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Trajnostnost gradbenih objektov - Ocenjevanje trajnostnosti gradbenih inženirskih objektov - Računske metode

Sustainability of construction works - Sustainability assessment civil engineering works - Calculation methods

Nachhaltigkeit von Bauwerken - Bewertung der Nachhaltigkeit von Ingenieurbauwerken - Rechenverfahren

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Sustainability of construction works - Sustainability assessment civil engineering works - Calculation methods

Nachhaltigkeit von Bauwerken - Bewertung der
Nachhaltigkeit von Ingenieurbauwerken -
Rechenverfahren

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17472:2020) has been prepared by Technical Committee CEN/TC 350 “Sustainability of construction works”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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Introduction

The purpose of this document is to provide 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.

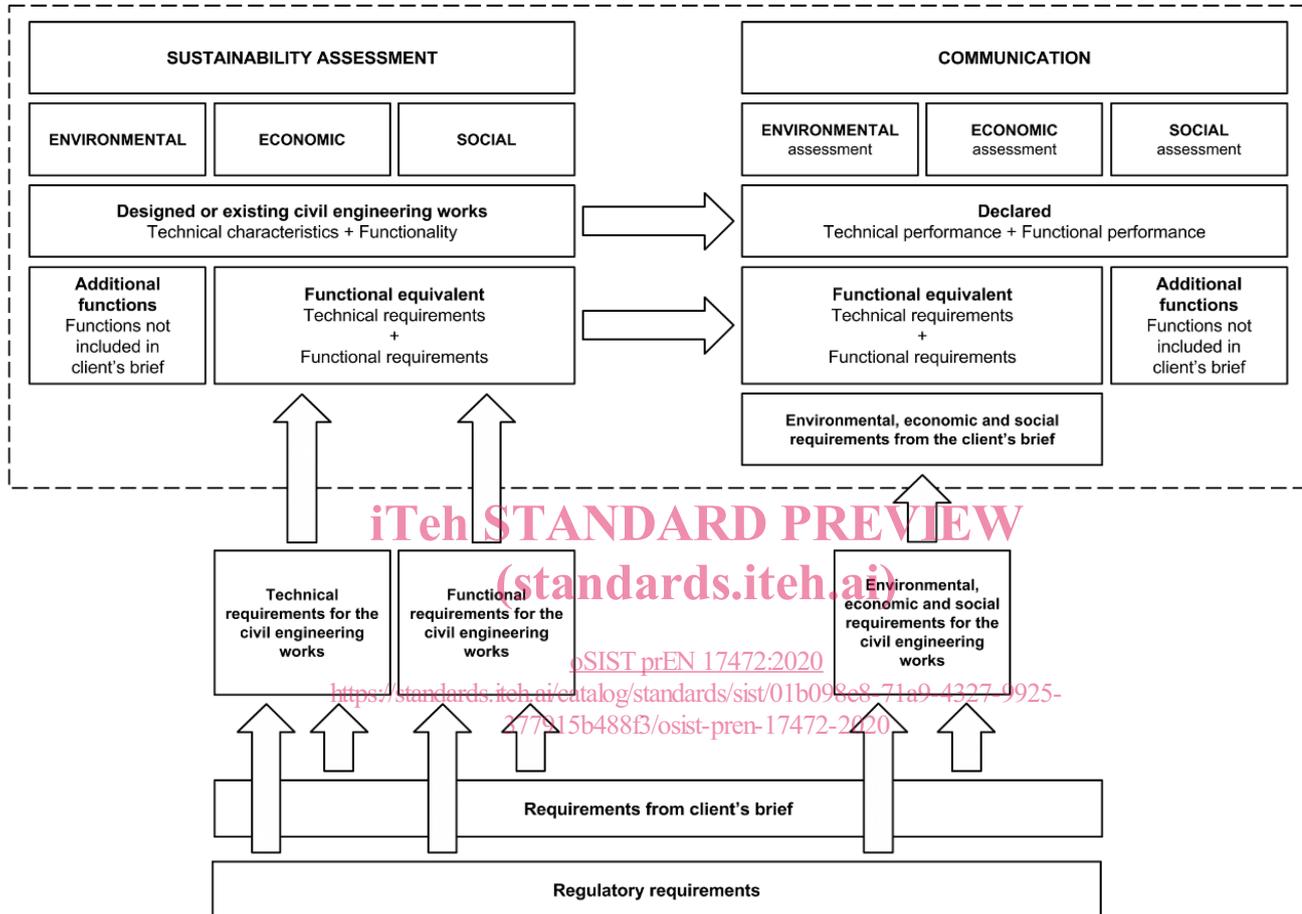


Figure 1 — Concept of sustainability assessment of civil engineering works

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.

This document is intended to support the decision-making process and documentation of the assessment of the sustainability of a civil engineering work.

In this document, the method of assessment of sustainability is based on a life cycle approach. It is important to use a consistent model for describing and recording the civil engineering works and its life cycle for assessing the environmental, economic and social performance. The same reference study period is used for all three elements of the assessment.

The general requirements for sustainability assessment of civil engineering works are described in EN 15643-5. Other standards developed by CEN/TC 350 in this area, and how they are related to this document, are shown in Figure 2.

Framework Level	Sustainability Assessment of Construction Works			Technical characteristics	Functionality
	prEN 15643 (revisions of EN 15643-1...5) Sustainability of Construction Works – Framework for Assessment of Buildings and Civil Engineering Works				
				Service Life Planning - General Principles ISO 15686-1	
Works Level	EN 15978 Assessment of Environmental Performance of Buildings	EN 16309 Assessment of Social Performance of Buildings	EN 16627 Assessment of Economic Performance of Buildings	prWI00350029 Assessment of Options for Sustainable Refurbishment of Buildings	
	prEN WI00350028 Assessment of Civil Engineering Works			EN ISO 52000 Energy Performance of Buildings	
Product Level	EN 15804 + A1 + A2 Environmental Product Declarations - Core Rules for Construction Products			Service Life Prediction Procedures ISO 15686-2,	
	EN 15942 Communication Format B-to-B			Feedback from Practice ISO 15686-7,	
	prEN 15941 rev Generic Data			Reference Service Life & Service Life Estimation ISO 15686-8	
	prEN xxxxx Communication Format B-to-C				
	CEN/TR 16790 Guidance for EN 15804				
	CEN/TR 17005 Add. Indicators				

Figure 2 — Work programme of CEN/TC 350

NOTE 1 The environmental assessment at civil engineering works level requires information from products and services (EN 15804).

NOTE 2 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.

1 Scope

The document provides the specific methods and requirements for the assessment of environmental, economic and social performances of a civil engineering works while taking into account the civil engineering work's functionality and technical characteristics. The primary objective of this document is to help in the decision making for a project by providing a standardized method for enabling comparability of scheme options. The document has not been designed to be used for the development of sustainability labels however, this use is not precluded.

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. The 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.

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

The document provides 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;
- the data necessary for the application of the standard and calculation.

Whenever the asset includes building(s) as part of the civil engineering works the building(s) will be assessed using EN 15978 for environmental performance, EN 16309 for social performance and EN 16627 for economic performance.

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 15978, *Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method*

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

EN 16627, *Sustainability of construction works - Assessment of economic performance of buildings - Calculation methods*

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 15686-10, *Buildings and constructed assets - Service life planning - Part 10: When to assess functional performance*

ISO 1996-2:2017, *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 <http://www.electropedia.org/>

— ISO Online browsing platform: available at <https://www.iso.org/obp>
<https://standards.iteh.ai/catalog/standards/sist/01b098e8-71a9-4327-9925-377915b488f3/osist-pren-17472-2020>

3.1

accessibility

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

Note 1 to entry: 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, modified]

prEN 17472:2020 (E)**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
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 influence area concerns only the civil engineering works and not the construction products. Example: Stones coming from China, China is not in the influence area.

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

**3.5
assembled system
part of works**

component or a set of components incorporated in the civil engineering works

**3.6
brief**

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

[SOURCE: ISO 6707-2:2017, 3.2.18, modified]

**3.7
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 6707-1:2017, 3.1.1.3, modified]

**3.8
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: ISO6707-1:2017, 3.1.1.2]

3.9 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]

3.10 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]

3.11 client

person or organisation that requires a building or civil engineering works to be provided, altered or extended and is responsible for initiating and approving the brief

3.12 construction product

item manufactured or processed for incorporation in civil engineering works

[SOURCE: ISO 6707-1:2017, 3.4.1.3, modified – “construction works” has been replaced by “civil engineering works”. Note 1 has been removed.]

Note 1 to entry: Construction products are items supplied by a single responsible body.

3.13 component

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

3.14 construction site

specified area of land where a building or a civil engineering works is located or is defined to be located and construction work of the building or civil engineering works and associated external works are undertaken

3.15 construction work

activities of forming a civil engineering works

[SOURCE: ISO 6707-1:2017, 3.5.1.1, modified]

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prEN 17472:2020 (E)**3.16****construction works**

everything that is constructed or results from construction operations

[SOURCE: ISO 6707-1:2017, 3.1.1.1, modified – Note 1 has been removed.]

Note 1 to entry: This covers both building and civil engineering works, and both structural and non-structural elements.

3.17**decommissioning**

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

3.18**design life**

service life intended by the designer

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

3.19**discount rate**

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

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3.20**disposal**

waste treatment operation other than recovery

[SOURCE: Directive 2008/98/EC, Art. 3, no. 19, modified – Definition has been shortened.]

3.21**downstream process**

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

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

3.22**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/DIS 15392:2018, 3.12, modified – “construction works” has been replaced by “civil engineering works”.]

3.23**economic impact**

any change to the economic conditions, whether adverse or beneficial, wholly or partially resulting from economic aspects

[SOURCE: ISO/DIS 15392:2018, 3.17.1 and 3.17]

3.24**economic performance**

performance related to economic impacts and economic aspects

3.25**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/DIS 15392:2018, 3.13, modified – “construction works” has been replaced by “civil engineering works”]

3.26**environmental impact**

any change to the environment, whether adverse or beneficial, wholly or partially resulting from environmental aspects

[SOURCE: ISO/DIS 15392:2018, 3.17.2 and 3.17]

3.27**environmental performance**

performance related to environmental impacts and environmental aspects

[SOURCE: ISO/DIS 15392:2018, 3.16]

3.28**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 15686-5:2017, 3.3.2, modified –Note 1 has been removed.]

3.29**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.]

3.30**exported energy**

total energy, expressed per energy carrier, supplied by the civil engineering works through the system boundary

3.31**external works**

all infrastructure, external to the works structure, that is specifically or significantly needed for constructing and maintaining the civil engineering works

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prEN 17472:2020 (E)**3.32****financial value**

aggregate of costs and revenues of economic aspects expressed in monetary units, considering the price level

3.33**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

[ISO 21931-1:2010, 3,7, modified – “or civil engineering works or an assembled system” has been added.]

3.34**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

3.35**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

3.36**functionality**

suitability or usefulness for a specific purpose or activity

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

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3.37**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

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[SOURCE: ISO 21930:2017, 3.3.8]

3.38**handover**

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

[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**internal rate of return****IRR**

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

3.43**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]

3.44**level of functionality**

number indicating the relative functionality required for a user 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 1 to entry: 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]

3.45**life cycle**

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

3.46**life cycle assessment****LCA**

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

[SOURCE: EN ISO 14044:2006, 3.2]

Note 1 to entry: In this context, a civil engineering works or assembled system is considered a “product” and a part of a “product system”.

3.47**life cycle cost****LCC**

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