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Sustainability in buildings and civil engineering works — General principles

Développement durable dans les bâtiments et ouvrages de génie civil — Principes généraux

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Foreword

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 17, *Sustainability in buildings and civil engineering works*.

This second edition cancels and replaces the first edition (ISO 15392:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The title and scope of the document have been updated to reflect that it applies to both buildings and civil engineering works.

— This scope of the document has been clarified to state that it identifies and establishes general principles for the contribution of buildings, civil engineering works and other types of construction works to sustainable development.

— The list of objectives for applying the concepts to sustainability and promoting sustainable development has been expanded to include additional considerations.

— The list of nine general principles has been updated to: continual improvement, equity, global thinking and local action, holistic approach, involvement of interested parties, long-term consideration and resilience, responsibility, risk management, and transparency.

— A description and additional explanatory information has been added for each principle.

— The concept of resilience was added as a key consideration as part of the principle of long-term consideration.

— The former “precaution and risk” principle was changed to “risk management” and includes the concepts of precaution, prevention, elimination, reduction and mitigation.

— Application of the general principles as they relate to the three pillars of sustainability, economic, social and environmental, along with integrated consideration of all aspects has been expanded.

— A new section providing basic guidance for the application of each principle has been added.

— Annex A was updated with new designations, titles and short description of the suite of documents under ISO/TC 59/SC 17.

— Informative Annex B 'Products of the building and construction sector' was replaced by a new informative Annex B 'Guidance provided by the ISO 15686 series for service life planning in buildings and constructed assets'.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document presents the concept of sustainability and the related general principles relevant to the design and decision-making processes associated with buildings, civil engineering works and other types of construction works. These general principles form the basis for a suite of standards intended to address specific issues, impacts and aspects related to the contribution of construction works to sustainable development. This document translates general aims and concepts of sustainable development to the construction industry, while adapting them to the constraints specific to the design, construction and management of buildings, civil engineering works and other types of construction works.

The issue of sustainable development is broad and of global concern, and, as such, involves all communities and other interested parties. This document considers the effects of design, construction and management of buildings and other types of construction works on the environment, economy and society, thereby implicating the ecological, economic and social dimensions of sustainable development. Both current and future needs define the extent to which these aspects and impacts can contribute to sustainable development.

The built environment, composed primarily of buildings and civil engineering works, has significant impacts on the environment in which society lives and works. It is a key element in determining quality of life and contributes to cultural identity and heritage.

The 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 basic economic and social services provided in the built environment and the potential opportunities for disadvantaged communities to be engaged in construction, operation and maintenance;

— it is one of the single largest industrial sectors and, while providing value and employment, it absorbs considerable resources, 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 a considerable opportunity to show improvement relative to its economic, environmental and social impacts.

Construction activities may or may not take place within a legal and regulatory or other administrative framework present within a country or region. In either case, aspects of governance are relevant to sustainable development, in addition to those aspects related specifically to buildings and civil engineering works. Well-established administrative frameworks may contain requirements that can act as drivers and help to move the building and construction sector towards sustainable development.

The contribution to sustainable development made by buildings and civil engineering works during their life cycle relates to the functional and technical performance, as well as the effect on the environment (environmental performance), the cost and value (economic performance) and the social effects on relevant stakeholders (social performance). In addition, the processes of design, construction and management, including related decision-making, are considered.

The challenge of sustainable development is global; targets and relevant indicators may be derived from both internationally agreed United Nations Sustainable Development Goals (UN SDGs)[1)], the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement[2)], as well as the area(s) of concern specifically under consideration. The strategies for addressing sustainability within buildings, civil engineering works and other construction works are essentially local and differ in

1) https://sustainabledevelopment.un.org

2) https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

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 and the local economy, 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. In developing countries, it may also include poverty reduction, job creation, access to safe, affordable food, water and shelter, and creation or preservation of livelihoods. The utilization of resources and associated effects on global and local environments are considered when assessing overall environmental impacts. Life cycle costs and the effects on the value of constructed assets are taken into account during consideration of economic consequences. Additionally, the cost of externalities may be considered from a macroeconomic point of view.

Applying the principles of sustainability in the context of construction works, including all related processes and activities, requires the direct and responsible involvement of all interested parties. While their legal responsibility and liability is subject to national or regional regulation, individual commitment and responsibility is voluntary. Nevertheless, this commitment is a basic principle of the application of sustainable development, including application in the building and construction sector.

Applying the concept of sustainability to specific buildings and civil engineering works includes a holistic approach, bringing together the global concerns and goals of sustainable development and the demands and requirements in terms of product functionality, efficiency and economy. Different target audiences have different perspectives on these challenges and the preferred solutions.

This document establishes internationally recognized principles for sustainability in the context of buildings, civil engineering works and other construction works and establishes a common basis for communication of the information required. Interested parties, such as product manufacturers and designers, are then able to provide information in accordance with these general principles. Such information can then be communicated to a wide range of target audiences, extending from policy makers and regulators to manufacturers, asset owners and consumers. The recipients of the information can elaborate upon and interpret this information according to their own context, intended use and target audiences.

The concepts involved in sustainability are highly complex and under constant study. There are no definitive methods for measuring sustainability or confirming its accomplishment. These general principles do not provide a benchmark against which a claim of sustainability can be made. Nevertheless, they can be useful when considering the completeness and validity of claims of, or calls for, sustainability or contributions to sustainable development in the context of buildings, civil engineering works and other construction works.

The aim of this document is to set out the objectives for sustainability in the context of all types of construction works and from these objectives, derive general principles for achieving them. This document forms the basis for deriving evaluation criteria and indicators for the assessment of the contribution of buildings and civil engineering works to sustainable development, and it enables decision makers to apply the principles in their decision-making processes. While this document remains at the level of identifying the objectives and principles for sustainability, relative to buildings, civil engineering works and other types of construction works, more detailed guidance on the application of these general principles is found within ISO/TS 12720.

This document does not set the political agendas, or provide priorities related to specific concerns that are established in international frameworks, such as the UN SDGs. However, requirements and targets related to political goals can be related to the identified general principles for sustainability in buildings and other types of construction works.

This document is one in a suite of International Standards developed under ISO/TC 59/SC 17, dealing with sustainability in buildings and civil engineering works, that includes the following:

a) This document;

b) ISO/TS 12720;

c) ISO/TR 21932;

d) ISO 21929-1;

e) ISO/TS 21929-2;

f) ISO 21931-1;

g) ISO 21931-2;

h) ISO 16745-1;

i) ISO 16745-2;

j) ISO 21930;

k) ISO 20887[3];

l) ISO 21678[4].

3) Under preparation. Stage at the time of publication: ISO/FDIS 20887:2019.

4) Under preparation. Stage at the time of publication: ISO/DIS 21678:2019.

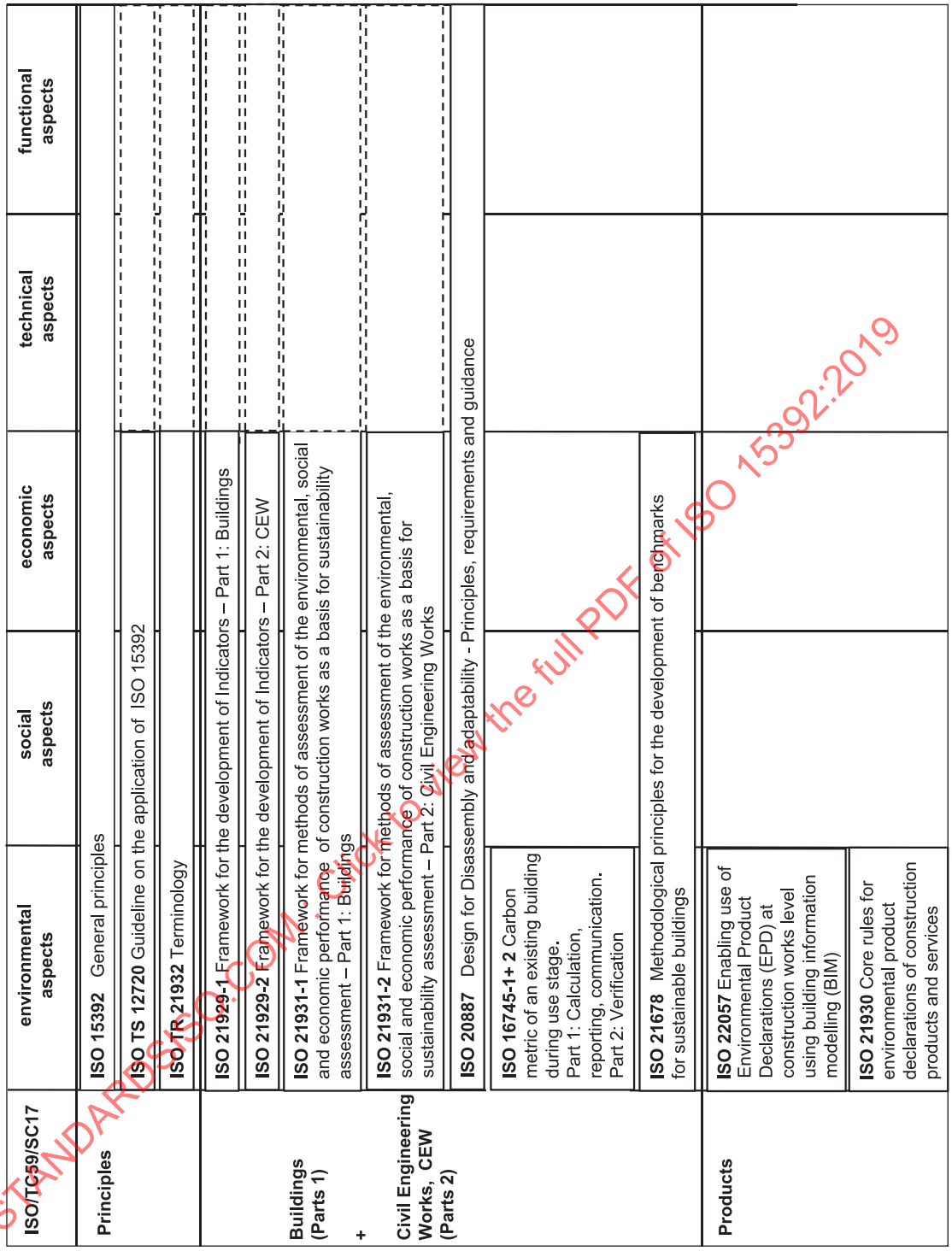


Figure 1 — Suite of related International Standards for sustainability in buildings and civil engineering works

NOTE For a description of the suite of International Standards, see Annex A. This suite of standards currently contains the documents indicated in Figure 1.

Intended users of the suite of International Standards include (in alphabetical order): builders, certification bodies, clients, contractors, designers, developers, facility managers, fund providers, governmental and non-governmental organizations, insurers, manufacturers, owners, planners, policy makers, promoters, real estate agents, regulators, researchers, standards developers, users (tenants, as well as the public), etc.

The guidance provided in ISO Guide 82:2014 was considered for the update of this document.

Sustainability in buildings and civil engineering works — General principles

1 Scope

This document identifies and establishes general principles for the contribution of buildings, civil engineering works and other types of construction works (hereinafter referred to collectively as construction works) to sustainable development. It is based on the concept of sustainable development as it applies to the life cycle of construction works, from inception to the end-of-life.

This document is applicable to new and existing construction works, individually and collectively, as well as to the materials, products, services and processes related to their life cycle. This document does not provide performance levels (benchmarks) that can serve as the basis for sustainability claims.

NOTE 1 The principles established in this document are intended to be applied broadly in the context of construction works. Specific applications are the subject of other related documents.

NOTE 2 Construction works are designed to meet numerous requirements, such as those expressed and established by authorities having jurisdiction. In some circumstances, it can be necessary to go beyond established requirements to contribute further to sustainable development.

NOTE 3 In this document, unless explicitly stated, the term 'product(s)' implies construction product (3.7) and the term 'service(s)' implies construction service (3.8).

This document is not intended to provide the basis for assessment of organizations or other stakeholders, but does acknowledge the importance of their role in the context of contributions to sustainable development by buildings, civil engineering works and other construction works.

NOTE 4 More detailed discussions on social responsibility aspects, relative to organizations, can be found in ISO 26000.

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.

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

ISO 14050, *Environmental management — Vocabulary*

ISO/TR 21932, *Sustainability in buildings and civil engineering works — A review of terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 14050 and ISO/TR 21932 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
access to services
availability and *accessibility* (3.2) of services outside the *building* (3.4)

Note 1 to entry: Services can include public transportation, parking, entertainment, health-care, water and energy supply, etc.

3.2
accessibility
ability of a space to be entered with ease

Note 1 to entry: Requirements for accessibility depend on the users' needs, as well as on the activities during the *life cycle* (3.19) of the *building* (3.4) or *civil engineering works* (3.6), e.g. *construction work* (3.9), maintenance and deconstruction.

Note 2 to entry: "Barrier-free use of buildings" relates to the requirements for accessibility to meet the needs of users with reduced mobility.

[SOURCE: ISO 6707-1:2017, 3.7.3.80, modified — Two notes to entry have been added.]

3.3
areas of concern
areas of protection
protection area
aspect(s) of the economy, the environment or the society that can be impacted by *construction works* (3.10), goods or services

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

3.4
building
construction works (3.10) that has the provision of shelter for its occupants or contents as one of its main purposes; usually partially or totally enclosed and designed to stand permanently in one place

[SOURCE: ISO 6707-1:2017, 3.1.1.3, modified — The note to entry has been deleted.]

3.5
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* (3.4), external works (landscaped areas), *infrastructure* (3.6) and other *construction works* (3.10) within the area under consideration.

3.6
civil engineering works
infrastructure
civil engineering project, US
construction works (3.10), 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* (3.4) and its associated site works

Note 1 to entry: Associated site works related to buildings are sometimes considered as civil engineering projects, for example particularly in the US.

[SOURCE: ISO 6707-1:2017, 3.1.1.2, modified — "infrastructure" has been added as a preferred term; Note 1 to entry has been modified.]

3.7
construction product
building product
item manufactured or processed for incorporation in *construction works* (3.10)

[SOURCE: ISO 21930:2017, 3.2.2, modified — ”building product” has been added as an admitted term; two notes to entry have been deleted.]

3.8
construction service
activity that supports the *construction work* (3.9) or subsequent maintenance

[SOURCE: EN 15804:2012+A2:2019, 3.7, modified — Reference to "construction work" has been inserted in place of "construction process".]

3.9
construction work
construction, US
activities of forming *construction works* (3.10)

[SOURCE: ISO 6707-1:2017, 3.5.1.1, modified — The note to entry has been deleted.]

3.10
construction works
everything that is constructed or results from construction operations

Note 1 to entry: This includes *buildings* (3.4), *civil engineering works* (3.6), structures, landscaping, external works and other types of construction works within a *built environment* (3.5).

Note 2 to entry: From an economic perspective, completed construction works are typically referred to as a *constructed asset* (ISO 15686-1:2011, 3.2).

[SOURCE: ISO 6707-1:2017, 3.1.1.1, modified — Two notes to entry have been added in place of the original note to entry; the US synonym "construction" as an admitted term has been deleted.]

3.11
disassembly
non-destructive taking apart of a *construction works* (3.10) or *constructed asset* (ISO 15686-1:2011, 3.2) into constituent materials or components

[SOURCE: BS 8887-2:2009, 3.11, modified — References to "construction works" and "constructed asset" have been added.]

3.12
economic aspect
characteristic of *construction works* (3.10), parts of works, processes or services related to their *life cycle* (3.19) that can cause a change to economic conditions

3.13
environmental aspect
characteristic of *construction works* (3.10), parts of works, processes or services related to their *life cycle* (3.19) that can cause a change to the environment

[SOURCE: ISO 14001:2015, 3.2.2, modified — Context changed from organizational to construction works-related; reference to “life cycle” has been added; ”interact with the environment” has been replaced with ”can cause a change to the environment”.]

3.14
social aspect
characteristic of *construction works* (3.10), parts of works, processes or services related to their *life cycle* (3.19) that can cause a change to society or quality of life

3.15
environmental declaration
claim which indicates the *environmental aspects* (3.13) of any good(s) or service(s)

Note 1 to entry: An environmental declaration may take the form of a statement, symbol or graphic on a product or package label, in product literature, in technical bulletins, in advertising or in publicity, amongst other things.

[SOURCE: ISO 14020:2000, 2.1, modified — "environmental label" as a preferred term has been deleted; "a product or service" has been changed to "any good(s) or service(s)".]

3.16
environmental performance
performance (3.20) related to *environmental impacts* (3.17.2) and *environmental aspects* (3.13)

Note 1 to entry: The environmental performance is influenced by all processes related to the *life cycle* (3.19) of the object of consideration.

3.17
impact
result of a change or existing condition that may be adverse, neutral or beneficial

3.17.1
economic impact
impact (3.17) to the economy, wholly or partially resulting from *economic aspects* (3.12)

3.17.2
environmental impact
impact (3.17) to the environment, wholly or partially resulting from *environmental aspects* (3.13)

[SOURCE: ISO 14001:2015, 3.2.4, modified — "change" has been changed to "impact"; the wordings "whether adverse or beneficial" and "an organization's" have been removed.]

3.17.3
social impact
impact (3.17) to society or quality of life, wholly or partially resulting from *social aspects* (3.14)

3.18
indicator
quantitative, qualitative or descriptive measure

3.19
life cycle
all consecutive and interlinked stages in the life of the object under consideration

Note 1 to entry: For consideration of *environmental impacts* (3.17.2) and *environmental aspects* (3.13), the life cycle comprises all stages, from raw material acquisition or generation of natural resources to end-of-life.

Note 2 to entry: For consideration of *economic impacts* (3.17.1) and *economic aspects* (3.12), in terms of costs, the life cycle comprises all stages from construction to decommissioning. A *period of analysis* (ISO 15686-5:2008, 3.3.6) can be chosen to be different from the life cycle, see ISO 15686-5.

[SOURCE: ISO 21930:2017, 3.3.1, modified — The original Note 2 to entry has been deleted and a new Note 2 to entry has been added.]

3.20
performance
observed (or predicted) behaviour of a *construction works* (3.10), *construction product* (3.7) or *construction service* (3.8) in fulfilling (to fulfil) required functions under intended use conditions

Note 1 to entry: Performance in this context pertains to functional and technical requirements in use.

[SOURCE: ISO 21930:2017, 3.2.7, modified — Reference to ”ability” has been deleted and replaced with “observed (or predicted) behaviour of a construction works”; further contextual clarification has been provided; Note 1 to entry has been added.]

3.21
resilience
ability to anticipate and adapt to, resist or quickly recover from a potentially disruptive event, whether natural or man-made

3.22
service life
period of time after installation during which a *construction works* (3.10) or its parts meet or exceed the *performance* (3.20) requirements

[SOURCE: ISO 6707-1:2017, 3.7.3.84, modified — “facility or its component parts” has been replaced by “construction works or its parts”.]

3.23
stakeholder
person or organization that can affect, be affected by, or perceive itself to be affected by a decision or activity

EXAMPLE Customers, communities, suppliers, regulators, non-governmental organizations, investors and employees.

[SOURCE: ISO/IEC Directives Part 1, 2019, Annex L, Appendix 2, 3.2, modified — EXAMPLE has been added.]

3.24
sustainability
state of the global system, including *environmental* (3.13), *social* (3.14) and *economic aspects* (3.12), 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 the construction of *buildings* (3.4) and *civil engineering works* (3.6), sustainability relates to how the attributes of the activities, products or services used in the *construction work* (3.9), or the use of the *construction works* (3.10), 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* (3.25).

[SOURCE: ISO Guide 82:2014, 3.1, modified — Notes 2 and 3 to entry have been added.]

3.25
sustainable development
development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Note 1 to entry: According to the Report of the World Commission on Environment and Development[26], sustainable development contains two key concepts: 1) the concept of “needs”, in particular the essential needs of the world's poor, to which overriding priority should be given; and 2) the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Note 2 to entry: Sustainable development concerns all resources providing a better quality of life, equally for present and future generations. Sustainable development also aims to eradicate poverty and gives priority to the needs of the poor.

[SOURCE: ISO Guide 82:2014, 3.2, modified — The original Note 1 to entry has been deleted; Notes 1 and 2 to entry have been added.]

4 General

Sustainability is a state that requires that humans carry out their activities in a way that protects the functions of the Earth's ecosystem as a whole.

NOTE 1 According to the World Commission on Environment and Development, sustainability can be described as a state in which humankind is living within the carrying capacity of the Earth.

NOTE 2 The Earth's ecosystem includes plants and animals, as well as humans and their physical environment. For humans, this also includes the key elements of human needs: the economic, environmental, social and cultural conditions for societies' existence.

Sustainability is the global goal of sustainable development, as defined by the Report of the World Commission on Environment and Development[26], and in the context of this document, applies to buildings, civil engineering works and other construction works.

Addressing sustainability in the context of construction works includes the interpretation and consideration of sustainable development in terms of its three primary aspects, economic, environmental, and social aspects, while meeting the requirements for technical and functional performance of the construction works.

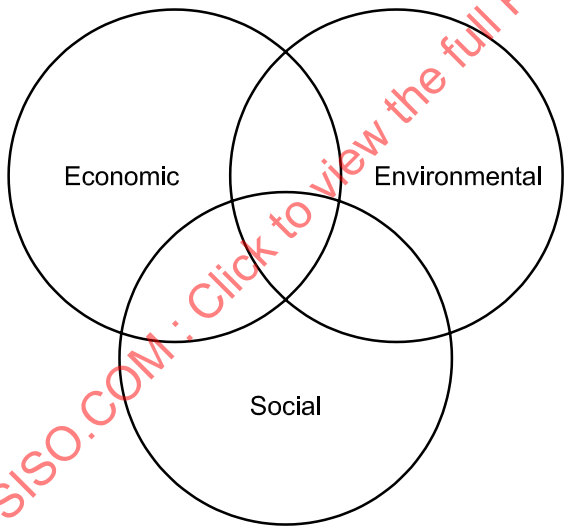


Figure 2 — Primary aspects of sustainability

These aspects are inextricably linked to each other and interdependent, as indicated in Figure 2, and a dynamic balance exists among them, which may be fragile or enduring. They have no inherent precedence over each other and this document gives them equal importance.

In practice, each aspect needs to be addressed in a systemic way, often involving prioritization. Prioritization relates to specific concerns, such as areas of protection, derived from economic, environmental and social needs.

This document does not set priorities and the aspects are presented here, and typically throughout this document, in alphabetical order without indication of importance. The overlapping of the spheres is purely illustrative of the common, but not necessarily equally shared, influence. In any particular circumstance, the degree of overlap varies and may lead to a positive impact in one sphere while resulting in an adverse impact in the other(s). The overall aim is to minimize adverse impacts and maximize beneficial impacts while providing the required environmental, economic and social value.

An interpretation and consideration of the primary aspects of sustainability may require consideration of areas of concern such as asset value, cultural heritage, resources, human health and comfort, and social infrastructure. These different areas of concern should be taken into account when selecting and applying indicators.

The application of sustainable development to construction works needs to reflect the context in terms of goals, priorities, preconditions, possibilities and constraints (such as poverty, accessibility and access to services). This document does not provide the prioritization, but recognizes that an application of general principles attempts to balance the environmental, social, and economic aspects according to the overarching goals of development targets.

5 Sustainability in construction works

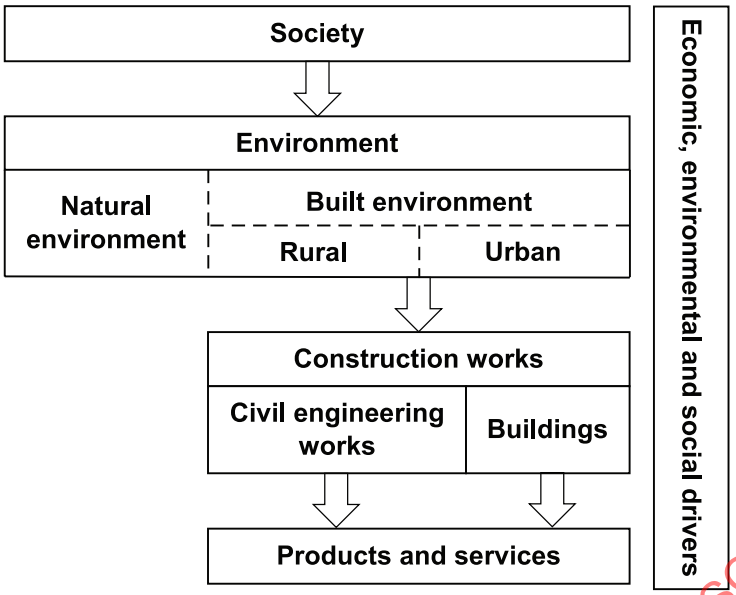
5.1 General

Sustainable development in the context of construction aims to bring about the required performance and functionality without decreasing the natural environment's long-term capacity and resilience, while encouraging improvements in economic and social (and cultural) aspects at local, regional and global levels. This may include consideration of buildings and infrastructure individually and collectively, as well as consideration of single products, functional components, services and processes related to their life cycle. Many sustainable development objectives do not directly relate to, and yet are clearly influenced by, the built environment. Instead of referring to absolute attributes, such as "sustainable construction" or "sustainable building", it is more appropriate to discuss the extent to which the built environment and its elements support and contribute to sustainable development.

When examining the contribution of construction works to sustainable development, the objectives (5.2) and principles (5.3) should be considered in their entirety, without regard to the prioritization of aspects. The extent to which these objectives and principles can properly be addressed also depends on the scope and the scale of the project. The significance and magnitude of impacts also may depend on and change with the life cycle stage(s) under consideration.

The contribution of buildings and civil engineering works to sustainable development can be considered on several levels, including a whole industrial sector, an enterprise, a community, a building stock, a group of buildings, or an individual building or construction works. This contribution of construction works also involves the recognition of their interdependency with products, as well as their context. Figure 3 illustrates the conceptual relationship among environmental, economic and social requirements and drivers acting on construction works and related products and services.

A concern related to construction works is that sustainability does not sufficiently address construction as a broader process or mechanism for the realization of human settlements. Besides addressing biophysical and economic considerations, the contribution of construction works to sustainable development needs to explicitly embrace the human dimension and involve issues relevant to adequate provision for basic needs such as shelter, and issues such as poverty and threats to cultural values and inequalities, related to gender, ability, and generational or regional differences.



NOTE 1 The arrows represent the origin and direction of requirements.

NOTE 2 Requirements from stakeholders are interpreted as economic, environmental and social drivers, with drivers to include priorities and requirements as well as constraints.

NOTE 3 A dashed line represents an indeterminate boundary between adjacent concepts.

Figure 3 — Environmental, economic and social requirements and drivers acting on construction works and related products and services

5.2 Objectives

Whilst applying the concept of sustainability to construction works, and at the same time promoting sustainable development, the objectives are:

— provision of functionality, health, comfort, safety and accessibility;

— performance management during operation;

— application of life cycle thinking;

— provision of economic value over time;

— provision of social and cultural value over time and for all;

— minimization of adverse end-of-life impacts;

— limitation of adverse environmental impacts and where possible, maintenance or provision of environmental value over time;

— adaptability;

— efficient and responsible management throughout the process;

— integration into the relevant planning schemes and policies (including sustainability planning) related to local building/town-planning and infrastructure;

— involvement of interested parties and consideration of their needs;

— reconciliation of contradictory interests or requirements arising from short-term and long-term planning or decision-making;

— stimulation of innovation;

— stimulation of a pro-active approach;

— improvement of the construction sector and the built environment;

NOTE 1 Sectors interacting with and supporting the construction sector are also addressed by the objectives, where relevant, e.g. real estate sector, financial and insurance sector, transportation, etc.

— decoupling of economic growth from increasing adverse impacts on the environment and/or society;

— maximization of beneficial impacts and value through application of restorative and regenerative approaches;

— reduction of adverse impacts while improving value, where impacts as well as value may be judged against any combination of the three primary aspects of sustainability.

NOTE 2 "Value" embraces performance, but is conceptually broader and is not intended to refer solely to "economic value".

NOTE 3 The three aspects can be judged against each other. The overall aim is to bring about social and economic wellbeing without decreasing the natural environment's resilience and capacity.

NOTE 4 ISO/TS 12720 provides more detailed information on achieving the objectives of the sustainability principles.

5.3 Principles

5.3.1 General

The principles that shall be considered to reach the objectives are, without indication of importance or priority and in alphabetical order: continual improvement, equity, global thinking and local action, holistic approach, involvement of interested parties, long-term consideration, responsibility, risk management and transparency.

It is acknowledged that not all of the principles apply to all contexts, situations and projects. As such, it is important to demonstrate that each of the principles has been considered and those that are applicable have been implemented, as appropriate.

5.3.2 Continual improvement

This principle encompasses the improvement of all aspects of sustainability related to the built environment including buildings, civil engineering works and other construction works over time. It includes the performance of construction works as well as processes, and addresses means of assessment, verification, monitoring and communication.

In order to rationally improve the contribution of any construction works to sustainable development, it is necessary to have an understanding of its current condition and capabilities, as well as a realization that requirements to achieve sustainability and the capacity to fulfil those requirements change with time. These deviations are due to shifts in cultural and socio-economic factors, technological advancements or innovation, the current state and knowledge of the relevant factors and their interactions, and changes in chemical-physical performance expectations (resulting from deterioration or alterations).

5.3.3 Equity

This principle encompasses the balanced and objective consideration of intergenerational, interregional and intra-societal ethics, including environmental protection, economic efficiency and social needs.

Equity amongst existing communities can be assured by providing basic needs and fostering comparable rights and opportunities for all. The notion of community stretches from the inhabitants of the smallest

villages to residents in all regions of the world. The provision of, and continued access to, various forms of community capital forms the basis for fair economic and social transactions and interaction(s), thereby strengthening the prospective and likelihood of success for long-term sustainable planning and development. If the processes for intra-generational equity are in place, the extension of that equity to future generations, communities and their interactions is more likely.

5.3.4 Global thinking and local action

This principle encompasses the consideration of the global consequences of local actions taking account of local and regional concerns, to ensure that:

— when acting locally, the regional, national and global relevance and consequences are considered;

— when establishing and applying global strategies, the local, national and regional implications, relevance, demands and resources are considered.

5.3.5 Holistic approach

This principle encompasses the inclusion and interdependence of all relevant and related aspects of sustainability when considering and assessing the contribution of construction works to sustainable development. A holistic approach considers all aspects of economic, social and environmental sustainability over the life cycle of the construction works.

5.3.6 Involvement of interested parties

This principle encompasses taking into account the contribution, needs and requirements of interested parties relative to their respective areas of responsibility, and the timing of their involvement.

The underlying and primary concept of engaging interested parties is that their participation potentially influences the decision-making process, particularly relative to decisions about actions that affect their lives or essential environment for life.

Consultation processes tend to be open exchanges of views and information and help to establish trust and credibility amongst participants, which are important elements required before entering into negotiations on specific issues or sets of issues.

NOTE 1 Due to the nature of the building and construction sector and its products, a wide range of stakeholders has interest in this industrial sector and its outputs. It is possible that these stakeholders demonstrate significant differences in their appreciation and understanding of the building sector. Such differences explain the multiplicity of views that exist in the interpretation of sustainable development in the context of construction works, particularly in terms of scope, content, level of detail, priorities, etc.

NOTE 2 Integrated design process is an example of involvement of interested parties, related specifically to the design/development process of a construction works.

5.3.7 Long-term consideration and resilience

This principle encompasses the taking into account of the short-, medium- and long-term implications in decision-making. Many of the initial functional requirements and the physical capability to provide those functions can change during the life cycle. Changes to the defined functional requirements are typically driven by socio-cultural, economic or business-related issues while the ability to fulfil the functions is dependent upon the condition, deterioration, the level of maintenance, and major interventions such as repair, refurbishment, replacement or renewal.

As a minimum, it includes the following considerations:

a) performance over time (as the ability of fulfilling a defined level of function throughout the use phase);

b) life cycle thinking (i.e. considering the consequences of a choice made in one stage of the life cycle on the other stages);

NOTE 1 Additional information on life cycle thinking can be found in ISO/TS 12720.

c) resilience to natural or man-made disruptions that enable the function, operations and performance of a building or civil engineering works to continue without interruption or to be re-established quickly;

d) legacy (i.e. the consideration of the impacts that are handed down as a result of development). The legacy may extend well beyond the physical boundaries of the development.

NOTE 2 The legacy can be physical (e.g. the buildings and infrastructure), environmental (e.g. environmental benefit or damage), social (e.g. cultural heritage, skills, capacity building) or economic (e.g. employment, economic growth).

5.3.8 Risk management

This principle encompasses risk management to control, limit or modify unwanted, adverse or detrimental impacts by precaution or by prevention, elimination, reduction or mitigation (risk treatment).

Risk management is a set of coordinated activities including hazard and risk identification, risk assessment, risk treatment, risk acceptance and risk communication.

— Precaution (avoidance of potential risks)

When a potential risk is suspected but cannot be quantified due to a lack of scientific consensus and/or knowledge, the precautionary approach (or "precautionary principle") should be applied. The precautionary principle aims to avoid the potential for harm to the public or the environment – it sets concerns of both present and future generations as the basis for the analysis of risk potentials. Adoption of new technologies or new products should include a precautionary perspective without unduly compromising innovation. Refer to 7.8.

— Prevention, elimination, reduction or mitigation (avoidance of identified risks)

When an actual risk is identified and quantified through scientific consensus and knowledge, a strategy consisting of risk prevention, elimination, reduction or mitigation shall be applied. The preferred strategy should be risk avoidance by prevention or elimination of the risk.

5.3.9 Responsibility

This principle encompasses the ethical responsibility for, rather than legal or financial consequences of, actions carried out by individuals or groups of individuals.

The enrichment of local skills and support of institutional capacity aids in the contribution of buildings and civil engineering works to sustainable development.

In order to demonstrate responsibility, organisations should strive to apply the principles described in this document, having a long-term perspective and consideration of environmental, social and economic aspects. Sustainability issues shall be considered in planning, management and decision-making processes. By implementing risk management procedures that include sustainability issues, the principle of continual improvement of performance is more likely to be fulfilled. Procedures should be put in place to encourage awareness and acceptance of responsibilities by employees as well as affiliated organisations and agents. More information on this topic is provided in ISO 26000.

5.3.10 Transparency

This principle encompasses the decision-making process and communication of information in a manner that is open, comprehensive, understandable and, like the underlying data, traceable, with verifiable credibility.

When considering the contribution of construction works to sustainable development, transparency relates to information about products as well as decision-making processes. For that purpose, an appropriate review and verification process for relevant documentation can be established, if needed.

6 Application of the general principles

6.1 General

This document gives the aspects of sustainability equal importance. When addressing the contribution of construction works to sustainable development, the objectives and principles shall be considered and applied, as appropriate, to enable decision-making that meets the needs in the current context. Such application of this document in a given regional, societal and economic context will most probably lead to temporal strategies specific to existing conditions (e.g. the response of developing countries and their strategies in developing sustainability agendas can be very different from those of developed economies).

NOTE 1 The decision-making process usually relates to strategic planning, project definition, design, construction and handover, operation and maintenance, and end-of-life strategy.

NOTE 2 Typical phases of a construction works project are: project inception, including the description of the project's characteristics; project development; acquisition of the land or existing building; conceptual design, including feasibility and profitability analysis; client brief, which defines the needs of the client; detailed design; construction; commissioning; operations, maintenance and refurbishment or redevelopment. Collaborative involvement of all project parties throughout the life cycle of the construction works is expanded upon in ISO/TS 12720.

6.2 Integrated consideration of the environmental, social and economic dimensions of sustainability

6.2.1 General

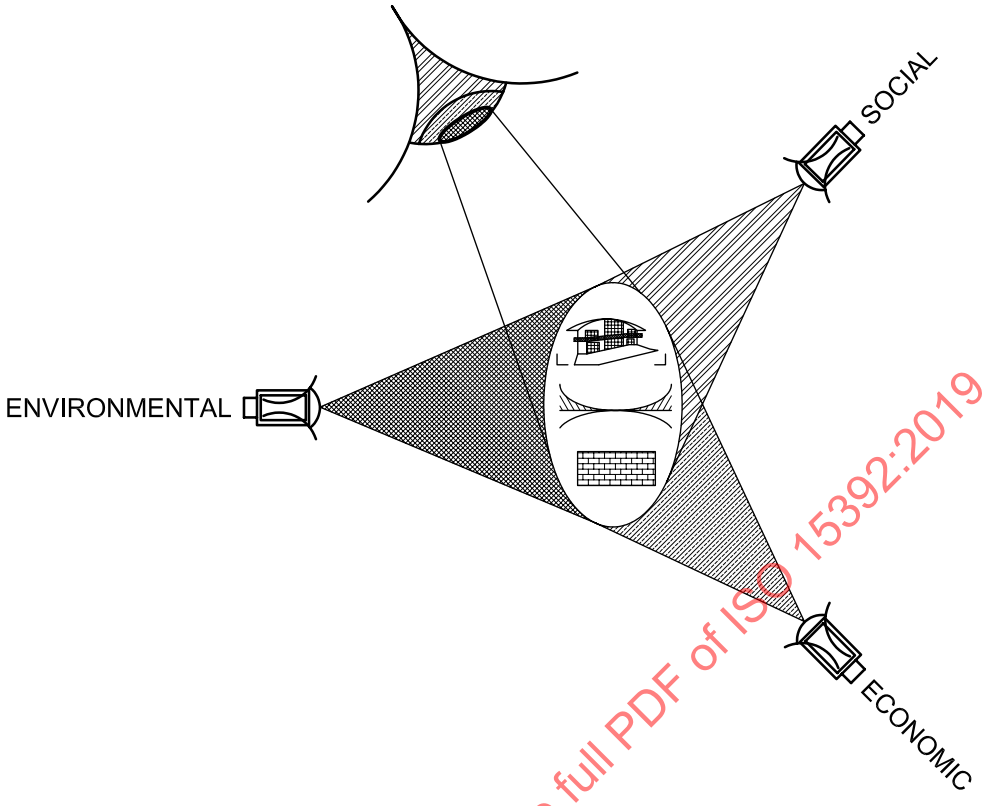
Any particular aspect of a construction works can have impacts on more than one of the dimensions of sustainability in parallel. Indicators in one specific dimension of sustainability, for example, an environmental performance indicator, may lead to effects in other dimensions.

EXAMPLE A well thought out design, including the selection of construction products can result in lower energy demand, lower energy cost and improved occupant comfort over the life cycle.

These parallel impacts and follow-on effects are typically not taken into account through assessments that consider only the environmental, social or economic dimension, potentially resulting in benefits not being realized or unanticipated impacts. Application of the holistic approach principle (5.3.5) would take into account all three dimensions, while also considering their interdependence and other relevant and related aspects.

It is assumed that the environmental impacts are generally included in environmental life cycle assessment (LCA) and environmental risk assessment (ERA) and other forms of environmental assessment of construction works. Furthermore, economic impacts are generally included in life cycle costing (LCC) and whole life costing (WLC), and in the estimation of intrinsic economic value (market value) and growth. Impacts on social and cultural aspects also should be taken into account through relevant evaluation mechanisms (e.g., United Nations Environment Programme (UNEP) guidelines on social LCA, social performance assessment of buildings and civil engineering works).

As indicated in Figure 4, addressing sustainability involves the parallel and integrated consideration of the primary aspects of sustainability, economic, environmental and social, in relation to the construction works.



NOTE The lamps in this figure indicate that sustainability aspects of the construction works are being made "visible" for the observer. Depending on the observers' viewpoint and depending on their individual priorities and value judgements, the perception of the information can be filtered, leading to the situation that different target audiences draw different conclusions from the same information.

Figure 4 — Integrated consideration of primary aspects of sustainability related to construction works

6.2.2 Economic aspects

Particular aspects of the construction works, parts of works, processes or services related to their life cycle, can interact with economic impacts, or economic legacy, which extends beyond the life of the construction works. These relate to costs and benefits that measure the impact to the economy, wholly or partially resulting from activities, products or services used in the construction works or in the use of the construction works. Besides direct and short-term economic considerations, economic aspects incorporate life cycle considerations that measure the long-term economic impacts, or economic legacy.

The consideration of economic aspects is closely linked to the areas of concern "asset value" and "economic resources". Depending on the position and the viewpoints of the interested parties, the focus can be placed on different economic aspects, such as investment, cash flow, market value, profitability, economic legacy, etc. These different viewpoints and interests are taken into account when selecting and applying appropriate indicators and they are inherently linked to the development of the asset values and life cycle costs (see ISO 21929-1, ISO/TS 21929-2 and ISO 21931-2).

6.2.3 Environmental aspects

Particular aspects of the construction works, parts of works, processes or services related to their life cycle, can interact with the environment. These relate to the use, quality and availability of resources, local, regional and global ecosystems and life cycle impacts on the environment, wholly or partially resulting from activities, products or services used in the construction works or during the use of the construction works. This should include any legacy left by the construction works.

The consideration of environmental aspects is closely linked to the areas of concern "the environment" and "resources". For all life cycle stages, the consideration of environmental aspects requires description and assessment of the use of resources as well as the impacts on the local and global environment, including risks to the environment. These different areas of concern are taken into account when selecting and applying indicators (see ISO 21929-1 and ISO/TS 21929-2) and in describing and assessing the environmental performance of buildings and civil engineering works (see ISO 21931-1 and ISO 21931-2).

6.2.4 Social aspects

Particular aspects of construction works, parts of works, processes or services related to their life cycle can interact with society or quality of life. These relate to intergenerational ethics (impact upon future generations) and recognize the inherent value of ecosystems, traditions and cultures. Impacts to society or quality of life, wholly or partially resulting from activities, products or services used in the construction works or in the use of the construction works involve impacts on local culture and the provision for basic human rights and human needs, and should include any legacy left by the construction works.

The consideration of social aspects is closely linked to the areas of concern "social infrastructure", "cultural heritage" and "human health, safety, security, wellbeing and comfort". In describing and assessing construction works, consideration is given, where relevant, to the aspects of accessibility, adaptability, health and wellbeing, impacts on neighbourhood, safety and security, resilience and other social aspects, and the socio-economic as well as cultural value. Social aspects may relate to individuals (e.g. the users of a building or infrastructure) and/or to groups of people (e.g. local society). These different aspects are taken into account when selecting and applying indicators (see ISO 21929-1, ISO/TS 21929-2 and ISO 21931-2).

7 Guidance for the application of the principles

7.1 General

The following text provides guidance to apply the principles identified in 5.3.

NOTE ISO/TS 12720 provides more detailed information on the application of the sustainability principles and objectives.

7.2 Continual improvement

Continual improvement is best accomplished by implementing formalized processes that permit the monitoring and verification of all aspects of sustainability. As well, those processes should rely upon the feedback of the performance data into the planning and decision-making frameworks. By adopting a culture of continual improvement, the processes themselves are continually enhanced. Refer to Annex B for information on the guidance provided by the ISO 15686 series toward achieving continual improvement.

7.3 Equity

Social, cultural and economic frameworks enable the provision of social equity. These structures are often influenced by perspectives related to ethnicity, race, sex, age and economic status or history. These underlying predispositions, when coupled with the traditional mechanisms of economic development, can amplify differences between developed and developing communities, broadening the equity gap. Differences and potentially competing or conflicting interests are common within any community. Efforts to address those interests shall centre on broad community involvement as well as open, yet formalised, dialogue and negotiation (refer to 7.6).

7.4 Global thinking and local action

Any step taken toward sustainable development should be viewed as a piece of a larger whole, toward satisfying and balancing global needs.

Efforts to make contributions to sustainable development by projects or construction works start at a local or community level, yet have implications and interactions upon adjacent communities and regions, and the outcomes are inevitably felt further afield. These interfaces touch on all primary aspects of sustainability and shall be examined in an integrated manner with thorough consideration of the broader consequences. Conversely, when global sustainability strategies are being developed there should be a concerted effort to assess the impacts, and to satisfy and promote the environmental, economic and cultural concerns at the regional and local levels.

7.5 Holistic approach

The use of a holistic approach to sustainability implies that over the life cycle of construction works there is an ongoing consideration of the environmental, economic and social aspects associated with the activity. The significance of specific aspects can vary over the life cycle, but it is important to continue to consider all aspects throughout. A holistic approach further suggests implicit adherence to the other principles, described in this clause and 5.3.

7.6 Involvement of interested parties

Prior to soliciting the contributions and requirements from the interested parties, it is desirable to have consulted or negotiated with those parties to formalise a data collection and assessment process, with a defined scope of stakeholder involvement, a clear statement of accountability and responsibility for the procedures as well as for the data to be collected and derived, in addition to conflict resolution processes. All participants shall acknowledge their specific roles and responsibilities and be made aware of the authorizations, obligations and duties of the other parties. Refer to 7.9.

When identifying which parties, individuals and organisations should be consulted in order to provide advice and feedback it is important to assess their dependence on any outcomes and results from the task at hand as well as the influence that those parties may have upon the results. While it is important to attempt to engage stakeholders covering a full range of combinations of influence and dependence upon the results, the focus should be on the parties that are both highly dependent and highly influential. The make-up of the relevant populations to be considered usually varies during the life cycle of any given building or civil engineering works and more significantly with the latter phases of the life cycle. Refer to ISO/TS 12720 for information on the collaborative involvement of all project parties throughout the life cycle of the construction works.

7.7 Long-term considerations and resilience

Throughout all stages of a project or construction works, the decision-making framework shall permit the consideration of the impacts, resilience, as well as the interactions associated with attempting to satisfy the primary aspects of sustainability. Any given decision has the potential to influence or alter factors and outcomes that are directly or indirectly linked to that specific choice. Actions taken today affect timelines, predicted results and future requirements. In addition, the impact of a decision can extend beyond the intended scope-of-influence or further than the initial consideration of the choice(s) that were made. The social, economic and environmental aspects shall be viewed relative to their short-, medium- and longer-term implications (life cycle thinking) as well as the effects upon adjacent communities, cultures and ecosystems. Refer to 7.4.

The level of resilience of a construction works can only be assessed by determining the capability of resisting, adapting to or recovering quickly from the effects of potential loads (e.g., from impacts arising from projected long-term environmental, social and economic conditions) or effects of exceptional events. Typically, the long-term environmental, economic and social benefits of resilience are not taken into account when only assessing the initial capital investment. The ISO 15686 series identifies and

describes service life prediction and planning procedures to monitor and manage performance and resilience issues throughout the life cycle (refer to Annex B).

7.8 Risk management

The precautionary principle, as it pertains to risk management, attempts to lead decisions in a direction that results in minimal harm, particularly in situations where there is uncertainty associated with the scientific evidence related to the significance of the anticipated detrimental effects. The majority of the applications of the precautionary principle have been relative to environmental concerns, but the principle may be applied to consider any of the primary dimensions of sustainability. When considering the use of new techniques or innovative materials, components or assemblies within construction works, historic performance information that may be used to justify the selections over more conventional and established choices, is typically not available. These data shortfalls shall be addressed by assessing the associated risk and applying risk management techniques to provide the most suitable, least damaging result.

Failure Mode and Effects Analysis (FMEA) is an iterative analysis that can be applied to infer all potential degradation paths. It is based upon the properties and connectivity of components, sub-components and the environment in which they are to be used. FMEA typically results in a list of failure scenarios. It is useful in cases where there is limited information on the in-use performance of innovative products. Further information on FMEA is available in IEC 60812 as well as ISO 15686-7.

7.9 Responsibility

Individuals and groups of individuals involved shall accept ownership of the processes used, developing lasting framework(s) to enrich local skill levels and institutional capabilities. As local capacity building increases, so do the success and acceptance of similar projects. This increases the reach of new or on-going sustainable development efforts.

As organisations and enterprises accept responsibility for social and cultural facets linked with sustainable development, including environmental restoration and other areas of concern, they become accountable to a wider range of stakeholders. The parties interested in scrutinizing an organisation's performance are beyond the traditional population of investors and shareholders. Heightened dialogue requirements, when coupled with the principle of transparency, can foster trust and improve capacity for meeting increased stakeholder expectations. Refer to 7.6 on the involvement of interested parties and 7.10 on transparency.

7.10 Transparency

Throughout the entire process, at the discretion of the decision makers and in keeping with their perspective(s), constraints and contractual obligations, information associated with expected and actual performance of products and assemblies, as well as the decision-making processes employed, shall be established, maintained and made openly available to specific target audiences. This is required to readily permit traceability of products and services, decision-tracking, comprehensive review, and a basis to verify the credibility of performance claims regarding contribution to sustainable development.

Annex B provides further information on how the guidance from the ISO 15686 series can be applied to satisfy the transparency principle.

Annex A
(informative)

Suite of documents for sustainability in buildings and civil engineering works

The suite of documents for sustainability in buildings and civil engineering works, developed by ISO/TC 59/SC 17, includes the following:

a) ISO 15392, *Sustainability in buildings and civil engineering works — General principles* (this document)

While the general principles outline a holistic view, the usefulness of standards and other documents with a partial scope, or with a more directed focus, is recognized. Sustainable development in buildings and other construction works, however, implies the systemic consideration of the three primary aspects of sustainability.

b) ISO/TS 12720, *Sustainability in buildings and civil engineering works — Guidelines on the application of the general principles in ISO 15392*

It is necessary to provide guidance for the application of the general principles of sustainability in buildings and civil engineering works. ISO/TS 12720 focuses on the different actors involved with the construction works and how they can each take these principles into account in their decision-making processes in order to increase the contribution of the construction works to sustainability and sustainable development.

c) ISO/TR 21932, *Sustainability in buildings and civil engineering works — A review of terminology*

Communication is important in the implementation and operation of the concept of sustainable development in buildings and other construction works. In the interest of common understanding and standardization, consistent word usage is beneficial in helping to eliminate the major barrier to effective technical communication.

Terminology should be based principally upon the definitions developed in the suite of documents of ISO/TC 59/SC 17, and used in complement with those concepts and definitions that originate from the general terminology on building and civil engineering in ISO 6707-1.

NOTE 1 Terminology related to environmental management issues, such as environmental declarations for products and life cycle assessment of product systems, originates and is used based on the concepts and the definitions in ISO 14001, ISO 14020, ISO 14021, ISO 14025, ISO 14031, and ISO 14040.

d) 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*

The three main functions of indicators are quantification, simplification and communication. Indicators are figures or other measures, which enable information on a complex phenomenon to be simplified into a form that is relatively easy to use and understand.

ISO 21929-1 describes and provides guidelines for the development of sustainability indicators related to buildings and defines the aspects and impacts of buildings to consider when developing systems of sustainability indicators.

e) ISO/TS 21929-2, *Sustainability in building construction — Sustainability indicators — Part 2: Framework for the development of indicators for civil engineering works*

The three main functions of indicators are quantification, simplification and communication. Indicators are figures or other measures, which enable information on a complex phenomenon to be simplified into a form that is relatively easy to use and understand.

ISO/TS 21929-2 describes and provides 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.

f) ISO 21930, *Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services*

Environmental declarations provide a standardized format for the communication of information about products. Such declarations provide input data and information for the assessment of performance of buildings and other construction works.

Environmental declarations according to ISO 21930 and ISO 14025 are declarations with specific focus on environmental impact. Declarations for other sustainability aspects are being developed (service life declarations, health product declarations, etc.).

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

Assessment methods provide a common and verifiable set of criteria and targets to enable measurement, demonstration and evaluation of the performance of buildings, which can contribute to the formulation of procurement and/or improvement strategies and prioritization.

NOTE 2 Methods for the assessment of the environmental performance of buildings according to ISO 21931-1 are assessments with specific focus on environmental aspects. Methods for assessing performance related to other aspects and for other types of construction works exist or are being developed (energy performance, economic performance, indoor climate, etc.).

h) ISO 21931-2, *Sustainability in buildings and civil engineering works — Framework for methods of assessment of the environmental, social and economic performance of construction works as a basis for sustainability assessment — Part 2: Civil engineering works*

ISO 21931-2 was updated with an expanded scope that addresses all three sustainability aspects. It identifies and describes relevant issues for the development and use of methods to assess the sustainability performance for all types of civil engineering works, both new and existing. The described issues and methods are applicable over the entire life cycle of new civil engineering works, and to the remaining "in use" stage and "end-of-life" stage of existing civil engineering works.

i) ISO 16745-1, *Sustainability in buildings and civil engineering works — Carbon metric of an existing building during use stage — Part 1: Calculation, reporting and communication*

ISO 16745-1 provides requirements for determining and reporting a carbon metric of an existing building, associated with the operation of the building. It sets out methods for the calculation, reporting and communication of a set of carbon metrics for GHG emissions arising from the measured energy use during the operation of an existing building, the measured user-related energy use, and other relevant GHG emissions and removals. These carbon metrics are separated into three measures designated CM1, CM2, and CM3; CM1 is the sum of annual GHG emissions, expressed as CO_2 equivalents, from building-related energy use; CM2 is the sum of annual GHG emissions, expressed as CO_2 equivalents, from building- and user-related energy use; CM3 is the sum of annual GHG emissions and removals, expressed as CO_2 equivalents, from building- and user-related energy use, plus other building-related sources of GHG emissions and removals.