies for contributing to sustainability within the construction sector are local and differ in context and content from region to region.

Note 4 to entry: Sustainability is the goal of sustainable development.

[SOURCE: ISO 15392:2019, 3.24]

### **3.84**

#### **sustainability assessment of civil engineering works**

combination of the assessments of environmental performance, social performance and economic performance taking into account the technical requirements and functional requirements of a building, civil engineering works) or an assembled system (part of works), expressed at the civil engineering works level

### **3.85**

#### **sustainability performance**

combination of environmental performance, social performance and economic performance of a civil engineering works

### **3.86**

#### **system boundary**

set of criteria specifying which unit processes are part of the civil engineering works

Note 1 to entry: System boundary defines what is included and what is not included in the assessment.

Note 2 to entry: Module D is provided as part of the assessment information

[SOURCE: ISO 14040:2006, modified – “a product system” has been replaced by “the civil engineering works”; the Note 1 has been replaced and Note 2 added.]

### **3.87**

#### **technical performance**

performance related to the capability of civil engineering works or an assembled system (part of works), which are required or are a consequence of the requirements made either by the client, users and/or by regulations

### **3.88**

#### **technical requirement**

type and level of technical characteristics of a civil engineering works or an assembled system (part of works), which are required or are a consequence of the requirements made by the client, users and/or by regulations

### **3.89**

#### **temporary works**

works undertaken during construction work or works to stabilize or protect an existing building or structure, or ensure temporarily its function which are not intended or required to form part of the completed civil engineering works

[SOURCE: ISO 6707-2:2017, 3.3.11, modified – “or ensure temporarily its function” has been added. “Construction works” has been replaced by “civil engineering works”.]

### **3.90**

#### **traceability**

ability to trace the history, application or location of that which is under consideration

[SOURCE: ISO 9000:2015, 3.6.13, modified – General reference to ‘that which is under consideration’ has been added and both Notes have been removed.]

### **3.91**

#### **transparency**

open, comprehensive and understandable presentation of information

[SOURCE: EN ISO 14044:2006, 3.7]

### **3.92**

#### **upstream process**

process carried out before the designated process in the stream of relevant processes

[SOURCE: ISO 21931-1:2010, 3.15]

### 3.93

#### **users**

persons or organizations using the service provided by the civil engineering works

NOTE The service can be provided by the workers or by the asset itself.

### 3.94

#### **users' utilization**

use of the service provided by the civil engineering works by persons or an organization

### 3.95

#### **vulnerability**

propensity or predisposition to be adversely affected

NOTE Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

[SOURCE: ISO 14090:2019, 3.15]

### 3.96

#### **waste**

any substance or object which the holder discards or intends or is required to discard

[SOURCE: Directive 2008/98/EC, Art. 3, no. 1]

### 3.97

#### **worker**

people employed for the creation/operation/demolition of the civil engineering works itself or for the services provided as a result of the asset existence

## 4 Abbreviations

|          |                                                |
|----------|------------------------------------------------|
| AC       | Annual Cost                                    |
| AEV      | Annual Equivalent Value                        |
| EPD      | Environmental Product Declarations             |
| ESL      | Estimated Service Life                         |
| LCA      | Life Cycle Assessment                          |
| LCC      | Life Cycle Cost                                |
| LCIA     | Life Cycle Impact Assessment                   |
| ND - Eco | Not Declared for the Economic performance      |
| ND - Env | Not Declared for the Environmental performance |
| ND - Soc | Not Declared for the Social performance        |
| NPV      | Net Present Value                              |
| ReqSL    | Required Service Life                          |
| RSP      | Reference Study Period                         |
| WLC      | Whole Life Cost                                |

## 5 The process for the assessment

In order to carry out and determine the aspects and the calculations necessary for the assessment of the environmental, economic and social performances of civil engineering works, the steps illustrated in [Figure 2](#) shall be followed. This will help to ensure that the essential information is gathered and processed in accordance with the requirements of this document.

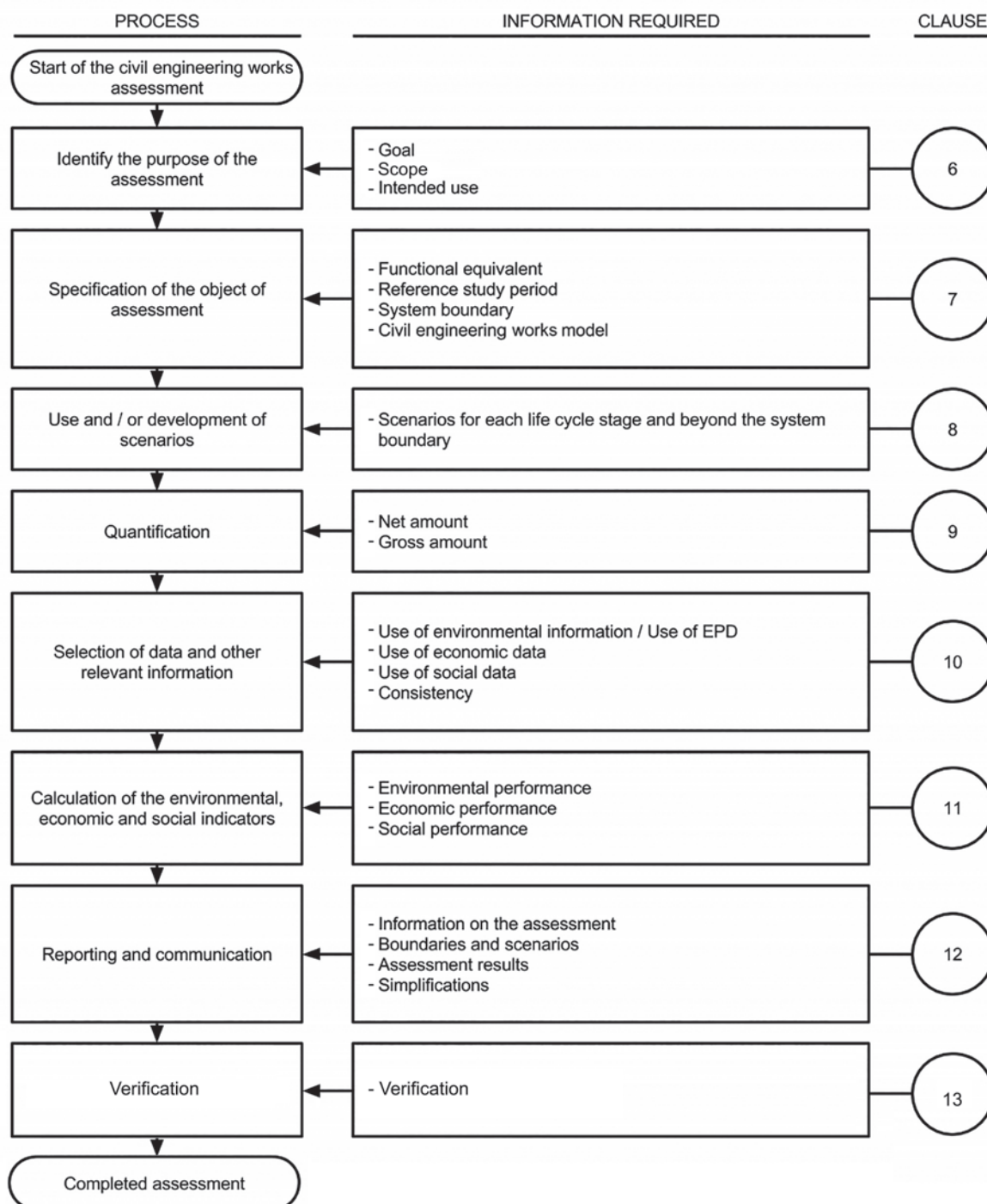


Figure 2 — Steps of the assessment process

## 6 Purpose of the assessment

The purpose of the assessment is defined by the goal, the scope and the intended use of the assessment.

The goal of the assessment is to quantify and describe the sustainability (environmental, economic and social) performance of the object of assessment by means of the compilation of environmental, economic and social information.

In order to estimate and calculate the sustainability performance (environmental, economic and social) of a civil engineering works in terms of the impacts, aspects and costs related to them, the scope and intended use of the assessment shall be defined, agreed and documented in accordance with the requirements of this document before the assessment is carried out.

Depending on the context, the intended use of the assessment includes, but is not limited to, the following:

- a) assistance in a decision-making process, for example:
  - comparisons of the environmental, economic and social performances of different design options;
  - comparisons of the environmental, economic and social performances of refurbishment, reconstruction and/or new construction;
  - identification of the potential for environmental, economic and social performances improvements;
- b) documenting the performances of a civil engineering works for use in, for example:
  - certification;
  - declaring performance with respect to legal, funding or other requirements;
  - marketing;
- c) support for policy development;
- d) procurement.

The scope and intended use specified in the client's brief determine the level of detail required of the environmental, economic and social information, and of other data used in the assessment. However, the assessment method remains the same.

If the client's brief does not require the assessment of all areas/aspects (environmental, economic and social), the scope of the assessment may cover one or two of the three areas of sustainability assessment. If so, in the communication it shall be clearly stated, and it shall be said that the assessment does not comply with the whole standard.

## 7 Specification of the object of assessment

### 7.1 General

The object of assessment shall be the civil engineering works and its area of influence.

If the assessment is restricted to a part of a civil engineering works, to a part of its life cycle, or if any relevant impacts or aspects are not addressed, this shall be documented, reported and reasons given.

The object of assessment shall be described in terms of its location, physical and time-dependent characteristics.

## 7.2 Functional equivalent

The functional equivalent is a representation of the required technical characteristics and functionalities of the civil engineering works. It is how the characteristics of the civil engineering works are rationalized into a minimum description of the object of assessment.

Although assessments can be carried out on an individual object, they will in most instances form part of the process for the evaluation of decisions in relation to the object of assessment. This includes the decision whether to build new, or refurbish/reconstruct an existing civil engineering works, the evaluation of the design options, locations, etc.

Comparisons between the results of assessments of civil engineering works or part of a civil engineering works, at the design stage or whenever the results are used, shall be made only on the basis of their functional equivalence. This requires that the major functional requirements shall be described together with intended use and the relevant specific technical requirements. This description allows the functional equivalence of different options and civil engineering works types to be determined and forms the basis for transparent and fair comparison. If the assessment results based on different functional equivalents are used for comparisons, then the basis for comparison shall be made clear.

The functional equivalent shall cover the requirements to be fulfilled by the civil engineering works according to the client's brief. Functions not required in the client's brief are considered additional functions. Once the client decides to include those additional functions in the brief, they are not additional functions anymore, and shall be included in the functional equivalent.

In case design options include these additional functions, they should be excluded from the functional equivalent and assessed according to the calculation methods described in this document.

**NOTE 1** If appropriate, the assessment results of the civil engineering works that have different functional equivalents (e.g. design options for different types of civil engineering works on the same site or the same types of civil engineering works exposed to different conditions) can also be compared based on a common unit of reference. The choice of the common reference unit for all civil engineering works being compared depends on a specific requirement of a technical, functional, economic, social or environmental aspect, or combination thereof, which is common to all these civil engineering works and is linked to their corresponding functional equivalents.

**NOTE 2** A common reference unit can be derived from the functional equivalent and be used to present the result of the indicators of the environmental, economic and social assessments relative to the functional equivalent. A reference unit can be dimensionless or qualified with a dimension (e.g. per vehicle, per m<sup>3</sup> of water).

The functional equivalent of a civil engineering works or one of its parts shall include, but is not limited to, information on the following aspects:

- civil engineering works type (e.g. road from A to B or harbour);
- relevant technical and functional requirements (e.g. capacity for *X* number of vehicles, capacity of *N* containers per year);
- pattern of use (e.g. number of expected vehicles per year, quantity of containers expected);
- required service life.

**NOTE 3** Other specific requirements and exposure to climate and to other conditions from the immediate surroundings can be relevant for inclusion in the information on the functional equivalent.

The client's brief and legal provisions can provide information on these items. Where this is not the case, the assessment shall include the assumptions that are made, the scenarios and the sources of information used by the assessor.

Where no required service life is specified by the client or by legal provisions, the design life may be used. If the design life is used (which can be longer than the required service life), it shall be described how it is derived, e.g. determined on the basis of empirical, probabilistic or statistical data.

**NOTE 4** Eurocodes and ISO 15686-1 provide guidance on determining the design life of the civil engineering works.

### 7.3 Reference study period

Assessments are carried out on the basis of a chosen reference study period.

The default value for the reference study period shall be the required service life of the civil engineering works. Any deviations from this shall be clearly stated and reasons explained.

The reference study period (RSP) can differ from the required service life given for the object of assessment ([Figure 3](#)) depending on the intended use of the assessment, or on regulatory requirements or national guidance. However, in all cases, the assessment is based on the civil engineering works' life cycle ([Figure 5](#)). Therefore, the values for impacts, aspects and costs shall first be calculated for the required service life.

[Figure 3](#) illustrates the three cases:

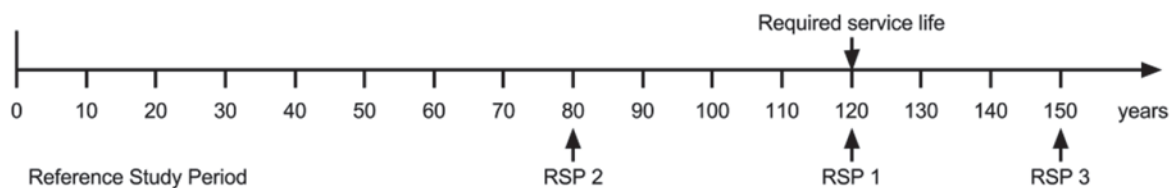


**Figure 3 — Reference study period versus required service life of the assessed object**

RSP 1: If the reference study period and required service life are the same,  $RSP/ReqSL = 1$ , the default value.

RSP 2: If the reference study period is shorter than the required service life, the quantified values of impacts and aspects for the use stage (Modules B1 – B8) and benefits and loads presented in Module D<sub>B</sub> that come from Modules B1-B8, are adjusted by a factor  $RSP/ReqSL$  (see [Figure 4](#)). In economic terms, where the reference study period is less than the required service life, the end of life costs are calculated and then discounted from the end of the required service life.

RSP 3: If the reference study period is longer than the required service life, scenarios for refurbishment, or demolition and construction of an equivalent new civil engineering works shall be developed. These scenarios shall provide for an extension of the service life which, when combined with the required service life of the object of assessment, is equal to or more than the reference study period. The full value of impacts and aspects, and the full costs and incomes for both the actual required service life and the extension to the service life shall be taken into account following the rules given above.

In all cases, the quantified values obtained for the product stage (Modules A1, A2, A3, see [Figure 4](#)), the construction/process stage (Modules A4, A5), and the end of life stage (Modules C1 - C4) are independent from the value of the reference study period. The values for impacts and aspects for modules in the use stage (Modules B1 – B8) are multiplied by the ratio of the reference study period to the required service life ( $RSP/ReqSL$ ) as presented in [Figure 4](#). The loads and benefits reported in Module D derived from the Modules A, B and C are also scaled in the same way. This does not apply to economic indicators where a discount rate shall be applied.

|                         | Multiplication factors |                         | Multiplication factors |
|-------------------------|------------------------|-------------------------|------------------------|
| Modules A1-A3           | x1                     | Modules A1-A3           | x1                     |
| Modules A4-A5           | x1                     | Modules A4-A5           | x1                     |
| Modules B1-B8           | $x \frac{RSP}{ReqSL}$  | Modules B1-B8           | $x \frac{RSP}{ReqSL}$  |
| Modules C1-C4           | x1                     | Modules C1-C4           | x1                     |
| Module D (related to A) | x1                     | Module D (related to A) | x1                     |
| Module D (related to B) | $x \frac{RSP}{ReqSL}$  | Module D (related to B) | $x \frac{RSP}{ReqSL}$  |
| Module D (related to C) | x1                     | Module D (related to C) | x1                     |
| RSP=ReqSL               |                        | RSP<ReqSL               |                        |

**Figure 4 — Illustration of how the quantified environmental and social impacts and aspects are adjusted for a reference study period that is less than the required service life (Cases RSP 1 and RSP 2)**

## 7.4 System boundary

### 7.4.1 General

The system boundary determines the processes that are taken into account for the object of assessment. For a new civil engineering works, the assessment shall include the civil engineering works' life cycle and Module D, as shown in [Figure 5](#). For an existing civil engineering works (or part of it), the assessment shall include any acquisition cost and all stages of the remaining service life, Module D and the end of life stage of the civil engineering works.

**NOTE 1** For comparisons of refurbishment options for existing civil engineering works (or comparison of demolition and new built versus refurbishment) it might not be useful to include the EOL impact of existing materials when they are part of both options.

**NOTE 2** When the system boundary is defined in order to compare different options, it is possible to exclude the impacts of existing materials when they are the same for all the options.

In this context, the object of assessment is the civil engineering works and its area of influence. This includes all the upstream and downstream processes needed to establish and maintain the function(s) of the civil engineering works including the users' utilization, from the acquisition of raw materials to their disposal or to the point where materials exit the system boundary either during or at the end of the civil engineering works life cycle. It includes also, all the costs associated with the acquisition of the site and the civil engineering works, through the use stage and the end of life stage at the end of the civil engineering works life cycle, taking into account the revenues associated.

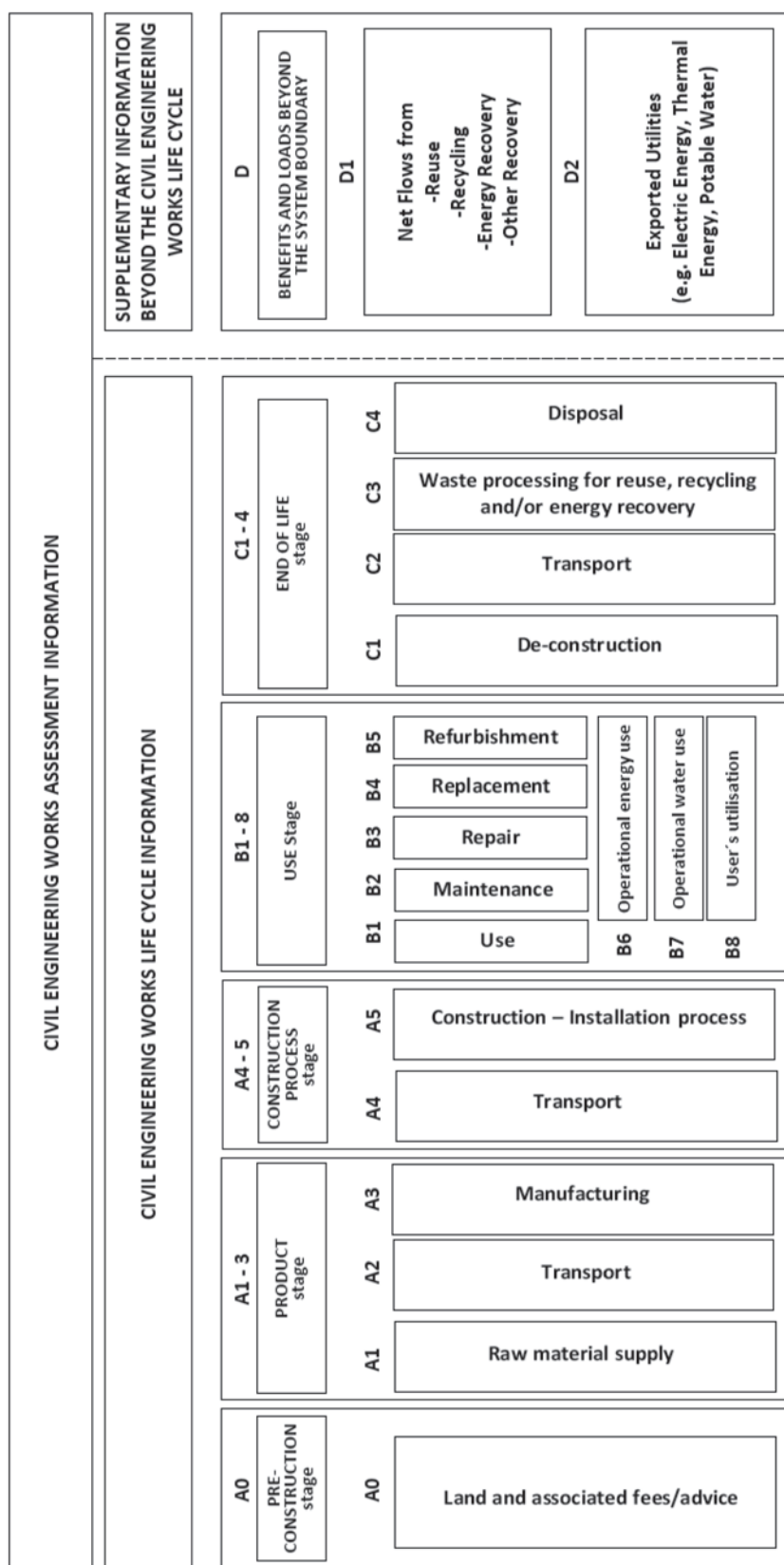


Figure 5 — Display of modular information for the different stages of civil engineering works' assessment

The setting of the system boundaries follows the “modularity principle”: where processes influence the civil engineering works’ environmental, economic and social performances during its life cycle, they shall be assigned to the module of the life cycle stage where they occur.

**EXAMPLE** All impacts and aspects due to the replacement of a deteriorated rail in the use stage which include production, transport, use of ancillary materials and recycling are assigned to ‘Repair’, Module B3.

The boundary covers environmental impacts, economic costs/revenues and social impacts for all modules.

**Figure 5** illustrates the organization of the different information modules used for reporting the assessment of the civil engineering works.

**NOTE** All the civil engineering works sustainability standards developed by CEN/TC 350 use a common format for reporting information from the sustainability assessment.

#### **7.4.2 Boundary of the pre-construction stage (Module A0)**

The boundary for Module A0 covers all the before life cycle stages. This module includes planning costs, land costs, professional fees and taxes incurred.

In general, all cost and impacts before the tender may be included in A0 stage.

#### **7.4.3 Boundary of the product stage (Modules A1, A2 and A3)**

The boundary for Modules A1 to A3 covers the 'cradle to gate' processes for the materials and services used in the construction.

**NOTE** It is possible that environmental information and cost of manufacture, transport and install construction products, are only available in aggregated form and not as individual itemized costs.

#### **7.4.4 Boundaries of the construction process stage (Modules A4 and A5)**

##### **7.4.4.1 General**

The construction process stage covers the processes from the factory gate of the different construction products and integrated technical systems to the handover of the construction works to the client.

The consideration of aspects and impacts of the manufacturing of capital goods (e.g. cranes) shall be in accordance with the criteria established for the assessment for the exclusion of inputs and outputs.

##### **7.4.4.2 Boundary of the transport to site (Module A4)**

The boundary for Module A4 shall include at least:

- transport of materials and products from the factory gate to the civil engineering works’ site, including any transport, intermediate storage and distribution;
- losses due to the transportation (i.e. production, transport and waste management of the products and materials that are damaged or lost during transportation).

##### **7.4.4.3 Boundary of the construction process (Module A5)**

The boundary for Module A5 shall include, where applicable:

- ground works and landscaping;
- storage of products, including the provision of heating, cooling, humidity, etc.;
- transport of persons and construction equipment (cranes, scaffolding, etc.) to and from the site;

Where construction equipment is often moved from one construction site to the next, due to the activity of a contractor, the average distance is taken into account. For hired equipment the actual distance for the transport to and from the construction site is taken into account.

- transport of materials, products, waste and equipment within the site;
- temporary works, including temporary works located off-site as necessary for the construction installation process;
- on-site production and transformation of a product;
- provision of heating, cooling, ventilation, humidity control etc. during the construction process;
- installation of the products in the civil engineering works including ancillary materials not counted in the EPD of the products;

EXAMPLE Releasing agents in formworks for concrete, formworks discarded at the end of the project, mass diagram compensation in a road.

- water use for cooling of the construction machinery or on-site cleaning;
- waste management processes of other wastes generated on the construction site – this includes all processes (including transportation from the civil engineering works site) until final disposal or until end of waste state is reached;
- production, transportation and waste management of products and materials lost during the construction and installation process.

#### 7.4.5 Boundaries of the use stage (Modules B1 – B8)

##### 7.4.5.1 General

The use stage covers the protection, conservation, moderation, maintenance, control and operation of the object of assessment including works-integrated technical systems.

The boundary for the assessment excludes impacts, aspects and costs relating to the appliances that are not civil engineering works asset-related and to non-intended uses.

The boundary for the assessment shall exclude performance guarantees or impacts of manufacturing cars. The impacts of the use of cars is included in B8.

Civil engineering works-related appliances are products that are fixed to the civil engineering works so that their dismantling decreases the performance of the civil engineering works and the dismantling or replacement of the product constitute construction operations.

##### 7.4.5.2 Boundary of the work in use (Module B1)

The boundary for Module B1 shall include:

- all impacts and aspects arising from the normal operation of the civil engineering works;  
EXAMPLE 1 Release of substances from components of the civil engineering works during normal conditions of use;
- cost and incomes resulting from the normal operation of the civil engineering works independent of the user's utilization.

EXAMPLE 2 Rents (concessions), insurance, cyclical regulatory costs (fire or access inspections), fees and taxes.

The boundary for Module B1 shall exclude:

- energy consumption (included in Module B6);
- water consumption (included in Module B7);
- users' utilization (included in Module B8).

#### **7.4.5.3 Boundary of maintenance (Module B2)**

The boundary for Module B2 shall include:

- the production and transportation of the components and ancillary products used for maintenance, including production impacts and aspects of any losses of materials during transportation;
- all cleaning processes of the interior and exterior of the civil engineering works, as well as the cost related to them;
- all processes and the costs associated to the activities for maintaining the functional and technical performance of the civil engineering works and its technical systems, as well as aesthetic qualities.

EXAMPLE      Painting work, annual inspection and maintenance of the machinery.

#### **7.4.5.4 Boundary for repair (Module B3)**

The boundary for Module B3 shall include:

- the production of the repaired part of component and ancillary products;
- the transportation of the repaired part of component and ancillary products, including production impacts, aspects of any losses of materials during transportation;
- the repair process of the repaired part of component and ancillary products;
- waste management of the removed part of the component and of ancillary products;
- the end of life stage of the removed part of the component and of ancillary products.

#### **7.4.5.5 Boundary for replacement (Module B4)**

The boundary for Module B4 shall include:

- the production of the replaced component and ancillary products;
- the transportation of the replaced component and ancillary products, including production impacts and aspects of any losses of materials during transportation;
- the replacement process of the replaced components and ancillary products;
- waste management of the removed component and of ancillary products;
- the end of life stage of the removed component and of ancillary products.

#### **7.4.5.6 Boundary for refurbishment (Module B5)**

The boundary for Module B5 shall include:

- the production of the new components;
- the transportation of the new components, including production impacts and aspects of any losses of materials during transportation;

- construction as part of the refurbishment process; including production of any material lost during refurbishment;
- waste management of the removed components;
- the end of life stage of the removed components.

If a civil engineering works is refurbished and the refurbishment was not taken into account at the outset, i.e. in any previous assessment, a new assessment shall be carried out, particularly where the refurbishment changes the functional equivalent. In such cases, the refurbishment will not have been included as Module B5 in the first assessment. In the new assessment of the refurbished civil engineering works, the environmental, economic and social impacts and aspects of the refurbishment materials and reconstruction/installation processes are allocated to Modules A1 to A5.

#### **7.4.5.7 Boundary of the operational energy use (Module B6)**

The boundary for Module B6 covers the energy used by the civil engineering works integrated technical systems during its normal operation.

Energy demand of a civil engineering works, amount of delivered energy into a civil engineering works, amount of generated energy in a civil engineering works and amount of exported energy from a civil engineering works shall be assessed in accordance with the framework of EN ISO 52000-1.

If the energy use of appliances that are not civil engineering works-related is included within the energy calculation, then this shall be documented and reported and communicated separately.

#### **7.4.5.8 Boundary of the operational water use (Module B7)**

The boundary for Module B7 covers the water used and its treatment (pre- and post-use) by the civil engineering works during its normal operation.

The boundary for Module B7 shall include:

- water used in industrial processes;
- water used for irrigation of associated landscape areas;
- water used for other specific water use of civil engineering works-integrated systems.

EXAMPLE      Fountains and ponds.

The boundary for Module B7 shall exclude maintenance (included in Module B2), repair (included in Module B3), replacement (included in Module B4) and refurbishment (included in Module B5) of equipment required to supply water to the civil engineering works if it is not part of the system.

If the water use of appliances that are not civil engineering works-related is included within the water consumption calculation, then this shall be documented and reported and communicated separately.

#### **7.4.5.9 Boundary of the users' utilization (Module B8)**

The boundary for Module B8 covers all aspects, impacts, revenues and costs relevant to the users' utilization of the civil engineering works during its normal operation and only for the civil engineering works intended use.

The amounts of utilities (e.g. energy or fresh water) exiting the boundaries because of the intended use of the civil engineering works shall be reported within this Module B8.

Net benefits resulting from the use of those amounts of utilities exiting the boundaries shall be reported in Module D, see [7.4.7.3](#).

Utilities produced by the asset as part of the activity, but not intended as any of the functions, shall be reported in Module D.

**EXAMPLE 1** Energy generation from a hydropower plant is one of the asset's functions, in the same way as clean water production from a water treatment plant. Energy produced by solar panels of a road to supply energy for lighting that exceeds the needs of the installation and is exported to the grid is considered in Module D.

**EXAMPLE 2** Toll revenue bonds, impact of traffic on a road, of planes movement in an airport or of the de-icing of the planes.

**NOTE** The energy production of dams is reported in kWh and in terms of revenues. Environmental credits are not reported in B8 but in D.

A life cycle impact assessment shall be carried out for the users' consumables. Manufacturing impacts of capital goods of users shall not be included.

**EXAMPLE 3** Fuel or electricity used by cars in the road is included, as they are users' consumables.

**EXAMPLE 4** Capital goods of users are cars, airplanes, ships, etc.

**EXAMPLE 5** Energy production of a dam, when it is part of its final intended functions.

#### **7.4.6 Boundaries of the end of life stage (Modules C1-C4)**

##### **7.4.6.1 General**

The end-of-life stage of a civil engineering works starts when it is decommissioned and is not intended to have any further use. At this point, the civil engineering works' demolition/deconstruction can be considered as a multi-output process that provides a source of materials, products and construction elements that are to be discarded, recovered, recycled or reused. The scenarios for these end-of-life options for the products and materials determine the system boundary.

The civil engineering works is deemed to have reached the end of its life when:

- all components and materials that were to be cleared from the site have been removed;
- the site is made ready for future re-use (i.e. cleared ready for new activity);
- the civil engineering works is decommissioned and abandoned.

##### **7.4.6.2 Boundary for deconstruction (Module C1)**

The boundary for Module C1 covers on-site operations and operations undertaken in temporary works located off-site as necessary for the deconstruction processes after decommissioning up to and including on-site sorting, deconstruction, dismantling and/or demolition.

##### **7.4.6.3 Boundary for transport (Module C2)**

The boundary for Module C2 covers transportation to disposal and/or until the end-of-waste state is reached. This includes transport to and from possible intermediate storage/processing locations.

##### **7.4.6.4 Boundary for waste processing for reuse, recovery or recycling (Module C3)**

The boundary for Module C3 covers the processes until the outputs of the previous stages reach the end-of-waste state.

Scenario for waste processing including materials flows shall be given taking into account currently widely used technologies but they may also consider best available technologies.

Materials for energy recovery are identified based on the efficiency of energy recovery with a rate of 60 % or higher, without prejudice to existing legislation. Materials from which energy is recovered with