ISO/TS 21929-2

TC 59/SC 17

Sustainability in building construction

Sustainability indicators

Part 2 : Framework for the development of indicators for civil engineering works

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Executive summary

Although the ISO portfolio already comprises of a number of standards dealing with sustainability for buildings, this is the first publication dealing with sustainability for civil engineering works (e.g. road construction, dams, maritime works). It will contribute to improving the related design and decision process and help in the monitoring, measurement and evaluation of the sustainability of civil engineering works throughout their life-cycles.

It will also contribute to demonstrating that the civil engineering works sector feel socially responsible and to gathering supporting data for communication and marketing strategies.

It is intended to be used in the

- design and decision making process during the planning and design stage of civil engineering works,
- development and application of assessment methods and certification systems,
- specification and verification of environmental and social requirements in the context of procurement,
- indicating of civil engineering performance (e.g. marketing),
- measuring, monitoring or evaluating of the performance and achievement of sustainability objectives over the different life cycle stages of the civil engineering works, and
- representing of activities and results in the context of responsibility towards economy, environment and society (e.g. sustainable development reporting).

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Foreword

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

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

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

The committee responsible for this document is ISO/TC 59, *Buildings and civil engineering works*, SC 17, *Sustainability in buildings and civil engineering works*.

ISO 21929 consists of the following parts, under the general title Sustainability in buildings and civil engineering works — Sustainability indicators:

— *Part 1: Framework for the development of indicators and a core set of indicators for buildings*

— *Part 2: Framework for the development of indicators for civil engineering works* [Technical Specification]

Introduction

This part of ISO 21929 describes and gives guidelines for the development of sustainability indicators related to civil engineering works and defines the aspects and impacts of civil engineering works to consider when developing systems of sustainability indicators.

These guidelines form a basis for the suite of ISO/TC 59/SC 17 standards intended to address specific issues and aspects of sustainability relevant to construction works. The issue of sustainable development is broad and of global concern, and, as such, involves all communities and interested parties. Both current and future needs define the extent to which economic, environmental and social aspects are considered in a sustainable development process.

The built environment (buildings and civil engineering works) is a key element in determining quality of life, and contributes to cultural identity and heritage. As such, it is an important factor in the appreciation of the quality of the environment in which society lives and works.

The building and construction sector is highly important for sustainable development because:

— it is a key sector in national economies.

— it has a significant interface with poverty reduction through the provision of improved basic economic and social services within the built environment.

— it is one of the single largest industrial sectors and, while providing value and employment, it uses considerable resources and contributes to the transformation of areas, with consequential impacts on economic and social conditions and the environment.

— it creates the built environment, which represents a significant share of the economic assets of individuals, organizations and nations, providing societies with their physical and functional environment.

— it has considerable opportunity to show improvement relative to its economic, environmental and social impacts.

While the challenge of sustainable development is global, the strategies for addressing sustainability in civil engineering works are essentially local and differ in context and content from region to region. These strategies reflect the context, the preconditions and the priorities and needs, not only in the built environment, but also in the social environment. This social environment includes social equity, cultural issues, traditions, heritage issues, human health and comfort, social infrastructure and safe and healthy environments.

It can, in addition, particularly in developing countries, include poverty reduction, job creation, access to safe, affordable and healthy shelter, and loss of livelihoods.

This part of ISO 21929 defines a framework for the development of sustainability indicators for civil engineering works based on the premise that civil engineering works contribute to sustainable development about the required performance and functionality

with minimum adverse environmental impact, while encouraging improvements in economic and social (and cultural) aspects at local, regional and global levels.

This part of ISO 21929 follows the general principles presented in ISO 15392.

Indicators are figures or other qualitative or descriptive measures that enable information on a complex phenomenon, like environmental impact, to be simplified into a form that is relatively easy to use and understand.

The three main functions of indicators are quantification, simplification and communication. Targets can also be set with the help of indicators. Changes in a civil engineering works over time and the development of changes in relation to stated objectives can be monitored with the help of indicators. One of the important functions of an indicator with reference to decision-making is its potential to show a trend.

When developing and selecting indicators, the starting point is the identification of the main users and user needs. Sustainability indicators for civil engineering works are needed in decision-making by a number of interested parties, such as

a) public bodies and policy makers,

b) investors, owners and promoters,

c) planners, developers and designers,

d) governmental and non-governmental organizations (considering interest groups both at national and at local level),

e) manufacturers of products,

f) contractors,

g) operators and maintainers,

h) users and other stakeholders who are given service by the infrastructure, and

i) nearby local residents.

The civil engineering and construction sector needs sustainability indicators both for its own decision-making within design, production and management as well as for indicating to the public and to clients the economic, environmental or social impact of civil engineering works, their products and related processes.

Indicators, as well as sets and systems of indicators, for the specification, assessment and representation of the contribution of a civil engineering works to sustainable development can be used in many different ways. For example, among others, their application can support the following:

— design and decision making process(es) during the planning, and design stage of a civil engineering works (e.g. incorporation in the design of sustainable material, technologies, processes and other components).

— development and application of assessment methods and certification systems.

— specification and verification of environmental and social requirements in the context of procurement.

— indicating the civil engineering performance (e.g. marketing).

— measuring, monitoring or evaluating the performance and achievement of sustainability objectives over the different life cycle stages of the civil engineering works.

— accepting responsibility for impacts on the environment and the society.

— representation of activities and results in the context of responsibility towards

— the economy, environment and society (e.g. sustainable development reporting).

NOTE The monitoring and evaluation of objectives can contribute to the continual improvement related to a specific or group of civil engineering works.

This part of ISO 21929 is one in a suite of International Standards dealing with sustainability in buildings and civil engineering works, which includes ISO 15392, ISO 21929-1, ISO 21930, ISO 21931-1, along with the terminology of sustainability in buildings and civil engineering works (ISO/TR 21932).

The relationship among the International Standards is shown in Figure 1.

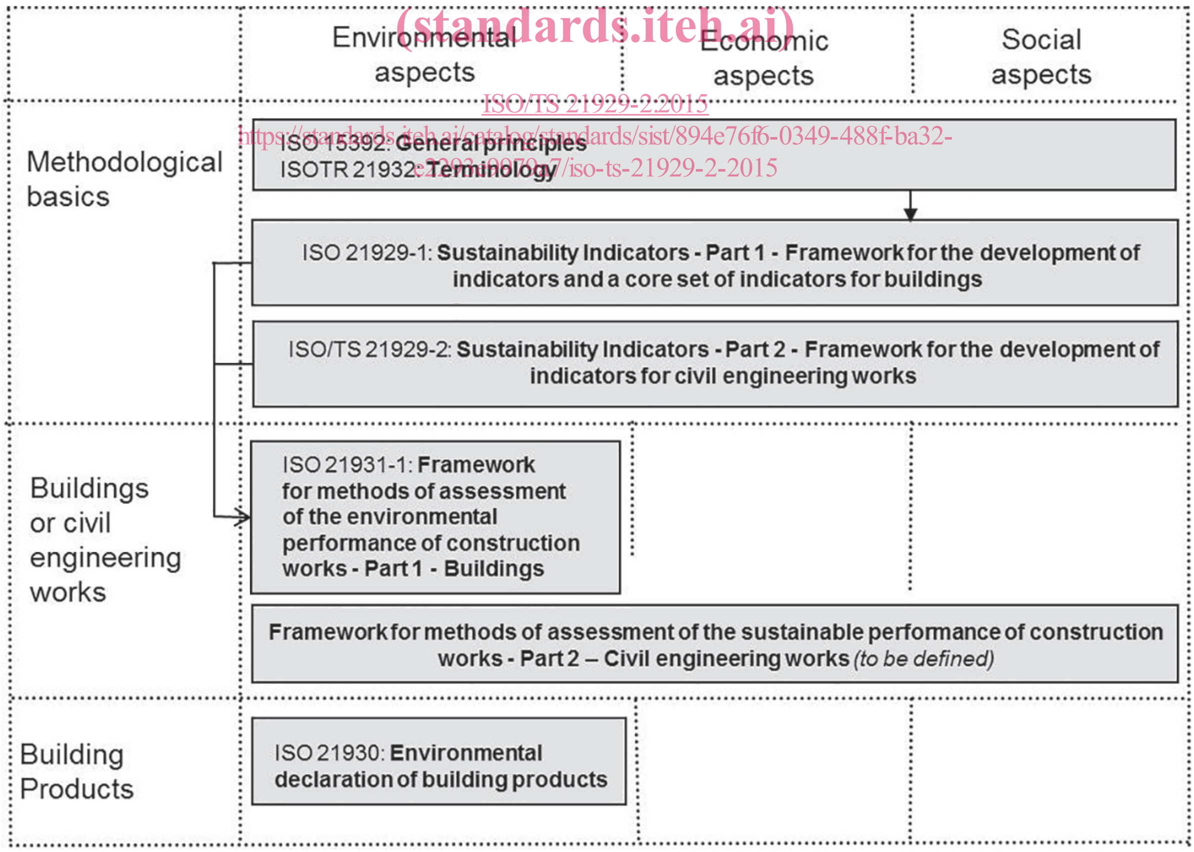
Environmental aspects
Economic aspects
Social aspects
Methodological basics
ISO 15392: General principles
ISOTR 21932: Terminology
ISO 21929-1: Sustainability Indicators - Part 1 - Framework for the development of indicators and a core set of indicators for buildings
ISO/TS 21929-2: Sustainability Indicators - Part 2 - Framework for the development of indicators for civil engineering works
Buildings or civil engineering works
ISO 21931-1: Framework for methods of assessment of the environmental performance of construction works - Part 1 - Buildings
Framework for methods of assessment of the sustainable performance of construction works - Part 2 – Civil engineering works (to be defined)
Building Products
ISO 21930: Environmental declaration of building products

Figure 1 — Suite of related International Standards for sustainability in buildings and civil engineering works

1 Scope

This part of ISO 21929 establishes a list of aspects and impacts which should be taken as the basis for the development of sustainability indicators for assessing the sustainability performance of new or existing civil engineering works, related to their design, construction, operation, maintenance, refurbishment and end-of-life. Together, the indicators developed from this list of aspects and impacts provide measures to express the contribution of a civil engineering works to sustainability and sustainable development. The developed indicators should represent aspects of civil engineering works that impact on issues of concern related to sustainability and sustainable development.

The object of consideration in this part of ISO 21929 is a civil engineering works, a part of the civil engineering works or a combination of several civil engineering works.

NOTE The aspects and impacts described in this part of ISO 21929 are intended to be used for all types of civil engineering works. Development of specific sets of indicators for different typologies of civil engineering works (industrial processes infrastructures; linear infrastructures; dams and other fluvial works; maritime works; public spaces; other civil engineering works-not contained in the previous typologies) will be the subject of future standardization work.

This part of ISO 21929

- adapts general sustainability principles for civil engineering works,
- includes a framework for developing sustainability indicators for use in the assessment of economic, environmental and social impacts of civil engineering works,
- establishes a core set of aspects and impacts, which should be taken into account, when developing systems of indicators for civil engineering works,
- describes how to use sustainability indicators with regard to civil engineering works, and
- gives rules for establishing a system of indicators.

This part of ISO 21929 follows the principles set out in ISO 15392 and, where appropriate, is intended to be used in conjunction with, and following the principles set out in, ISO 26000, ISO 14040 and the family of International Standards that includes ISO 14020, ISO 14021, ISO 14024 and ISO 14025. Where deviation occurs or where more specific requirements are stated, this part of ISO 21929 takes precedence.

This part of ISO 21929 does not give guidelines for the weighting of indicators or the aggregation of assessment results.

2 Normative references

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

ISO 6707-1, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

ISO 14020, *Environmental labels and declarations — General principles*

ISO 14040, *Environmental management — Life cycle assessment — Principles and framework*

ISO 14050, *Environmental management — Vocabulary*

ISO 15392, *Sustainability in building construction — General principles*

ISO 21929-1, *Sustainability in building construction — Sustainability indicators — Part 1: Framework for the development of indicators and a core set of indicators for buildings*

ISO 21931-1, *Sustainability in building construction — Framework for methods of assessment of the environmental performance of construction works — Part 1: Buildings*

ISO 26000, *Guidance on social responsibility*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 14040, ISO 14050, ISO 15392 and the following apply. Where differences or conflicts occur, the definitions in 3.1 to 3.44 take precedence.

NOTE 1 Several terms and definitions from these other sources have been repeated below for ease of reference.

NOTE 2 ISO/TR 21932 is another source of terminological data on concepts related to sustainability in civil engineering works and sustainable development that is applicable to the different aspects of both the construction (process) and use of a civil engineering works and the effect of the civil engineering works on sustainable development.

3.1
airport
area containing an airfield and facilities for handling passengers and cargo

[SOURCE: ISO 6707-1:2014, 3.3.12]

3.2
area of influence
area or combination of areas surrounding a *civil engineering works* (3.5) that can be affected with changes to their economical, environmental or social conditions by the civil engineering works' operations throughout its *life cycle* (3.24)

Note 1 to entry: the area of influence is variable and dependent on the construction works (3.9) project, its location and its life cycle stage. As an overall approach, the area of influence will be usually limited to the civil engineering works itself and its immediate surroundings.

3.3
avoided emissions
emissions that are not produced (are avoided) as a result of the implementation of voluntary initiatives or good practices

3.4
built environment
collection of man-made or induced physical objects located in a particular area or region

Note 1 to entry: When treated as a whole, the built environment typically is taken to include buildings, external works (landscaped areas), infrastructure (3.20) and other construction works (3.9) within the area under consideration.

[SOURCE: ISO 21929-1:2011, 3.7]

3.5
civil engineering work
work of constructing *civil engineering works* (3.6)

[SOURCE: ISO 6707-1:2014, 7.1.3]

3.6
civil engineering works
construction works (3.9) comprising a *structure* (3.35), such as a *dam* (3.9), bridge, *road* (3.35), *railway* (3.31), runway, utilities, *pipeline* (3.30), or *sewerage system* (3.37), or the result of operations such as dredging, *earthwork* (3.12), geotechnical processes, but excluding a building and its associated site works

[SOURCE: ISO 6707-1:2014, 3.1.2]

3.7
civil engineering work system boundary
set of criteria specifying which unit processes are part of the specific analysis of a *civil engineering works* (3.6)

[SOURCE: ISO 14050:2009, 6.6; modified and adapted to civil engineering works]

3.8
construction work
activities of forming a *construction works* (3.9)

[SOURCE: ISO 6707-1:2014, 7.1.1]

3.9
construction works
everything that is constructed or results from construction operations

Note 1 to entry: It includes both buildings and *civil engineering works* (3.6).

[SOURCE: ISO 6707-1:2014, 3.1.1; modified and adapted to civil engineering works]

3.10
dam
barrier constructed to retain water in order to raise its level, form a reservoir, or reduce or prevent flooding

[SOURCE: ISO 6707-1:2014, 3.2.24]

3.11
dock
partially enclosed or sheltered area of water where vessels may be moored or docked, used for shipping

[SOURCE: ISO 6707-1:2014, 3.3.69: modified and adapted to civil engineering works by elaborating text to explicitly describe concept of basin (used) for shipping]

3.12
earthwork
work of excavating, or the raising or sloping of ground

[SOURCE: ISO 6707-1:2014, 7.1.6]

3.13
economic aspect
part of civil engineering works, processes or services related to their *life cycle* (3.24), that can cause a change to economic conditions

[SOURCE: ISO 15392, 3.13; modified and adapted to civil engineering works]

3.14
environmental aspect
part of civil engineering works, processes or services related to their *life cycle* (3.24), that can cause a change to the environment

Note 1 to entry: Adapted from ISO 14001:2004.

[SOURCE: ISO 15392, 3.14; modified and adapted to civil engineering works]

3.15
external costs
costs associated with an asset that are not necessarily reflected in the transaction costs between provider and consumer and that, collectively, are referred to as externalities

Note 1 to entry: These costs may include business staffing, productivity and user costs; these can be taken into account in a LCC analysis but should be explicitly identified.

[SOURCE: ISO 15686-5:2008, 3.1.6]

3.16
impact
any change that may be adverse or beneficial

[SOURCE: ISO 15392:2008, 3.13]

3.17
impact category
class representing an economic, environmental or social *issue(s) of concern* (3.22) (areas of protection) to which analysis (assessment) results may be assigned

Note 1 to entry: Issues of concern can involve either *impacts* (3.16) or aspects related to the economy, the environment or the society.

[SOURCE: ISO 21929-1:2011, 3.15]

3.18
indicator
quantitative, qualitative or descriptive measure representative of one or more *impact categories* (3.17)

Note 1 to entry: Periodic evaluation and monitoring using indicators can show direction of any *impact* (3.16).

[SOURCE: ISO 14040:2006, 3.40: modified and adapted to civil engineering works]

3.19
indirect indicator
indicator (3.18) that does not express the subject of interest directly or only expresses it in a proxy way

3.20
infrastructure
civil engineering works (3.6), a part of the civil engineering works or a combination of several civil engineering works

Note 1 to entry: In this part of ISO 21929, the term infrastructure is sometimes used as a synonym for civil engineering works.

Note 2 to entry: Used of preferred term, infrastructure, derived from the definition of civil engineering works in ISO 15392.

3.21
interested party
person or group concerned with or affected by the environmental *performance* (3.28) of a *civil engineering works* (3.6)

[SOURCE: ISO 21931-1:2010, 3.18; modified and adapted to civil engineering works]

3.22
issue of concern
aspect(s) of the economy, the environment or the society that can be impacted by *construction works* (3.9), goods or services

EXAMPLE Asset value, cultural heritage, resources, human health and comfort, social infrastructure.

Note 1 to entry: The preferred term to designate this concept has been changed from 'areas of concern' to 'issue of concern' and the admitted terms removed

[SOURCE: ISO/TR 21932:2013, 3.6]

3.23
land take
total area of land required for the *civil engineering works* (3.6)