TECHNICAL SPECIFICATION

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Sustainability in building construction — Sustainability indicators —

Part 1: Framework for the development of indicators for buildings

Développement durable dans la construction — Indicateurs de développement durable —

Partie 1: Cadre pour le développement d'indicateurs pour le bâtiment

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 21929-1 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 17, *Sustainability in building construction*.

ISO/TS 21929 consists of the following parts, under the general title *Sustainability in building construction — Sustainability indicators*:

— *Part 1: Framework for the development of indicators for buildings*

A Part 2 dealing with construction assets (other than buildings) is in preparation.

This document is not to be regarded as an “International Standard”. It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

Introduction

The aim of this part of ISO/TS 21929 is to define a framework for sustainability indicators of buildings.

This part of ISO/TS 21929 describes and gives guidelines for the development and selection of sustainability indicators related to buildings.

This part of ISO/TS 21929 defines a framework for sustainability indicators for buildings based on the premise that sustainable construction achieves the required technical performance of the construction with the minimum of environmental impact. At the same time, sustainable construction encourages economic, social and cultural improvement at a local, regional and global level.

Indicators are figures or other 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. Changes 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. Indicators should be objective and the results should be repeatable.

When developing and selecting indicators, the starting point is the identification of the main users and user needs. Sustainability indicators for construction works are needed by a number of interested parties in the building and construction sector. Indicators are needed in decision-making by

— investors and owners of real estate;

— occupiers and users of buildings;

— planners, developers and designers;

— manufacturers of products;

— contractors;

— facility managers and real estate agents;

— public bodies (housing, building, traffic, environment).

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

This part of ISO/TS 21929 is part of a suite of standards for sustainability in building construction, which includes

— general principles; see Reference [5];

— terminology; see Reference [6];

— environmental declarations of building products; see Reference [7];

— framework for methods of assessment for environmental performance of construction works; see Reference [8].

The aim of this part of ISO/TS 21929 is to define a framework for sustainability indicators of buildings. The framework is based on the premise that sustainable construction brings about the required performance with the least unfavourable environmental impact, while encouraging economic, social and cultural improvement at a local, regional and global level.

This part of ISO/TS 21929 adopts the general understanding about the aspects of sustainability, including economic, environmental as well as social aspects. Sustainability indicators have been developed by international organisations and research projects. Annex A presents a summary of the earlier work.

Sustainability in building construction — Sustainability indicators —

Part 1: Framework for the development of indicators for buildings

1 Scope

This part of ISO/TS 21929 provides a framework, makes recommendations, and gives guidelines for the development and selection of appropriate sustainability indicators for buildings.

The aim of this part of ISO/TS 21929 is to define the process that shall be followed when addressing the economic, environmental and social impacts of a building using a common framework and a set of indicators. This part of ISO/TS 21929:

— adapts general sustainability principles for buildings;

— includes a framework for the assessment of economic, environmental and social impacts of buildings;

— shows indicators as examples;

— shows how to use sustainability indicators with regard to buildings and shows the process of using sustainability indicators;

— supports the process of choosing indicators;

— supports the development of assessment tools;

— defines the conformity with this specification.

NOTE An associated document, designated as ISO 15392[5], is under development and is intended to describe the general principles. Such general principles can be extended or modified, and potentially superseded by, the specific requirements of this part of ISO/TS 21929.

2 Normative references

The following references documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the references document (including any amendments) applies.

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

ISO 14041, *Environmental management — Life cycle assessment — Goal and scope definition and inventory analysis*

ISO 14042:2000, *Environmental management — Life cycle assessment — Life cycle impact assessment*

ISO 14050, *Environmental management — Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 14041 and ISO 14050, and the following apply.

NOTE The terms and definitions given in ISO/TR 21932[6], when published, will apply.

3.1
accessibility
ability of a space to be entered with ease

[ISO 6707-1]

3.2
building performance
ability of a building to fulfil required functions under intended use conditions or behaviour when in use

NOTE Adapted from the definition of performance in ISO 6707-1.

3.3
consequential economic indicator
economic indicator that expresses economic impacts in terms of building performance or location either quantitatively or qualitatively

3.4
consequential environmental indicator
environmental indicator that expresses environmental impacts in terms of building performance or location either quantitatively or qualitatively

3.5
economic indicator
sustainability indicator related to an economic impact

3.6
environmental indicator
sustainability indicator related to an environmental impact

3.7
indicator
quantitative, qualitative or descriptive measure

NOTE Adapted from the definition of indicator in ISO/TR 14061[4].

3.8
life cycle costs
total cost of a building or its parts throughout its life, including the costs of planning, design, acquisition, operations, maintenance and disposal, less any residual value

[ISO 15686-1]

3.9
life cycle economy
expression of the relationship between the life cycle income and life cycle costs

3.10
renewable resource
resource that grows naturally, can be replenished, or cleansed

NOTE Sustainable use of a renewable resource implies that the rate of growth, replenishment or cleansing takes place at a rate equal to or greater than the current rate of depletion of that resource.

3.11
set of indicators
non-structured list of indicators

3.12
social indicator
sustainability indicator related to a social impact

3.13
sustainability indicator
indicator related to economic, environmental, or social aspects

3.14
system of indicators
structured list of indicators

4 Indicating the sustainability of buildings and construction works

4.1 General

Clause 4 defines the issues that should be considered when the sustainability of buildings is expressed or described with the help of indicators. Sustainability indicators of buildings include environmental, economic as well as social aspects of individual buildings and groups of buildings. This part of ISO/TS 21929 addresses cultural aspects as part of social aspects. In 4.2 are elaborates the individual environmental, economic, social indicators and aspects of buildings.

The character, quality and availability of information is dependent on the life cycle stage of the building. During the design stage, issues of concern may need to be dealt with in terms that differ from information available during the occupancy of a building. Indicators addressing the same issues may, therefore, initially relate to values predicted at the design stage, while during operation, indicators addressing that same issue of concern may be based on measurements, inquiries concerning user satisfaction, etc.

Indicators have a relationship to both the concerns of the interested parties and the overall assessment goal. Indicators can be used to describe and assess attributes and characteristics of buildings and building products and/or the quality of process (including development, planning, construction and operation processes). The selection of the relevant set of indicators shall reflect the concerns of interested parties and the proper representation of the assessment goal.

Indicators can address economic, environmental and social impacts directly or issues that have consequences on such impacts. Such consequential indicators can be useful for the assessment of the impacts of buildings on sustainability. In some cases, consequential indicators address more than just a single aspect of sustainability.

EXAMPLE “Access to services” is a consequential indicator that can relate to

— the environmental impacts because of transport-related environmental impacts;

— economic impacts because of transport-related costs;

— social impacts because of the need for the equal availability of transportation services by different groups of people.

Technical solutions and systems in the building, like the selection of a heating, ventilation and air conditioning system (HVAC system), an affect the energy consumption. Guidelines on the selection of materials, products and systems can be given as practical recommendations. However, these solutions shall not be dealt with as indicators. The validity of practical recommendations can be assessed with the help of sustainability indicators.

Practical recommendations, which favour a certain type of technical solution, depend on geographical and technological circumstances, especially on the climate, building technological and energy technological facilities. Indicators are more generic in nature, although the acceptable values of indicators, like the limit between low-energy and normal-energy consumption, again are site-specific.

4.2 Framework of sustainability indicators

4.2.1 Environmental indicators

An environmental indicator of a building addresses an environmental aspect either in terms of loadings or impacts. Environmental loadings are the use of resources and the production of waste, odours, noise and harmful emissions to land, water and air. These environmental loadings are related to environmental impacts, which can be expressed as environmental impact categories according to ISO 14042:2000, 5.3.

In addition to indicators that can be presented in terms of environmental loadings and impacts, it is also possible to use consequential environmental indicators to quantify or qualify the environmental impacts of a building. A consequential environmental indicator addresses aspects that influence the amount of loadings or impacts. The development of these kinds of indicators can be necessary, for example, because of easier usability. When used, the consequential environmental indicators shall have an evident connection with environmental loadings or environmental impacts.

EXAMPLE The following are examples of the application of consequential environmental indicators:

— building performance, especially the adaptability of a building, can indirectly result in an environmental loading because of the presumed effect on the service life of a building and thus also on the consumption of resources;

— durability and service life of the building and its parts result in the consumption of resources;

— accessibility can indicate an environmental impact of a building. For example, the accessibility with using the means of public transport and/or bicycle and pedestrian traffic expresses the influence of the use of the building on traffic-related environmental loadings. Also the access from the building to services needed by the users of the building can express the influence of the use of the building on traffic-related environmental loadings;

— location reflects transport-related effects on emissions and energy consumption;

— building site and soil sealing can express impacts of a building on bio-diversity, quality of soil and water table.

Annex B presents examples of environmental aspects of buildings.

Classes of impact categories include depletion of renewable and non-renewable resources.

When developing a system of environmental indicators of buildings, reference shall be made to such environmental aspects as mentioned above. When including only a limited number of loadings or impact categories, one shall justify the exclusion of others.

The environmental indicators of buildings should, whenever possible, consider the life cycle of the building. Information about all stages of the building under scrutiny should be available and considered because the impacts of use, maintenance, demolition, recycling, and final disposal stages may be decisive. The indicators addressing the environmental loadings or environmental impacts over the entire life cycle shall, as a minimum, maintain the distinction of the life cycle stages of manufacturing, construction, use and end of life. If the environmental impact of a building is assessed for other than the full life cycle, this variance shall be transparent and justified. For example, when indicating the environmental performance of existing buildings, it may well be justifiable to exclude the impacts from the original construction phase.

Indoor air quality, as one aspect of building performance, can also be used as an indicator of the impact of a building on sustainability. This part of ISO/TS 21929 requires that indicators related to indoor air quality can be dealt with as environmental indicators. Thus the indoor concentration of contaminants expressed on the basis of classification can be used as an environmental indicator of a building.

Examples of important aspects related to building location and placement on a site that can be used to indicate the environmental impact of a building are presented in Annex C.

If consequential indicators like service life or accessibility are used to address the environmental aspects, the implied factual connection to environmental loadings or environmental impacts shall be presented in the system.

One can indicate the environmental performance of a building with reference to environmental impacts caused by the building and/or building process. An environmental impacts can occur because of the use of materials that potentially contaminate the environment when released into air or water and/or in the case of fire or other specific conditions possible with regard to the building. An environmental impact may also be related to the building process.

The environmental performance of a new building can be indicated by the effective use of methods and tools that support the consideration of environmental aspects.

NOTE Methods and tools that support the consideration of environmental aspects include, for example

— service life design methods and tools;

— environmental assessment tools; and

— design methods for energy-efficiency and assessment methods for energy consumption.

The ISO/TS 21931-1[8] introduces a system of environmental indicators that can be used for the assessment of environmental performance of buildings.

4.2.2 Economic indicators

The following economic flows are related to the life cycle of a building:

— investment: site, design, product manufacturing, construction;

— use: energy consumption, water consumption, waste management etc.;

— maintenance and repair;

— deconstruction and waste treatment;

— development of the economic value of a building; and

— revenue generated by the building and its services.

The economic indicators indicate monetary flows connected to the building.

The assessment of the economic impact of buildings may be based on life-cycle economy. When assessing the life cycle economy of buildings, one has to take into account, in addition to the life-cycle costs assessed on the basis of investment, use, maintenance and deconstruction, the potential income and value development during the service life of the building under scrutiny. Potential income depends on a variety of aspects, including location, spaces and services for users and the building performance. Income can be improved by ensuring the appropriate performance of the building with regards to user needs. Potential income also depends on the ability to implement planned periodic building maintenance while minimizing the disruptions of the services provided by the building.