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order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn.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again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.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.

The economic indicators of buildings shall provide a balance between its long-term and short-term economic aspects. When the economic indicator considers a shorter time period than the entire life cycle, this shall be transparent and adequately justified.

As is the case with environmental indicators, economic indicators can also be consequential. Consequential economic indicators have an influence on the life-cycle costs or life-cycle economy of the observed building. These indicators are based on the assumption that certain features of a building indicate economic advantages or costs for the owners or users of the building over a long time scale. When using consequential economic indicators, the factual connection shall be explained, pointing out the effect on life-cycle costs or life-cycle economy.

NOTE These consequential economic indicators can include, for example

a) building performance:

— adaptability can indicate advantageous life-cycle costs although possibly increasing the investment costs of the building;

— carefully designed service life can also indicate savings in life-cycle costs;

— good indoor conditions can have an economic influence by improving productivity;

b) building location:

— location affects the land costs and also influences transportation costs of people and goods;

c) energy efficiency:

— energy consumed during the use phase of buildings significantly affects the total costs of buildings. In addition, facilities that promote energy efficiency, for example the monitoring facilities of energy and water, can also consequentially indicate cost-efficiency.

4.2.3 Social indicators

Social indicators of buildings are used to describe how buildings interact with issues of concern related to sustainability at the community level.

Social aspects of the building environment are related to community-level issues.

NOTE 1 Community-level issues that can be relevant are urban sprawl, mixed land use, access to basic services including public transport, availability of green and open space, attractiveness of city centres, development of brown-fields, the availability of housing, social segregation, cultural quality and protection of cultural heritage, safety, noise and air quality.

Social aspects can also be addressed on the building level.

NOTE 2 Building level social aspects can include

— quality of buildings as a place to live and work;

— building-related effects on health and safety of users;

— barrier-free use of buildings;

— access to services needed by users of a building;

— user satisfaction;

— architectural quality of buildings; and

— protection of cultural heritage.

The above list of social aspects of buildings is a suggestion and it is not meant to be exhaustive. The list is also presented in Annex D with additional explanatory text.

Also process-related issues can be used to indicate the social aspects of new construction or refurbishment.

EXAMPLE The following list presents examples of process-related subject matters that can be used to indicate the social impact of construction process:

a) co-operation with the users of the building and the neighbours:

   — users' participation in the process;

   — ability to maintain good relations in the neighbourhood and to listen to the neighbours' views;

b) ensuring the thorough consideration of users' needs in the design and construction process. Users' needs can concern:

   — availability of needed services;

   — building performance including indoor conditions, safety, adaptability, barrier-free use and usability;

   — economic and environmental aspects;

c) ability to support social cohesion in the process, for example:

   — consideration of the different social and cultural groups of users and their special needs;

   — making use of local labour.

5 The use of sustainability indicators

5.1 General

It is necessary to use a wide range of attributes in describing the overall performance of a building. This includes

— the building performance;

— the building description;

— the social, economic and environmental aspects a building.

These different aspects frequently overlap. Overlapping can be avoided providing:

— "building performance" is used to describe the user's requirements of the building;

— "building description" is used to describe the technical solution;

— sustainability is assessed on the basis of impacts of the building on the environment, monetary flows, on the well-being of users, and the cultural quality of the building environment.

However, some performance issues are simultaneously related to environmental, economic and social impacts. The list below gives some examples.

— location of a building affects the access to the building. Thus, building location also affects the traffic and related environmental and economic impact;

— space solutions affect the operational energy use;

— services, such as services in buildings for elderly people, affect the well-being of users. On the other hand, provision of these services causes environmental and economic consequences;

— location, space solutions and services together define the conformity of a building in relation to clients' needs;

— technical solution, building description, together with space solution determine the basis for the building performance: indoor conditions, safety, flexibility, usability, access, comfort;

— service life depends on technical solution and architectural quality and it affects the environmental and economic impact on the basis of required resources during a given time span;

— functional performance of a building, including indoor conditions, affects the health and well-being of users. On the other hand, the appropriate indoor conditions depend on client needs, which are reflected in the specific activities carried out in a building.

All aspects of sustainable development are inter-related. When analysing sustainability relative to a specific building as a whole, attention should be paid to the issues presented in Figure 1.

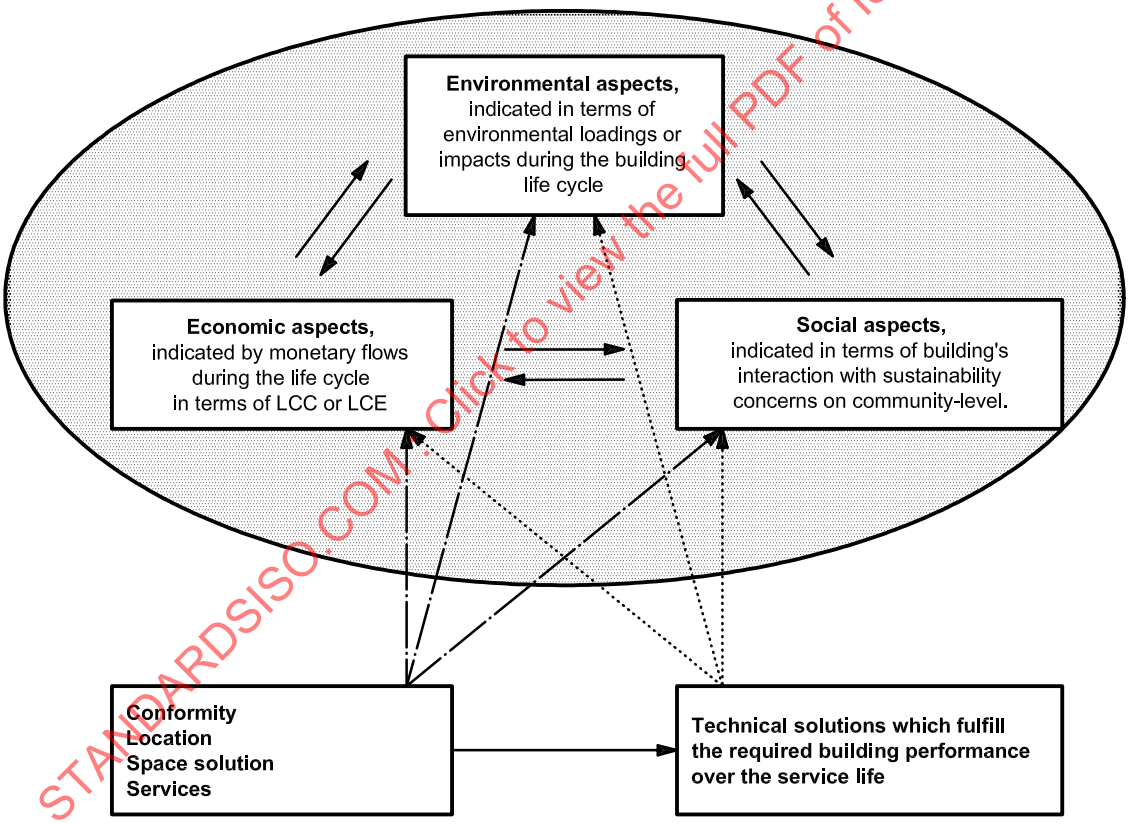

Figure 1 — Aspects of sustainable buildings.

NOTE There are instruments to describe the relationship between primary aspects of sustainability, e.g. eco-efficiency, cost performance, environmental impact per profit relations (damage-profit-index).

Sustainability indicators can be developed and used separately or together to indicate various sustainability aspects of buildings. When the environmental, economic and social aspects of buildings are expressed with help of indicators, experience demonstrates that systems of indicators are more effective than an individual indicator. Sets of indicators can be organised in order to allow the inclusion of a broad representation of sustainability aspects while being relevant to the stakeholders' perspectives.

To use indicators it is necessary to

— choose relevant indicators;

— find suitable methods and information to assess their values.

The choice of relevant indicators will depend on the needs of interested parties, decision boundaries, the object (the building context) and the availability of information.

The other step is to gather information and use the relevant methods in order to assign values to the selected indicators.

5.2 Rules for establishing a system of indicators

The following describes the general requirements for a system of sustainability indicators for buildings:

— the sustainability shall be described on the basis of a comprehensive system of indicators expressing the environmental, economic and social aspects, and their inter-relationship;

— selected indicators shall describe the essential environmental, economic and social impacts of a building;

— the relevance of the selected indicators shall be reasoned and, when necessary, validated;

— the process of development and application of indicators shall be transparently reported.

5.3 How to use sustainability indicators

Sustainability indicators of buildings describe the environmental, economic and social impact of buildings for the owners and users of buildings, for the building's surroundings, and for the whole environment. Individual sustainability indicators should be as independent as possible with respect to users and use phase. However, the system of indicators that is determined is user- and use-phase-dependent.

EXAMPLE It is recommended that if carbon dioxide emissions indicate the environmental sustainability of buildings, this should be valid in all use phases and for all users of indicators.

Although the life-cycle point of view is recommended, sometimes also a narrower approach may be used because of practical reasons.

EXAMPLE In choosing the indicator "energy demand", the use phase may be quantified by using net values of energy consumption. This may be reasonable, if the user of a building has no influence on the energy-production related phases. However, the user shall be aware that the scope of such an indicator may not include the full environmental impact.

In order to be usable, an indicator shall be accompanied by an explanation that describes how to assign the value of the indicator. In addition, the usefulness of indicators can be increased by creating a benchmark against which the value of an indicator can be compared. Indicators often also need a source of information on the basis of which the value of an indicator can be calculated.

As indicators can be used to simplify and communicate complex information, they can be useful for

— assessment (for example, against stated target values);

— diagnosis (for example to point out affecting factors);

— comparison (of alternative buildings);

— monitoring (for example the change over time).

While not covering subjects related to weighting of indicators, this part of ISO/TS 21929 recognizes that weighting may be applied in practice, implicit through the choice of indicators or explicit through the application of weights. As weightings relate to subjective value choices, and as there are no commonly agreed methods for weighting, this part of ISO/TS 21929 recommends clear and transparent documentation if weighting methods are applied.

See ISO 14042 for details when communicating weighted impact assessment results to the public.

Sustainability indicators are often used for the comparison of design options or buildings. The providers of indicators and the users of indicators shall always ensure that the basis of comparison is appropriate in terms of building performance, and adequately defined.

5.4 Users of indicators

The application of indicators may vary according to users, the related needs of those users, and application phase. When developing indicators, one should be aware about the context of their application. The context relates to the field of application (assessment, diagnosis, comparison, monitoring), the stakeholder's scope, the decision scope the phase of the life cycle of the object and the availability of information.

NOTE The following text gives examples of user needs for sustainability indicators. However, the role of interested parties vary from one country to another and thus also the relevance of these examples may vary.

a) Developers and owners of buildings

Indicators help developers and owners of buildings to state sustainability-related requirements and objectives. Indicators and related methods help to show the conformity of the design or the construction with stated requirements. Owners or asset managers may also apply indicators to show the sustainability of the building when marketing.

b) Designers

Indicators aid design by identifying critical aspects related to sustainability, such as consumption of energy, release of CO_2 or accessibility. This ensures that the designer is able to recognise the design features that may have an effect on the chosen indicators. A designer may also need guidelines about advantageous solutions in terms of practical recommendations. These can prove beneficial with the help of indicators and related assessment methods. Alternative designs can be compared and the conformity of a design against stated objectives can be shown by using indicators and corresponding assessment methods and tools.

c) Contractors

Contractors should be aware of stated sustainability-related requirements for the building in terms of indicators. In addition, contractors may apply sustainability indicators in order to monitor the construction process.

d) Administrative bodies

Administrative bodies can use indicators to state and show sustainability-related requirements on buildings. Administrative bodies can also use indicators to evaluate sustainability-related performance of buildings. Administrative bodies may relate incentives to certain indicator-related performance aspects, possibly in line with their policy objectives.

e) Users and property managers

Sustainability indicators provide parameters for monitoring the use stage of buildings.

6 Reporting

Indicators can be used for assessment, diagnosis, comparison and monitoring. The whole process including the assignation of values for individual indicators should be repeatable. The basic methods, principles and data basis used shall be presented in detail and be available for all stakeholders. The information includes:

a) the methodological framework, including:

   — the description of the choice of indicators;

   — the reasoning behind individual indicators;

   — an explanation of the consequential indicators;

b) principles of assigning the value: methods of observation, measurement and calculation and benchmarking (when relevant) with regard to all individual indicators;

c) information about the used (generic) database, when relevant. The relevance of the database shall be fully explained;

d) in cases where several indicators are grouped or aggregated into a common representation, the procedure of aggregation and weighting shall be transparent.

Annex A
(informative)

Review of sustainability indicators

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. According to the terminology of "Organization for Economic Cooperation and Development" (OECD) an indicator is a parameter, or a value derived from parameters, which points to, provides information about, describes the state of a phenomenon/environment/area, with a significance extending beyond that directly associated with a parameter value; a parameter being a property that is measured or observed.

This part of ISO/TS 21929 describes and gives guidelines for the development and selection of building-related sustainability indicators. These have a close connection to sustainable urban environment-related indicators. Urban design-related sustainability indicators should be able to support the monitoring of land use and urban design trends, which include for example urban sprawl, mixed land use, accessibility to basic services including public transport, availability of green and open space, attractiveness of city centres and development of brown-fields. These indicators are introduced for example in the final report of the European project "Trends and indicators for monitoring the EU thematic strategy on sustainable development of urban environment" (TISSUE) within the 6th framework.

The United Nations' Commission on Sustainable Development (CSD) has developed a working list of general indicators of sustainable development. This should be seen as a flexible list from which countries can choose indicators according to national priorities, problems and targets. Indicators are presented in a Driving Force - State - Response framework. The OECD and the European Environmental Agency (EEA) have also developed typologies of indicators. The EEA uses the Driving Force - Pressure - State - Impact - Response Framework in its reporting activities. According to the EEA Technical Report No 25 [Smeets], indicators can be classified into four groups: Descriptive indicators, Performance indicators, Efficiency indicators and Total welfare indicators.

ISO 14031[3] gives guidance on the design and use of environmental performance evaluation within an organisation. ISO 14031 also defines environmental condition and performance indicators as follows:

— environmental condition indicator: specific expression that provides information about the local, regional or global condition of the environment;

— environmental performance indicator: specific expression that provides information about an organisation's environmental performance.

This specification uses the term performance in a more limited sense than ISO 14031[3].

The International Council for Research and Innovation in Building and Construction (CIB) Publication No. 64[1] describes the performance approach as being concerned with what the building is required to do, and not with describing the technical solutions, i.e. how it is constructed. A descriptive approach describes an acceptable solution while a performance approach describes the required performance. The approach to the sustainability indicators of construction works adopted to this specification is based on the preliminary work and definitions of CIB as well as the work that has been done within the European thematic network "Construction and City Related Sustainability Indicators" (CRISP).

Annex B
(informative)

Examples of environmental aspects of buildings

An environmental indicator of a building addresses an environmental aspect either in terms of loadings or impacts. It can take the shape of impact categories. A consequential environmental indicator addresses aspects that indirectly can influence the amount 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.

The following list includes examples of environmental aspects of buildings, also including consequential examples:

— total CO_2 emissions;

— contribution to climate change in terms of total CO_2 equivalents;

— distance from the building to public transport services considering the route frequency.

The first item is an example of how the environmental aspects of a building can be expressed in terms of environmental loadings.

The second item is an example of how the environmental aspects of a building can be expressed in terms of environmental impacts.

The last one of the presented examples is a consequential indicator. The distance from the building under scrutiny to the nearest bus stop or other public-transport stop can indicate the influence of the building and its location on traffic-related environmental loadings.