



**International
Standard**

ISO 24510

**Activities relating to drinking
water and wastewater services —
Guidelines for the assessment and
for the improvement of the service
to users**

*Activités relatives aux services de l'eau potable et de
l'assainissement — Lignes directrices pour l'évaluation et
l'amélioration du service aux usagers*

**Second edition
2024-01**

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Published in Switzerland

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Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 224, *Drinking water, wastewater and stormwater systems and services*.

This second edition cancels and replaces the first edition (ISO 24510:2007), which has been technically revised.

The main changes are as follows:

- completion of content of the contracts in terms of rights of the user and user obligations;
- addition of new services (e.g. online services, e-bills);
- development of user segmentation to differentiate procedures and better meet expectations;
- better accessibility to services for all, including vulnerable customers;
- addition of stormwater management in the service agreement;
- addition of reference to the United Nations sustainable development goals.

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

0.1 Water issues: global context and policies framework

Water constitutes a worldwide challenge for the 21st century, both in terms of the management of available water resources and the provision of access to drinking water and sanitation for the world's population.

A number of international efforts and resolutions have been tackling the challenge of the provision of water services since 2000 and some progress has been made. Currently the focus is through the UN's Sustainable Development Goals (SDGs),¹⁾ which provide the blueprint to achieving a better and more sustainable future for all. These address global challenges, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The 17 goals are all interconnected and are intended to be achieved by 2030. Water and sanitation are particularly related to SDGs 3 and 6 but are relevant to all of them. The United Nations Commission on Sustainable Development (CSD13) has emphasized that governments (referred to as "relevant authorities" in this document) have a primary role in promoting improved access to safe drinking water and basic sanitation through improved governance at all levels and appropriate enabling environments and regulatory frameworks, with the active involvement of all stakeholders. This process should incorporate institutional solutions to make the water sector more productive and the management of water resources more sustainable. In this respect, the ministerial declarations from the third and fourth World Water Forums recommended that governments endeavour to reinforce the role of parliaments and local public authorities, particularly with regard to the provision of adequate water services, and recognized that an effective collaboration with and between these actors is a key factor for meeting water-related challenges and goals.

Examples of key issues for efficient drinking water and sanitation services policy frameworks are:

- clear definition of the roles of the different stakeholders;
- definition of sanitary rules and organization for assessment of compliance;
- processes to ensure consistency between the policies regarding urban development and water utility infrastructure;
- regulation for water withdrawal and wastewater discharge;
- information for users and communities.

0.2 Water utilities: general objectives

In addition to public health and environmental protection, sound management of drinking water utilities, wastewater utilities and stormwater utilities (hereinafter jointly referred to as "water utilities") is an essential element of integrated water resource management. When applied to these utilities, sound management practices will contribute, both quantitatively and qualitatively, to sustainable development. Sound utility management also contributes to social cohesion and economic development of the communities served, because the quality and efficiency of water services have implications for virtually all activities of society.

As water is considered a "social good" and activities related to water services support the three aspects of sustainable development (economic, social and environmental), it is logical that the management of water utilities be transparent to and inclusive of all stakeholders identified in accordance with the local context.

There is a broad array of types of stakeholders that can play a role in activities related to water services.

Examples of such stakeholders include:

- governments or public agencies (international, national, regional or local) acting with legal or legislative authority;
- associations of the utilities themselves (e.g. international, regional, multinational and national drinking water or wastewater associations);

1) <https://sdgs.un.org/goals>

- autonomous bodies seeking to play an overview role (e.g. organizations concerned, such as non-governmental organizations);
- users and associations of water users.

The relationships between stakeholders and water utilities vary around the world. In many countries, there are bodies that have responsibility (in whole or in part) for overseeing the activities related to water services, whether the utilities are publicly or privately owned or operated and whether they are regulated by relevant authorities or acting in a system of technical self-regulation. Standardization and technical self-regulation are possible ways of ensuring the involvement of all stakeholders and meeting the subsidiarity principle.

The aim of water utilities is logically to offer services to everybody in the area of responsibility of the utility, and to provide users with continuous services under economic and social conditions that are acceptable to the users and to the utility. Water utilities are expected to meet the requirements of relevant authorities and the expectations specified by the responsible bodies in conjunction with the other stakeholders, while ensuring the long-term sustainability of the service. In a context of scarcity of resources, including financial resources, it is advisable that the investments made in installations be appropriate and that necessary attention be paid to proper maintenance and effective use of the installations. It is advisable that water tariffs generally aim at meeting cost-recovery principles and at promoting efficiency in the use of the resources, while striving to maintain affordable basic access to water services.

It is advisable that the stakeholders be involved in both setting service objectives and assessing the adequacy and efficiency of service.

0.3 Objectives, content and implementation of this document

The objective of this document is to provide the relevant stakeholders with guidelines for assessing and improving the service to users, and with guidance for managing water utilities, consistent with the overarching goals set by the relevant authorities and by the international intergovernmental organizations noted in 0.2. This document is intended to facilitate dialogue between stakeholders, enabling them to develop a mutual understanding of the functions and tasks that fall within the scope of water utilities.

The group of International Standards addressing water services consists of this document (service-oriented), ISO 24511 and ISO 24512 (management-oriented).

This document addresses the following topics:

- a brief description of the components of the service relating to the users;
- core objectives for the service, with respect to users' needs and expectations;
- guidelines for satisfying users' needs and expectations;
- assessment criteria for service to users in accordance with the provided guidelines;
- examples of performance indicators linked to the assessment criteria that can be used for assessing the performance of the service.

ISO 24511, ISO 24512 and ISO 24536 address the following topics:

- a brief description of the physical or infrastructural and managerial or institutional components of water utilities;
- core objectives for water utilities, considered to be globally relevant at the broadest level;
- guidelines for the management of water utilities;
- guidelines for the assessment of water services with service assessment criteria related to the objectives and performance indicators linked to these criteria.

The performance indicators presented in this document, ISO 24511, ISO 24512 and ISO 24536 are for the purposes of illustration, because assessing the service to users cannot be reduced to a single or universal set of performance indicators.

The scope formally excludes the installations inside a user's premises. However, attention is drawn to the fact that the quality of the supplied water (or discharged wastewater) can be adversely impacted between the point-of-delivery (or, in the case of wastewater, the point-of-collection) and the point-of-use (or, in the case of wastewater, the point-of-discharge) by the installations inside the premises. Some stakeholders, such as relevant authorities, owners, contractors and users, can have a role to play regarding this issue.

Because the organization of water utilities falls within a legal and institutional framework specific to each country, this document does not prescribe the respective roles of various stakeholders, nor does it define required internal organizations for local, regional or national bodies that can be involved in the provision of water services. In particular, this document does not interfere with the free choice of the responsible bodies regarding the general organization and the management of their utilities. This document is applicable to publicly and privately owned and operated utilities alike and does not favour any particular ownership or operational model.

The guidelines given in this document, ISO 24511 and ISO 24512 focus on users' needs and expectations and on the water services themselves, without imposing a means of meeting those needs and expectations, the aim being to permit the broadest possible use of this document, ISO 24511 and ISO 24512 while respecting the cultural, socio-economic, climatic, health and legislative characteristics of the different countries and regions of the world. It should therefore be understood that, in the short-term, it is not always possible to meet the expectations of local users. This can be due to factors such as climate conditions, resource availability and difficulties relating to the economic sustainability of the water services, particularly regarding financing and the users' ability to pay for improvements. These conditions can limit the achievement of some objectives or restrict the implementation of some recommendations in developing countries. However, this document is drafted with such constraints in mind and, for example, allows for differing levels of fixed networks and the need for on-site alternatives. Notwithstanding the need for flexibility in terms of engineering and hardware, many recommendations in this document, such as consultation mechanisms, are intended to apply universally.

In order to assess and improve the service to users and to ensure proper monitoring of the improvements, an appropriate number of performance indicators (PIs) or other methods for checking compliance with requirements can be established. The use of PIs is only one of the possible support tools for continuous improvement. Stakeholders can select PIs from the examples given or develop other relevant PIs, taking into account the principles described in this document, ISO 24511 and ISO 24512. The PIs logically relate to the objectives for which they are defined through the assessment criteria and are used to measure performance. They can also be used to set required or targeted values. This document does not impose any specific indicator or any minimum value or performance range. It respects the principle of adaptability to local contexts, facilitating local implementation.

While it is in no way intended that this document, ISO 24511 and ISO 24512, and more specifically the performance indicators given as examples, be considered as a prerequisite or condition for the implementation of a water policy or for the financing of projects or programmes, they can serve to assess progress towards policy goals and the objectives of financing programmes.

The objective of this document, ISO 24511 and ISO 24512 is not to lay down systems of specifications supporting direct certification of conformity, but to provide guidelines for the continuous improvement and for the assessment of the service.

This document, ISO 24511 and ISO 24512 are consistent with the principle of the "plan-do-check-act" (PDCA) approach: they propose a step-by-step process, from identifying the components and defining the objectives of the utility to establishing performance indicators, with a loop back to the objectives and to the management, after having assessed the performances. [Figure 1](#) summarizes the content and application of this document. Implementation of this document, ISO 24511 and ISO 24512 does not depend upon the adoption of ISO 9001 and/or ISO 14001. Nevertheless, this document, ISO 24511 and ISO 24512 are consistent with those management system standards. Implementation of an overall ISO 9001 and/or ISO 14001 management system can facilitate the implementation of the guidelines contained within this document,

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ISO 24511 and ISO 24512; conversely, these guidelines can help to achieve the technical provisions of ISO 9001 and ISO 14001 for organizations choosing to implement them.

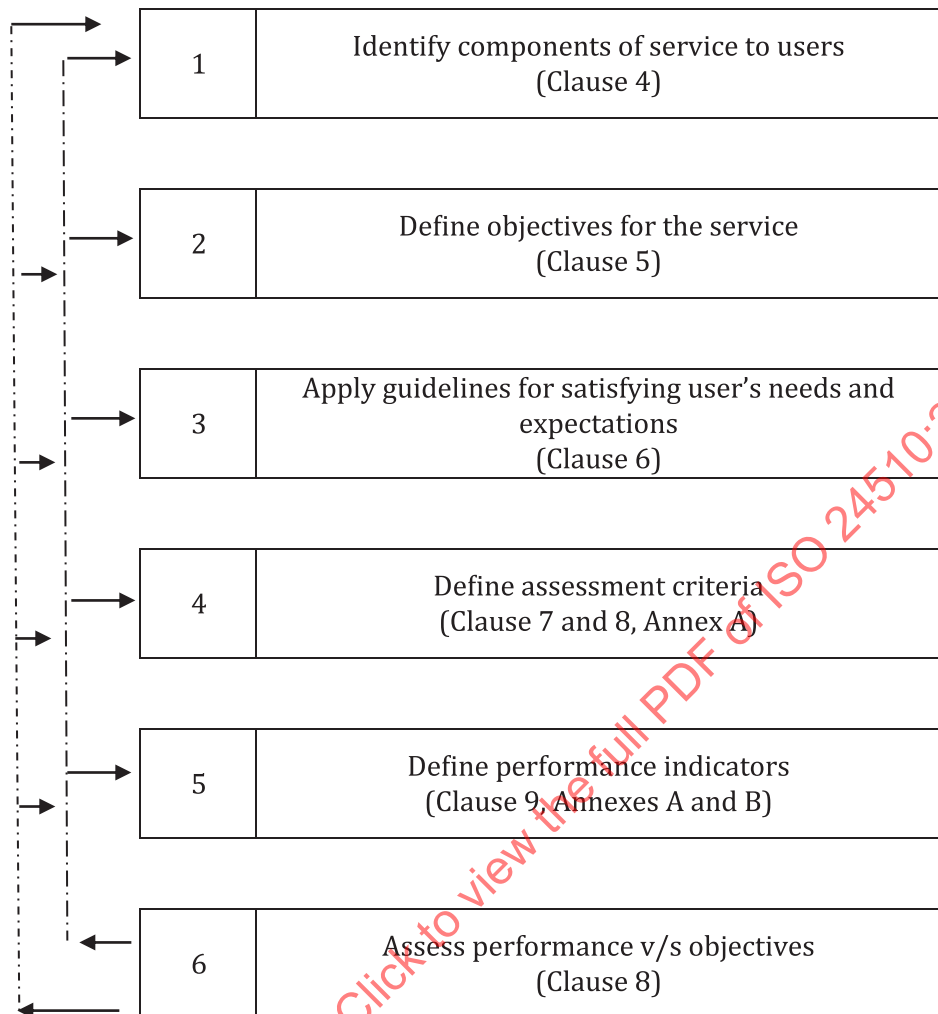


Figure 1 — Content and application of this document

0.4 Service to users

This document is different in nature from ISO 24511 and ISO 24512. The target audience of this document addresses users' expectations that pertain to relevant authorities, responsible bodies and operators. It is written from the perspective of the users rather than from that of the water utility. Consequently, some of the content of this document, ISO 24511 and ISO 24512 relates to the same issues but the guidelines it contains are complementary, due to their differences in perspective and target audience.

Activities relating to drinking water and wastewater services — Guidelines for the assessment and for the improvement of the service to users

1 Scope

This document specifies the elements of drinking water and wastewater services of relevance and interest to users. It also provides guidance on how to identify users' needs and expectations and how to assess whether these are being met.

The following are within the scope of this document:

- the definition of a language common to the different stakeholders;
- the definition of key elements and characteristics of the service to users;
- the objectives for the service with respect to users' needs and expectations;
- guidelines for satisfying users' needs and expectations;
- assessment criteria for service to users;
- introduction to performance indicators;
- examples of performance indicators.

The following are outside the scope of this document:

- methods of design and construction of drinking water and wastewater systems;
- the regulating management structure and methodology of operation and management of activities relating to drinking water and wastewater services, including contracting;
- topics relating to the system inside buildings.

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 24513, *Service activities relating to drinking water supply, wastewater and stormwater systems — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24513 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 registered user customer

user for whom relevant information is recorded by the responsible body or operator

Note 1 to entry: The term “customer” can be considered as a synonym, given that a customer has a commercial relationship, such as a service agreement, with the water utility. The term “customer” is currently used in such expressions as “customer relations”.

Note 2 to entry: The term “user” indicates the water consumer, whether or not subscribed to the service. An example of a non-subscribed user is a consumer who lives in a residential building where only the main meter is included in the service agreement.

Note 3 to entry: The term “vulnerable user” indicates a person with disabilities (e.g. with difficulties to understand or use the services) or a person belonging to a vulnerable economic group (e.g. with limited economic resources).

3.2 water services

services delivered by a water utility that include drinking water supply, wastewater collection and stormwater management

4 Elements of the service relating to users

4.1 General

To promote the continuous improvement of service to users, its elements should first be identified. The essential elements of service to users are:

- access to and provision of the water, wastewater and stormwater service and access to customer relationship services;
- contract management, billing and collection of invoices and management of users with payment defaults;
- water consumption measurement;
- promoting a good relationship with the users;
- protection of the environment;
- safety and emergency management.

Unless stated otherwise, most of the elements of the service with regard to users are common to both drinking water services and wastewater services.

4.2 Access to water services

Access to services means not only connection to networked drinking water and wastewater systems but also, if these are not available, access to other means of service. For drinking water supply, other options, such as wells, mobile water delivery, regulated bottle water vendors and drinking water points, including springs, can be used. For wastewater services, this could include septic tanks, pit latrines, composting toilets and other forms of disposal.

Beyond physical access to water, access to water services should include the affordability of customer relationship services for all users, including the most vulnerable.

4.3 Provision of the service

4.3.1 Application and termination of the service

Clear, simple and transparent procedures should be established for users to apply for and terminate water services.

4.3.2 Water services

Water services include all the procedures for supply and maintenance of the quality of drinking water services or recycled water services. Wastewater services (collection, treatment and disposal) include all the procedures for provision and maintenance of the quality of wastewater services. Stormwater management services include all the procedures for the planning, infrastructure and management of stormwater hazards.

4.3.3 Water quality

The quality of drinking water or recycled water comprises the health and aesthetic aspects of the water provided. The quality of wastewater or stormwater comprises the environmental aspects of the water collected, treated and discharged or managed.

4.4 Contract management and billing

4.4.1 Service agreement

The service agreement includes the establishment of an agreement, implicit or explicit, between the registered user and the water utility.

4.4.2 Billing

Billing encompasses the conditions relating to billing for service, terms of payment and information on applicable rates.

4.5 Promoting a good relationship with users

Promoting a good relationship with users implies identifying their needs and expectations, in terms of access and quality of service, providing the proper communication channels and timely response to their inquiries, as well as enabling a participatory process on matters of general interest related to the water service.

4.6 Protection of the environment

Protection of the environment encompasses preventing or mitigating all the permanent or temporary impacts of the water utilities' service activities on the environment. It includes the quality of the wastewater or stormwater discharged, whether to land or water bodies, and the appropriate management of any residues produced. The protection of the environment and all measures for resource prevention, in particular by a water consumption control, includes the maintenance of the infrastructure and the long-term protection of the water resources and, where possible, the encouragement of water usage management and efficiency.

4.7 Safety and emergency management

Safety and emergency management procedures include the information, plans and solutions to maintain or restore service in the event of major incidents or natural disasters.

5 Objectives for the service in respect of users' needs and expectations

5.1 General

This clause should be used to identify the needs and expectations of users. The quality of the service provided to the users depends on the ability of the institutions providing the water services to meet the users' needs and expectations under sustainable conditions. All elements of need and expectation listed relate to both drinking water services and wastewater services, unless stated otherwise.

5.2 Access to water services

Because access to water and sanitation has been declared a human right,²⁾ users and potential users expect that all practical steps be taken to ensure their access to those services. Users expect to have access to the service, even if this access does not include a physical connection to the infrastructure. Users also expect the relevant authority or responsible body to plan the development and provision of water services within the service area and inform them of the timing of providing such access.

Vulnerable users expect the water service and the relevant authority or responsible body to ensure that the services provided take into account any vulnerabilities (disabilities or economic limitations) they have.

5.3 Provision of the service

5.3.1 Time to establish new service provisions

The user expects to be provided with the service in a reasonable and specified time within the service area. An explanation may be required on the specific conditions under which the service can be provided, and when.

5.3.2 Repairs

The user expects repairs that affect the provision of the service to be completed within a reasonable time, as well as to be warned in advance of planned repairs that would affect the service. Water services may determine and publish a level of service standard regarding the length of service interruptions. In all cases, the user expects the inconvenience to be minimized. If the service is affected and an interruption occurs over a long period, an alternative drinking water service (e.g. emergency pipes, tankers, water bottles) should be implemented.

The interruption of supply should be reduced to a minimum. The corresponding duration is part of the service level and should be defined locally.

5.3.3 Price of service

The user expects the service to be fairly priced and the relevant authority or responsible body to ensure that affordability is not a barrier to access, particularly in the case of vulnerable users.

5.3.4 Quantity of water services

The user expects to receive sufficient drinking water or recycled water at the point-of-delivery to satisfy his or her needs or collected wastewater or managed stormwater volumes reflecting general user expectations or declared levels of service standards.

5.3.5 Water quality

The user expects that all drinking water or recycled water supplied will be fit for purpose, and that all water discharged to the environment (wastewater or managed stormwater) will meet applicable environmental goals and objectives.

2) https://www.un.org/waterforlifedecade/human_right_to_water.shtml

5.3.6 Level of service

Where the user is physically connected to the water supply or a wastewater collection system or is served by a stormwater management system, the user expects the level of service standards to be met. These can include, for example:

- a) water supply volumes and pressures;
- b) wastewater collection and back flow prevention volumes and flow rates;
- c) stormwater diversion;
- d) continuity of service and provision of alternative service when needed.

5.3.7 Coverage and availability of water services

5.3.7.1 Drinking water service

Where there is a service based on physical connections in a service area, the user expects that drinking water supply be provided throughout the service area and that where it is not, alternative delivery systems for water supply be made available.

5.3.7.2 Wastewater services

Where there is a service based on physical connections, the user expects that wastewater service be provided throughout the service area. In such systems, the user expects to be able to discharge wastewater directly into the wastewater system at any time and without delay or risk to human health.

The user expects no backup from the wastewater system to affect properties or streets. In the case of a backup event, the user expects the duration and effects to be minimized and remediation assistance provided by the water utility or other appropriate body.

5.3.7.3 Stormwater management

Residents within an area subject to a stormwater management service expect no flooding to affect properties or streets. In the case of a flooding event, residents expect the duration and effects to be minimized and remediation assistance provided by the stormwater utility or other appropriate body.

5.4 Contract management and billing

5.4.1 Availability of a clear service agreement

The user expects a service agreement with conditions that are clear, fair and well-documented. The user expects to be informed of any change to the agreement or its conditions a reasonable amount of time prior to the changes taking effect. The user also expects procedures for the establishment and cancellation of the agreement.

5.4.2 Water consumption

Charges for wastewater collection services are sometimes included as a percentage of the water delivered and sometimes as a separate metered fee.

The user expects a reliable meter reading (by a meter reader or online), on schedule and with the least disruptive operation.

Where this option is available, the user can also expect to be able to communicate automatically their consumption data online, by phone or by a picture with transmission and acceptance conditions that are clearly stated.

5.4.3 Accuracy of billing

The user expects to be fairly and accurately billed for the service provided.

5.4.4 Response to billing complaints

Where a billing complaint has been made by the user, the user expects a response from the water utility. The user expects the response to clarify and/or resolve the problem in a reasonable amount of time, with fair consideration of any monetary issues caused by billing errors.

5.4.5 Clarity of billing

The user expects clear, accurate and detailed information on the structure and content of bills.

5.4.6 Methods of payment

The user expects regular billing and a variety of convenient payment methods.

Where it is possible, a payment plan (monthly or quarterly) should be set up for a better control by the user of his or her water budget.

5.5 Promoting a good relationship with users

5.5.1 General

Where particular services are available, the user can expect various methods of communication to be used, with respect to the following:

- any enquiry addressed to the responsible body, operator or relevant authority by any appropriate means to be clarified and/or resolved within a reasonable amount of time;
- guaranteed confidentiality and guaranteed personal data security for data that are collected only for the personal operation of the services;
- competent and respectful contact persons.

Further details by communication channel are given in [5.5.2](#) to [5.5.7](#).

5.5.2 Written contact

The user expects written contact [e.g. letters, e-mails, faxes, short message services (sms), social media messages] to be responded to and dealt with in a reasonable amount of time and in a respectful manner.

5.5.3 Telephone contact

Where a telephone service is available, the user should be able to contact the water utility by telephone, with telephone calls to be responded to and dealt with in a reasonable amount of time, either directly or by being transferred to the appropriate service department. The user expects to be able to notify the water utility at any time during an emergency related to the service.

5.5.4 User visits to the offices of the water utility

The user expects to be welcomed, assisted effectively and directed to the appropriate person. The user also expects:

- convenient opening hours that are respected;
- reasonable, well-managed waiting times;
- a suitable public reception area offering confidentiality;

— a convenient office location.

5.5.5 Online customer relationship service

When the service is available, users expect a secured online platform providing 24 h access, seven days a week, to a first level of information responding to their demand and enabling them to fulfil administrative procedures relative to the management of the service agreement.

The user expects to have clear information about access to their user account and its use in order to become self-reliant for the usage of the online customer relationship service.

5.5.6 Social media

When the service is available, the user expects to have access to information on the water service and to be able to transmit requests and complaints by social media.

For the transmission of inquiries and complaints, social media are an alternative or supplement to other means.

5.5.7 Visits to the user

The user expects employees of the operator to respect the appointment time, to show proper identification and to minimize any inconvenience to the user.

5.5.8 Complaints and requests

The user expects that any complaint or request (e.g. verbal communication, e-mails, faxes) be carefully considered. The user expects a clear, accurate, adequate response in a reasonable time.

When the user is not satisfied by the response to their complaints, they expect to be able to apply for an amicable settlement thanks to a cascading procedure enabling them to make their claim to another department or organization (e.g. water mediation).

5.5.9 Notification of restrictions and interruptions

The user expects to be notified of unsafe conditions or any restrictions or interruptions of the service.

5.5.10 Notification of an abnormal water situation

The user expects to be informed by any means and as soon as possible after the statement of water loss, the suspicion of water loss or a water overconsumption event, in order to rapidly correct the defect.

5.5.11 Availability of service information

The user expects that all information regarding public aspects of the service, in accordance with local conditions, including the designation of responsibilities and performance of the service, be issued in an open and transparent manner.

5.5.12 Community activities

The user expects the water utility to proactively provide information regarding the utility through community activities and outreach efforts.

5.5.13 Participation of the users

The user expects participation to be encouraged and enabled by a transparent participatory process and the right to put forward users' interests on such matters as prices, standards and physical connection or alternative service development. Anonymous satisfaction surveys can fit with this expectation.

5.6 Protection of the environment

5.6.1 Sustainable use of natural resources

The user expects the operator, responsible body and relevant authorities to promote and practise sustainable use of water resources, as well as other natural resources.

5.6.2 Wastewater treatment

The user expects the efficient and effective treatment of water treatment residuals, wastewater and, where possible, managed stormwater before it is returned to the environment. The user also expects that sludge and other residues are disposed of or beneficially reused in a way that is safe and protective of public health and the environment.

5.6.3 Environmental impact

The user expects that any negative environmental impacts resulting from the service be minimized.

5.7 Safety and emergency management

In the event of an emergency affecting the service or the safety of the users, the user expects that the service be restored in a reasonable time and that risks and inconveniences be reduced as far as practically possible in accordance with local conditions, in order to prevent:

- a) disruptions of the service due to problems with quantity or quality;
- b) pollution of water resources or the environment.

In addition, in the event of an emergency, the user also expects timely information on the following:

- the nature of the incident and the risks (if any) involved;
- contact details for appropriate water utility representatives;
- what the user should do (if anything);
- the time before normal service will be returned and whether temporary alternatives are available;
- updates on any corrective measures being undertaken by the water utility.

5.8 Higher user and regulatory demand

An objective of the water utility should be to respond to rising user and regulatory demand, while considering the impact of these demands on consumer pricing, such as:

- more stringent demands from users regarding the continuity of the services or the shortening of service interruptions;
- more stringent standards for the quality of the water and the quality of the service.

5.9 Available technologies

An objective of the water utility should be to take advantage of available and reliable technologies relating to:

- a) water supply and process technologies;
- b) data mining and analysis;
- c) communications and digitation;

d) protection against risks stemming from the use of cyber communications.

Attention should be given to the potential adoption of future resilient technologies.

6 Guidelines for satisfying users' needs and expectations

6.1 General

The service to users can be improved by taking into account users' needs and expectations. In order to satisfy those needs and expectations, it is necessary to define actions to follow that will have these needs and expectations as their objectives. When not stated in the guidelines, the stakeholder responsible for the implementation of each action (relevant authority, responsible body or operator) should be defined beforehand.

This clause provides guidelines to define those actions. The results of these actions should be assessed following the criteria presented in [Clause 7](#).

Given the varying degrees of economic development, it is possible that the full implementation of the guidelines presented in this clause is not yet attainable in some countries, in which case they should be considered as goals for continuous improvement.

In the absence of specific laws and regulations, the relevant stakeholders should agree on the necessary conditions to guarantee a good service.

For further guidance on the management of water utilities in such a way that users' needs and expectations are satisfied, users of this document should refer in particular to ISO 24511 and ISO 24512 and also to all the other standards published by ISO/TC 224.

6.2 Access to water services

Relevant authorities and responsible bodies within their service areas should define and implement institutional and economic or financial measures to put in place drinking water supply, wastewater and stormwater systems, which can include resource management, physical infrastructure extension and alternative means of water supply, wastewater collection or stormwater management and treatment for those who are not connected.

The fact that certain communities and/or users are not connected to water and wastewater physical infrastructure should not be taken to mean that there is no service to which this document should apply. There should be other service provisions considered, such as:

- wells and springs;
- mobile drinking water delivery;
- regulated vendors and drinking water points;
- latrines;
- septic tanks;
- septage removal and transport;
- other forms of provision, including on-site self-provision.

Relevant authorities and responsible bodies should take measures to ensure equitable and affordable access. These measures may include grants for water invoice payment and/or support for financing connections for the poor, loans, social tariffs (including possible zero-rate tariff blocks targeted at the poorest), subsidies, cross subsidies between households at different income levels or other aids.

Responsible bodies should take measures to ensure that all users have access to enough water to meet basic human needs, in accordance with local conditions and the advice of those bodies responsible for sanitary

controls. The choice of such measures, which may be temporary, should take into account the cost and effectiveness of cross subsidies between users and the financial viability and sustainability of the service.

Responsible bodies should define and implement all means necessary for the access of all users, including the most vulnerable ones, to the customer relationship services.

6.3 Provision of the service

6.3.1 Time to establish new service provisions

The water utility should establish a standard time for new service provision in network systems and commit to achieving this target for all regular connections.

In all systems, the water utility should be able to estimate and clearly communicate to the user the time that it takes to establish a new service or connection. The estimate should include a reasonable allowance for unexpected local conditions or delays, as follows:

- The standard time should be defined as the period from the time the user application procedure is completed to when the service is available for the user.
- The application procedures should be clearly specified by the water utility.

In the absence of a piped network system, the user should be informed about when the service is to be provided, either through an infrastructure extension or through alternative means of service.

6.3.2 Repairs

For planned repairs, the water utility should inform the affected users in advance with an estimate of the time and duration of the interruption to the service. For unplanned repairs that affect the service, the water utility should take measures to inform the affected users about the estimated time until normal service is restored. In all repairs, the water utility should minimize the inconvenience to the affected users.

Life cycle cost should be considered in the undertaking of repairs (see ISO 24516).

6.3.3 Price of service

The operator, responsible body and relevant authorities should aim to provide the service at a “fair price”. In order to identify what is meant by a fair price, the following elements should be taken into consideration:

- affordability;
- total cost;
- historic price levels and inflation;
- rate of return;
- impact on water use.

The acceptability to users of a fair price could require providing the public with information regarding the components of the price and the extent to which the costs of providing the service are covered by revenues from the users.

The extent, nature and purpose of relevant subsidies should be identified, as should any calculations of affordability for users. Information on those factors influencing variations in price (e.g. cost inflation, cost of capital, environmental laws and regulations, emergencies, network extensions, water quality and availability, taxes) should also be provided.

6.3.4 Quantity of drinking water supply

The operator, responsible body and relevant authorities should use their best endeavours to ensure that the current demand for water is met. For their part, users should be expected to strive towards a rational and efficient use of water and should be encouraged in that direction by the operator, responsible body and relevant authorities.

The operator, responsible body or relevant authorities should make adequate estimations of future demands. The estimates should lead to a reliable and sustainable drinking water supply in the future which meets those demands.

6.3.5 Drinking water quality

The operator, responsible body and/or relevant authorities should prevent the supply of drinking water which has a detrimental effect on the health of the people using the water. The operator, responsible body and/or relevant authorities should carry out regular collection and analysis of water samples taken at relevant points, including points-of-use, to determine that it is safe for human consumption and use.

In the absence of applicable laws or regulations, drinking water should at least comply with guidelines from the World Health Organization.^[21]

The operator, responsible body and/or relevant authorities should make the results of these analyses available to users and include in a periodic report (e.g. the annual report) a summary of water quality and any related problems.

Where an emergency situation causes the release into the water distribution system of drinking water that could be detrimental to health, the water utility or another relevant body should take all possible measures to remove the contaminated water from the system. Where removal of the contaminated water is not possible, the water utility, relevant authority or another relevant body should inform potential users of the risks of the situation and provide them with an alternative means of supply of drinking water.

6.3.6 Aesthetic aspects of water

The drinking water utility should implement measures affordable to the user to provide aesthetically pleasing water on a regular basis. The drinking water utility should monitor complaints on the aesthetic quality of water (taste, colour and odour), and/or carry out user surveys on water quality aesthetics on a periodic basis.

The wastewater utility should implement measures affordable to the user to minimize unpleasant odours emanating from the wastewater system.

6.3.7 Pressure of drinking water supply

When the drinking water service is provided through a piped network, the water utility should provide water at adequate pressure and should inform the users of the minimum and maximum pressure values. In any case, the water utility should ensure that the state of the piped network is not an impediment to providing adequate pressure levels.

6.3.8 Continuity of drinking water supply

The water utility should take all necessary steps to provide a drinking water supply on a continuous basis. Where this is not possible, supply should be made available on a basis that is equitable to the users.

The water utility should take the necessary steps to minimize the impact of events such as system failures or ongoing repair or rehabilitation works that cause the drinking water supply to users to be interrupted. The water utility should inform users regarding supply interruptions in a timely manner.

In non-networked supply systems, the water utility should provide a drinking water supply on a regular basis and inform users of the locations, intervals and timing of the provision of drinking water.

6.3.9 Coverage and availability of drinking water services

Responsibility for geographical coverage of the drinking water service rests with the relevant authority and responsible body, which should take all reasonable steps to provide service on an equitable basis within and between all rural and urban areas. This objective of maximum coverage can require differences in methods of service delivery, in accordance with local conditions.

Where populations are not served by piped network systems, the responsible body should plan on the basis of alternative forms of provision, such as public water points or tanker trucks. The possibility that a geographical area will not be profitable in commercial terms should not constitute an obstacle to service. The range of possible models of service provision should include low-cost alternatives and prices adapted to the needs of economically disadvantaged zones, with a view to expanding service.

The volume of drinking water made available to the user should at least meet the user's basic water requirements, defined by the World Health Organization,^[21] and should also provide protection against illnesses linked to lack of and poor quality of water.

Coverage and availability of the service should be environmentally and financially sustainable.

6.3.10 Coverage and availability of wastewater services

Responsibility for geographical coverage of the wastewater service rests with the relevant authority and responsible body, which should take all reasonable steps to provide service on an equitable basis within and between all rural and urban areas. This objective of maximum coverage can require differences in methods of service provision in accordance with local conditions.

Where networked wastewater collections systems exist, the wastewater utility should control the quality of the installed connection and the waste discharged into the system. The water utility should clearly inform the users about what may or may not be discharged into the wastewater system. The users should be expected to comply with such requirements.

Where populations are not served by network systems, the responsible body should plan to provide users with alternative forms of wastewater collection and treatment, such as latrines or septic tanks. The possibility that a geographical area will not be profitable in commercial terms should not constitute an obstacle to service. The range of possible models of service provision should include low-cost alternatives and prices adapted to the needs of economically disadvantaged zones, with a view to expanding service.

The wastewater utility should develop and operate a programme of operations and maintenance to repair or restore assets or systems to ensure that the user has the ability to discharge wastewater or septage.

The wastewater utility should provide reliable service and minimize unplanned interruptions to the users' ability to discharge wastewater or septage.

Coverage and availability of the service should be environmentally and financially sustainable.

6.3.11 Stormwater management

The water utility should take all reasonable steps to minimize the risk of flooding. The water utility or local relevant authority should provide clear information about the flooding risks in the service area and the measures which users and property owners can adopt to minimize the possible impact of system flooding (e.g. installation of flood barriers on property lines or building features). The operator should develop a plan to react in an appropriate way to the risks of flooding.

6.4 Contract management and billing

6.4.1 Content of the service agreement and water consumption measurement

6.4.1.1 Availability of a clear service agreement

The water utility should enter into clear and fair service agreements with users. The service agreement should have clear and available conditions. In any case, it is possible that individual contracts or written contracts will not be necessary.

A service agreement should include at least:

- obligations of the water utility, such as:
 - setting of connections and meters;
 - maintenance and continuity of the service, except in the case of “force majeure”;
 - water supply, wastewater collection and stormwater management;
- obligations of the user, as well as the water supply, wastewater collection and stormwater management procedures and, in particular, the procedures for service agreement subscription.

Procedures for subscription:

- The user should subscribe for the service on their own initiative by making an official request to the water utility.
- In response to the subscription request, the service agreement (commonly called “service rules”), as well as a descriptive document summarizing the particular clauses of the service, should be sent to the user.
- The effective date of the service subscription is the date of the connection commissioning. If the connection remains in service, the subscription takes effect when the user enters the premises.
- The water supply, wastewater collection and stormwater management are performed with connections and meters, except in exceptional cases.

When the water utility uses a standard service agreement, this should be made publicly available and easily accessible.

When the water utility proposes to change an existing service agreement, customers should be given reasonable notice of the details of the change and should be able to provide comment on the final decision.

The water utility should prepare and make available to users procedures for the establishment and cancellation of agreements. The cancellation procedures should be simple.

6.4.1.2 Water consumption measurement

Except for some exceptional cases, the water utility should install an individual meter in a public or private space for measuring with precision the consumption of the user.

In cases of dispute following an irregularity, the user should have the ability to request the removal of the meter for the purpose of a calibration by an accredited body on an accredited bench. The tolerance level of the accuracy is the one defined by the local regulation.

The user should give easy access to the meter to the water utility.

The frequency of meter reading should be defined in the service agreement.

The water utility should guarantee the reliability, traceability and calculation accuracy of the consumption. The meter reading can be made either by an officer of the water utility [if possible, by mobile equipment such as a personal digital assistant (PDA) or smartphone] or by remote reading (either walk-by or online

remote reading). When the water utility officer cannot access the meter, the user may be authorized to read the meter and communicate the value of the measure with the means at their disposal or, when possible, by sending a picture of the meter.

In the absence of meter readings or self-metering data from the user, the consumption should be estimated.

When the meter has an incident (e.g. broken, blocked) or when there is a problem in its environment of installation (e.g. flooded manhole, buried meter), the utility meter reading officer should obtain document evidence, such as a photograph. The water utility should inform the customer and handle the incident as soon as possible.

The utility meter reading officer should also indicate if there is a suspicion of fraud (e.g. meter switched back, pipe connection) in order to generate a check of the user device.

6.4.1.3 Accuracy of billing

The water utility should take all reasonable steps to ensure that billing of customers is accurate. The meters, when they are installed, should be checked and/or exchanged. Moreover, the water utility shall verify the meter as often as they consider it necessary.

In the event of a complaint about the accuracy of a meter used to measure use of service, the operator should perform a flow gauging and, in the case of a confirmed dispute, perform a calibration of the meter and replace it when appropriate. There should be a clear procedure for adjustment in the event of an error disadvantageous to the user.

When the meter reading is not possible (inaccessibility or incident on the meter) the water utility should be authorized to estimate the consumption on the basis of past monitored consumption.

The rules for calculation should be simple, clear and mentioned in the service agreement; they should be accessible to the user through other means (e.g. invoice, online service to user).

When consumption is estimated, this information should be clearly stated on the invoice so that the user can make a clear difference between measured consumption or collection and estimated consumption or collection.

The invoice should be sent to the user in a reasonable timescale after the meter reading. The invoice should be sent in paper form or online. It can be given to the user when reading the meter (on-site billing), delivered by the water utility to the user's home or sent by post.

If the website provides an online customer relationship service, the invoice may also be available in electronic format in the user account. By default, the invoice should be sent to the address of the consumption point (address of the connection) but it may be also sent to another address (address of the payer) on the customer's request.

When the customer has no meter, the operator should clearly state the basis of invoicing (e.g. type of residence, number of inhabitants).

Depending on the terms of the service agreement, in the event of failure to supply, the bill should be reduced accordingly.

The billing should be carried out with a system enabling controls for each period of billing:

- number of customers billed;
- consumption or collection billed;
- amount billed.

The billing system should keep all information requested for invoicing.

6.4.2 Response to billing complaints

The water utility should provide a timely response to the registered customer, which clarifies the problem or resolves the complaint within a reasonable time.

The water utility should maintain a local service commitment (which may be included in the service agreement) to customers, which specifies a maximum response time for billing complaints.

Depending on the terms of the service agreement, the water utility should give consideration to monetary issues caused by billing errors, explain to the customer the error origin and provide acceptable solutions (e.g. reimbursements of the difference if the payment has already been made and there is an overcharge).

6.4.3 Clarity of billing

6.4.3.1 General

The water utility should operate a billing system which provides customers with paper or electronically based bills, or other means which are clear, comprehensible, accurate, timely and complete.

The water utility should provide the customers with detailed information regarding the structure and contents of bills. This information should be clear and easy to understand, using plain language and unambiguous presentation. Examples of documents that could be used to provide this information include tariff schedules and special cases.

6.4.3.2 Components of the tariff

The information should clearly state the different components of the water or wastewater tariff and the different categories of recipients. Where a stormwater management fee is relevant, this should show the fee structure based on the categories of beneficiaries.

In the case of different services sharing a common bill with drinking water or wastewater services, the contents should be clearly distinct, with each service being clearly identified.

If the communication infrastructure is in place and the customers expect this service, this information should be available for the customer on the online service platform or provided by the customer relationship service.

6.4.3.3 Control of the water consumption and advice

The invoice should include a pattern of the water consumption of the customer or a comparison of its water consumption with the previous year or period.

General information and best practices on consumption per usage (e.g. toilets, shower, electrical goods), as well as advice for decreasing consumption, should be available in the consumer relationship centre or on the online customer relationship platform.

Information on the importance of reducing wastewater discharges, as well as advice on the means of doing so (e.g. decreasing consumption or introducing reuse and recycling opportunities), should be available in the consumer relationship centre or on the online customer relationship platform.

6.4.4 Methods of payment

The water utility should establish systems to facilitate payment by the customer in terms of:

- a) regularity of consumption or discharge measurement and/or billing;
- b) choice and flexibility of payment methods;
- c) frequency of payment;
- d) minimum inconvenience (e.g. in terms of physical placement of payment locations or long queues).

Payment will be made according to local custom and practice, such as:

- cash;
- cheque;
- bank transfer;
- automatic bank debit to due date or progress payment (e.g. monthly, quarterly);
- pre-purchased “water stamps” or “tokens”;
- credit card or phone card;
- virtual purse solutions;
- any payment means accepted locally.

Payment can be made:

- online on the customer relationship management application;
- by phone, mail or at the customer relationship centre;
- on a self-service payment terminal.

The water utility should bear in mind that poorer customers often prefer to make frequent payments of small amounts and adjust the billing systems to accommodate this preference, if possible.

A system of prepayment (pay as you go) enabling the customer to pay only what is consumed or discharged should be offered to these users as far as possible and when the service agreement allows it. This system has a double benefit:

- it allows vulnerable customers with irregular revenues to pay with small amounts;
- it allows the automatic interruption of the water service when the credit is finished, avoiding dispute or water disconnection costs; the reactivation of the service will then be automatic when the user has recharged their pre-paid account.

6.4.5 Payment management

Payment registration systems should be managed accordingly and should offer the possibility for users to check payment with amounts due.

Payment registration systems should keep historical data according to the duration mentioned, if any, so that the user can check the history of payment.

Any double payment or overpayment should be reimbursed to the user on request in a reasonable timescale; if needed, this sum will be credited to their account and deducted from their next bill.

In the case of an unpaid bill on the specified payment deadline, the water utility should remind the user of their duties once or several times with any regulatory means. Delay penalties may be applied in consistency with the service agreement.

If the bill remains unpaid after these payment reminders, the water utility should be authorized to close the connection or to reduce the flow after a last reminder to the user. If legislation doesn't allow the interruption or reduction of the service, the water utility can take any means (regulatory or legal) to ensure recovery.

In the case of users with difficult financial situations, the water utility should evaluate the situation and offer different solutions, in particular payment delays or time frames.

6.5 Promoting a good relationship with users

6.5.1 General

The water utility should address user expectations. The water utility should have procedures promoting understanding good relationships and participation by users in general. The water utility should provide accessible contact information for user communication. The water utility should also have procedures which deal with enquiries from users and which clarify and/or resolve them in a reasonable amount of time. The procedures should also guarantee confidentiality to the user and be carried out in a competent and respectful manner by people who have access to the most current information.

The water utility should maintain a local service commitment (which may be included in the service agreement) which specifies a maximum response time to the enquiries.

The water utility should be able to respond to the various expectations of users according to their segmentation (household or non-household, professional activities and water usage) and/or vulnerability.

6.5.2 Written contact

The water utility should specify the forms of written communication available that are adapted to the needs of users and provide a response in a reasonable time. The water utility should provide suitable solutions or answers to users.

The water utility should maintain a local service commitment (which may be included in the service agreement) which specifies a maximum response time for written contact.

6.5.3 Telephone contact

Where telephones are available, the water utility should provide a service which responds to received calls in a reasonable time and also provides suitable solutions or answers to users.

The telephone service provided should be available at all times to respond to calls regarding emergencies. The water utility should maintain a local service commitment (which may be included in the service agreement) which specifies a maximum waiting time and a maximum response time for telephone contact.

In areas where a telephone service is not available, the water utility should provide an alternative system for responding to enquiries or emergency contact from users.

6.5.4 User visits to the offices of the water utility

The water utility should provide designated facilities which are appropriate for the reception of users. The facilities should have established opening hours which are respected and provide reasonable and well-managed waiting times for visitors. The facilities should be at offices that are convenient to users. In rural or low-density areas, where fixed offices are not cost-effective, the water utility should provide alternatives (e.g. mobile offices, electronic desks).

The facilities should offer visitors confidentiality and the employees of the water utility that provide assistance to them should be clearly identified.

Easily understandable documents that relate to the main features of the service should be made available proactively to visitors of the designated facilities. These should include information that sets out in simple terms the water utility's application procedure for a service.

6.5.5 Online customer relationship service

Wherever possible, the water utility should offer users a secured internet space giving them 24 h access seven days a week to a first level of information and should carry out administrative procedures for the management of its service agreement. Online services are an alternative or supplement to other means of submission.

6.5.6 Social media

Wherever possible, the water utility should offer the user through social media a first level of information on the water and wastewater service and a first level of collection and treatment of their requests and reclaims. Social media are an alternative or supplement to other means of submission.

6.5.7 Visits to the user

The water utility should adopt procedures which ensure that their employees observe appointment times agreed for visits to users. The procedures should also require that employees who visit the users carry appropriate identification and that they show it to the users. Users should be made aware of this requirement.

Employees of the water utility should minimize any inconvenience to the user and provide confidentiality during and after the visit. Employees making visits to users should be competent regarding the reason for the visit and should always behave in a courteous manner.

6.5.8 Complaints and requests

The water utility should have procedures for answering and/or resolving complaints and requests made by users. The water utility should maintain a local customer service commitment (which may be included in the service agreement), which should specify maximum response times for users' complaints and requests. For all complaints and requests, the water utility should put in place a monitoring system to assess the response time.

Complaint and request methods can be:

- written;
- by telephone;
- by e-mail (internet or social media);
- by fax;
- verbal, via a visit from the user;
- verbal, via a visit from the employees of the water utility.

For further guidance on handling complaints and requests, refer to ISO 10002.

The water utility should inform the user that if they are not satisfied by the response to their complaint or request, they may benefit from a cascading procedure enabling them to make a claim to another department of the utility or another organization (e.g. water mediation).

6.5.9 Notification of restrictions and interruptions

The water utility should use the most appropriate method to notify affected users about unsafe conditions or any planned restrictions or interruptions to the service. In the case of unplanned or exceptional service restrictions or interruptions, the water utility should as soon as is reasonably possible inform affected users of the reason for, and the expected duration of, the restriction or interruption.

It is recommended that the water utility maintains a local customer service commitment (which may be included in the service agreement) which specifies the minimum period for notification to affected users of planned restrictions or interruptions of the service.

Frequent updates on any prolonged interruptions should be given to the user.

6.5.10 Notification of an abnormal water situation

In the case of existing smart meters, the water utility should implement an alert system to the user by any means and as soon as possible after the statement of an abnormal situation, such as a proven water loss, a

water loss suspicion or an overconsumption, a likely sewer back-up or a stormwater flooding warning, so that they can react rapidly.

After verification of abnormal consumption (water loss or overconsumption) or abnormal collection, a message with or on the invoice should alert the customer so that they can check their device. A separate message (before or after invoicing) can also be sent to the user to alert them of this abnormal consumption.

When the abnormal consumption remains very low during several consecutive periods, the water utility should be allowed to check the user's device.

6.5.11 Availability of service information

The operator, responsible body and relevant authorities should openly and transparently provide the users with general information regarding publicly available aspects of the service, including the designation of responsibilities and the performance of the services in accordance with local conditions. This information should be provided in such a manner as to be of the greatest use to the greatest number of users.

Users may request the operator, responsible body and/or relevant authorities to disclose information. There are some cases where information disclosure is controlled by law. Information may be made available and not necessarily publicly disseminated. However, when possible, the operator, responsible body and relevant authorities should provide all legally available information actively when requested to do so.

EXAMPLE Depending on local conditions, public aspects of the service can include:

- public health matters:
 - quality test results;
 - periodic reports on water quality;
 - periodic reports on wastewater quality and residue disposal;
- customer service:
 - contact details (office hours, telephone contacts, internet address);
 - complaints procedures and cascading procedure for amicable resolution;
 - metering procedures, billing procedures and payment procedures;
 - how to seek available help to pay a bill (e.g. social security);
- legal framework:
 - customer contracts;
 - rights of users;
 - responsibilities of users;
 - tariffs;
 - tariff-setting procedures;
 - existing contracts (e.g. concessions, management agreements);
 - proposals for new or renewed contracts (e.g. concessions, management agreements);
 - procedures for contract awards (e.g. concessions, management agreements);
- operational matters:
 - timelines for service extension;

- emergency procedures;
- financial matters:
 - cost structure;
 - pricing formula and price evolution formula;
- performance of the service:
 - performance data as published, for example, by relevant authorities.

6.5.12 Community activities

The water utility should participate in local community activities, whenever these are relevant to the service, or should organize its own activities, such as facility open houses and tours. The water utility should promote good relationships with the local community by providing information proactively and being aware of local expectations (as this could result in, for example, cooperation from the community and volunteer participation in cases of emergency).

6.5.13 Participation of the users

The operator, responsible body and/or relevant authorities should encourage and promote participation by users (e.g. legal framework, funding), which could take several forms, for example:

- ongoing consultation through standing user committees which may monitor complaints and standards of service;
- participation in dispute resolution for individual cases;
- consultation at key decision points, such as new programmes to extend the network, set prices for a new period, considering the content of new operating contracts and/or changes of the responsible body; consultation can take place between users and operators, responsible bodies and/or relevant authorities, either jointly or separately;
- listening to customer needs and measurement of the quality of the service by anonymous surveys on user satisfaction.

6.6 Protection of the environment

6.6.1 Sustainable use of natural resources

The water utility should strive for efficiency and sustainability in the use of water and other resources (e.g. energy).

The water utility should also undertake actions such as:

- minimizing leakage;
- minimizing contamination of the environment;
- establishing source water protection, including long-term resource allocation mechanisms;
- monitoring the quantity and quality of water resources in catchment areas;
- participating in commissions responsible for river basin management;
- providing education and general information to users about efficient use of water and other natural resources;
- setting tariffs and/or taking measures which promote efficient water use.

For further guidance, refer to ISO 24511 and ISO 24512.

6.6.2 Wastewater treatment

The responsible body and/or relevant authorities should ensure the adequate treatment of wastewater to prevent risks to public health and to minimize adverse environmental impact.

The operator, responsible body and/or relevant authorities should provide users with information regarding any applicable regulations and guidelines and the level of compliance.

For further guidance, users should refer to ISO 24511.

The responsible body and/or relevant authorities should ensure the adequate treatment of stormwater to prevent risks to public health and to minimize adverse environmental impact.

For further guidance, refer to ISO 24536 and ISO/TR 24539.

6.6.3 Environmental impact

The operator, responsible body and relevant authorities should take positive action to minimize the impact of their activities on the environment. The results of implementation should be communicated to the stakeholders. These activities should be in accordance with guidelines and can be enhanced by an environmental management system (e.g. ISO 14001). The operator, responsible body and/or relevant authorities should provide regular information about the environmental impact of the activities relating to water services.

For further guidance, refer to ISO 24511 and ISO 24512.

6.7 Safety and emergency management

The operator, responsible body and relevant authorities should develop and regularly test appropriate emergency and prevention plans based on risk management principles that include:

- a) prevention and mitigation measures;
- b) the internal organization to deal with emergencies;
- c) training procedures for employees;
- d) appropriate information for users;
- e) procedures for the restoration of normal service operation.

Emergency plans should be designed to restore the service to users in a reasonable time and reduce risks and inconveniences as far as practically possible, in accordance with local conditions. The emergency plans should also be designed to prevent disruptions to the service due to problems with quantity or quality of the supplied water or degradation of water resources or the environment.

Emergency plans should be in accordance and integrated with general emergency plans for the area. The operator, responsible body and/or relevant authorities should provide easily accessible means of contact during an emergency. Such means may be common to all kinds of emergencies in a given area.

During any emergency, the operator, the responsible body or the relevant authority should provide timely information to the users on the following:

- the nature of the incident and the risks (if any) involved;
- contact details for appropriate water utility representatives;
- what (if anything) the user should do;
- the estimated time before normal service is resumed and what temporary solutions are available.

The information should be distributed to users by appropriate and available methods under the circumstances of the emergency.

For further guidance, users should refer to ISO 24511 and ISO 24512.

7 Assessment criteria for service to users

7.1 General

The service to the users should be assessed, taking into account users' needs and expectations and the results of the actions defined from the guidelines presented in [Clause 6](#). The fulfilment of these needs and expectations and the degree of success of the actions can be measured by means of performance indicators.

In such cases, in order to define specific performance indicators, this clause presents key assessment criteria needed to evaluate the fulfilment of the related objectives. For every user need and expectation in [Clause 5](#), a guideline is listed in [Clause 6](#) and corresponding assessment criteria are given in this clause. For each objective chosen for the utility, one or more performance indicators should be developed by the appropriate stakeholder to use in assessing the service for this objective. The specific performance indicators to be used depend on local conditions (e.g. in populations with high illiteracy rates, performance indicators based on written complaints are not valuable; in non-network systems, performance indicators related to pressure measures are not relevant). In every case, the performance indicators should be developed using one or more of the assessment criteria outlined in this clause and the methodology presented in [Clause 8](#). Examples of performance indicators are provided in [Annex A](#).

7.2 Access to water services

The assessment criteria include:

- quantity of water available to users;
- equity in the access to drinking water and wastewater services;
- access to drinking water and wastewater services in rural areas and poor areas;
- access of vulnerable users to customer and relationship services (including set-up of measures for digital training);
- affordability of the water supply and wastewater services;
- implementation of public policy to support access to drinking water and wastewater services for poor and vulnerable people;
- availability of feasible and affordable alternatives to the service;
- sustainability of the water supply and wastewater services;
- the probability of stormwater occurrences and their impact in the region.

7.3 Provision of the service

7.3.1 Time to establish new service provisions

The assessment criteria include:

- compliance with the standard service connection time;
- simplicity of establishing a new service connection;
- average time to establish alternative forms of service provision.

7.3.2 Repairs

The assessment criteria include:

- effects on users of service interruptions (planned or unplanned);
- extent of information to users on interruptions (planned or unplanned);
- degree of success in finishing planned repairs in the specified time.

7.3.3 Price of service

The assessment criteria include:

- variation in price regarding historic price levels (taking into account currency fluctuations);
- degree of cost-recovery and degree of coverage by subsidies;
- affordability of the service;
- comparison with other forms of provision of the water services (e.g. ratio of vendor prices to piped water prices);
- comparison with other networked services.

7.3.4 Quantity of drinking water supply

The assessment criteria include:

- existence of a service development plan;
- balance between demand and capacity of the drinking water supply system;
- efficiency in the use of water and of water resources;
- quantity or rate of water losses.

7.3.5 Drinking water quality

The assessment criteria include:

- results of analyses of samples and their compliance;
- drinking-water-related complaints.

7.3.6 Aesthetic aspects of water

The assessment criteria include:

- complaints related to aesthetic quality of drinking water;
- complaints related to odours from the wastewater system.

7.3.7 Pressure of drinking water supply

The assessment criteria include:

- compliance with pressure guidelines;
- pressure-related complaints.

7.3.8 Continuity of drinking water supply

The assessment criteria include:

- degree of continuity of the supply;
- regularity of non-network means of supply;
- continuity-related complaints.

7.3.9 Coverage and availability of drinking water services

The assessment criteria include:

- degree of coverage or availability;
- equity of coverage or availability.

7.3.10 Coverage and availability of wastewater services

The assessment criteria include:

- degree of coverage or availability;
- equity of coverage or availability;
- interruptions of wastewater or septage collection and discharge.

7.3.11 Property flooding by wastewater

The assessment criteria include:

- damage by wastewater flooding;
- existence of wastewater flood-prevention measures;
- existence of action plans, including communication in the event of wastewater flooding;
- complaints related to wastewater flooding.

7.3.12 Property flooding by stormwater

The assessment criteria include:

- probability and extent of flooding due to extreme weather events;
- damage likely to be caused by stormwater flooding;
- existence of stormwater flood management and prevention measures;
- existence of action plans, including communication in the event of stormwater flooding;
- complaints related to stormwater flooding.

7.4 Contract management and billing

7.4.1 Content of the service agreement and consumption measurement

7.4.1.1 Availability of a clear service agreement

The assessment criteria include:

- existence of a clear publicly available service agreement (so-called “service rules”) transmitted to each user;
- existence of a document describing and summarizing the specific conditions of the subscription targeting each user;
- existence of a follow-up and treatment of service-agreement-related complaints.

7.4.1.2 Metering

Assessment criteria include:

- metering errors;
- incidents with meters;
- inaccessibility of meters;
- results of meter calibration;
- results of regulatory controls when they exist at national level.

7.4.2 Accuracy of billing

The assessment criteria include:

- corrected bills;
- invoicing speed (delay between metering and invoice mailing).

7.4.3 Response to billing complaints

The assessment criteria include:

- efficiency in complaint handling;
- effectiveness in complaint handling;
- conformity with the standard response time.

7.4.4 Clarity of billing

The assessment criteria include:

- contact regarding bills;
- existence of additional information regarding bills;
- customer surveys regarding bills.

7.4.5 Methods of payment

The assessment criteria include:

- choice of payment means;
- variety of payment methods;
- convenience of local payment points;
- efficiency of payment record systems;
- effectiveness and efficiency of collection and recovery of water billing.

7.5 Promoting a good relationship with users

7.5.1 General

The assessment criteria include:

- the existence of a management unit in charge of relations with users;
- the existence of a participation scheme for users;
- user surveys regarding the service agreement management and relationship with the water utility;
- the degree of privacy or confidentiality enjoyed by users.

7.5.2 Written contact

The assessment criteria include:

- effectiveness in handling written contact;
- conformity with the maximum specified response time.

7.5.3 Telephone contact

The assessment criteria include:

- effectiveness in handling telephone contact;
- conformity with the maximum specified response time;
- conformity with the maximum specified waiting time.

7.5.4 User visits to the offices of the water utility

The assessment criteria include:

- availability and convenience of offices;
- efficiency in handling user complaints and requests during user visits to the offices;
- effectiveness in handling user complaints and requests during user visits to the offices.

7.5.5 Online customer relationship service

When online customer relationship is implemented, the assessment criteria include:

- availability of the online relationship service to users;
- personal data security;

- effectiveness and efficiency of the administrative procedures and the treatment of requests and complaints of the customer online service;
- digital training measures;
- number of users connecting to the website;
- number of online records (e.g. subscription, payment).

7.5.6 Social media

Where social media communication channels are implemented, the assessment criteria include:

- effectiveness and efficiency of the information delivery concerning the water and wastewater services and complaints from users on social media;
- number of users consulting the site or following the website.

7.5.7 Visits to the user

The assessment criteria include:

- the existence of procedures for visits to the user, including identification procedures of the employee in charge of meter reading;
- complaints regarding visits to the user.

7.5.8 Complaints and requests

The assessment criteria include:

- the existence and use of a procedure for handling complaints and requests or a monitoring system (e.g. ISO 10002);
- efficiency in handling complaints and requests;
- effectiveness in handling complaints and requests;
- existence and set-up of a cascading procedure aiming for an amicable resolution.

7.5.9 Notification of restrictions and interruptions

The assessment criteria include:

- efficiency in notifying users of interruptions to the service;
- effectiveness in notifying users of interruptions to the service;
- conformity with the specified notification time.

7.5.10 Notification of an abnormal water situation

The assessment criteria include:

- existence of an alert system for proven water loss, suspicion of water loss or overconsumption;
- effectiveness and efficacy of the alert system;
- existence of risk of a sewer system overcapacity;
- existence of risk of stormwater flooding.

7.5.11 Availability of service information

The assessment criteria include:

- the availability of information regarding the service to the general public (e.g. website, periodic reports);
- complaints regarding availability of the information;
- accessibility of the available information (potential number of users with access to the information channels).

7.5.12 Community activities

The assessment criteria include:

- existence of a policy for community participation by the water utility;
- stakeholders involved directly in activities with the water or wastewater service (e.g. visits to operating facilities, school programmes, information packs distributed).

7.5.13 Participation of the users

The assessment criteria include:

- existence of a legal framework or collective agreements to establish user participation;
- degree of user participation in consultation processes regarding the governance of the service;
- interventions delivered by users' committees;
- user satisfaction surveys.

7.6 Protection of the environment

7.6.1 Sustainable use of natural resources

The assessment criteria include:

- existence of an environmental management system (e.g. ISO 14001);
- water losses;
- efficiency in energy consumption;
- efficiency of use of water by domestic and non-domestic users.

For additional criteria, refer to ISO 24511 and ISO 24512.

7.6.2 Wastewater treatment

The assessment criteria include:

- wastewater treatment capacity;
- results of wastewater and ambient water analyses;
- environmental impact of wastewater discharge;
- effects of wastewater discharge on public health.

For additional criteria, refer to ISO 24511.

7.6.3 Stormwater treatment

The assessment criteria include:

- stormwater treatment capacity;
- results of stormwater and ambient water analyses;
- environmental impact of stormwater runoff;
- effects of stormwater runoff on public health.

For additional criteria, refer to ISO 24536 and ISO/TR 24539.

7.6.4 Environmental impact

The assessment criteria include:

- existence of an environmental management system (e.g. ISO 14001);
- compliance with guidelines;
- total pollutant emission from the water or wastewater system (gas, liquid or solid phase);
- environmental impact of water abstraction.

For additional criteria, refer to ISO 24511 and ISO 24512.

7.7 Safety and emergency management

The assessment criteria include:

- the existence and regular testing of an emergency plan (including prevention measures);
- availability of means of enquiry during an emergency;
- efficiency in providing emergency information;
- effectiveness in providing emergency information.

For additional criteria, refer to ISO 24511 and ISO 24512.

8 Assessment of water services

8.1 General

Assessment as a process should be managed to achieve a clear and precise purpose and refer to the objectives outlined in [Clause 5](#). The following should be established as part of a comprehensive policy (see [8.2](#)):

- the goal and scope of the assessment (see [8.3](#));
- the parties involved in the assessment (see [8.4](#));
- the methodology of assessment (see [8.5](#));
- the necessary service assessment criteria (see [8.6](#));
- the resources necessary to conduct the assessment (see [8.7](#));
- the production of output and recommendations for the use of the output (see [8.8](#)).

How and by whom the assessment information is to be used should also be identified.

If not precisely specified, the assessment can cause confusion or conflicts among the parties involved.

There is a great variety of types of assessment, depending on the characteristics listed.

EXAMPLES Environmental performance assessment, conformity assessment relating to best practice, risk assessment, audits.

The output of this process (i.e. assessment as a result) should facilitate the further decision-making process for the stakeholder requesting the assessment.

8.2 Assessment policy

The responsible body should establish a comprehensive policy for the assessment of service.

A sound assessment policy is a key component of the continuous improvement of the service. It should give a general framework for the assessment. It facilitates the determination of the actual situation and how strategic planning and decision-making influences performance.

The assessment policy should address the overall efficiency and effectiveness of the strategic planning and decision-making activities. It should be designed to encompass all of the various management systems and procedures and should include self-assessment in the management component.

It should assist in the measurement of the achievement of the various functions and activities performed for providing the services, closing the cycle and linking:

- the set of objectives stipulated in [Clause 5](#);
- the guidelines for satisfying users' needs and expectations in [Clause 6](#);
- the selected assessment criteria in [Clause 7](#).

Assessment should be designed and implemented as a tool for promoting the development of collective learning and feedback to decision-making.

8.3 Goal and scope of the assessment

The general goal of assessment is to check if the water service objectives concerning the users have been met. Objectives for the service to users are defined in [Clause 5](#).

The goal and scope for a specific assessment should be clearly defined, taking into account climate change, higher user and regulatory demands and available technologies.

This document does not deal with the assessment of the management of the utility.

Service assessments should be focused on service performance, on the satisfaction of users and on meeting the objectives for the service, but not on the means used or the detailed organization implemented for meeting the objectives.

Part of the assessment of water services deals with the assessment of service to users. For service to users, assessment should focus on the interface between the utility and the user (e.g. measuring user satisfaction). Assessment of service to users should effectively involve the users in the process. With regard to assessment of water services (in addition to the assessment of service to users), the general recommendation is to focus on the service performance. Nevertheless, some activities do not fit well with direct measurement of their performance. In such cases, indirect assessment of the performance can be accomplished through the evaluation of some management systems (e.g. risk management, security management, asset management). More guidance for the assessment of water services is given in ISO 24511 and ISO 24512.

8.4 Parties involved in the assessment

The responsible parties and all other parties (e.g. the assessment team) involved in the assessment should be clearly defined. Their responsibilities, their role in the process and the framework of operation for each party should be specified.

When the responsible body and the operator(s) are not the same legal body, assessment procedures, if not fixed by legal requirements from the relevant authorities, should be agreed to in advance to provide coherent assessment results from all involved parties, in accordance with respective rights and responsibilities. Concerning service to users, the responsible body and its operator(s) should take a consistent position relevant to the assessment procedures concerning service to users.

8.5 Methodology of assessment

Due to the diversity of legal, institutional and managerial systems governing water services, this document does not present detailed service assessment procedures. However, this document should be used to configure assessment procedures appropriate to local conditions.

The selection of the assessment tools should fit the assessment goals and scope. Performance indicator systems are one of these tools (see [Clause 9](#)).

NOTE In some cases, specifications for assessments can be required by relevant authorities or by financial investors.

Assessment methodology and procedures should be:

- developed with a capacity for repeated measurement to determine trends;
- periodically reviewed to check their efficiency and effectiveness, paying notable attention to avoidance of duplication;
- flexible, to adjust to changes in goals, framework, assessment criteria and indicators as new insights are gained.

Some types of assessment procedures will possibly already be standardized. In such cases, it is recommended that the relevant standards be used.

EXAMPLES Review (see ISO 9000:2015, 3.11.2); environmental performance evaluation (see ISO 14031:2021, 3.4.11).

If, at a geographically relevant level (country, region and city), specifications are established for the water services, then these specifications should also include provisions concerning assessment processes (e.g. user satisfaction).

8.6 Service assessment criteria

The necessary service assessment criteria should be selected in accordance with the objectives and requirements of interest as determined by stakeholders, taking into account local conditions.

Service assessment criteria are the link between objectives and performance indicators. The following example shows, for one of the objectives proposed in [Clause 5](#), possible service assessment criteria. [Clause 7](#) presents assessment criteria for service to users for every objective listed in [Clause 5](#).

It should be noted that service assessment criteria can be related to more than one objective.

EXAMPLE

Objective: written contacts.

Possible service assessment criteria:

- effectiveness in handling written contacts;
- conformity with the maximum specified response time.

8.7 Resources to conduct the assessment

The responsible party for the assessment should ensure that the necessary resources, including human, financial, organizational and required information technology, are available. The team with the

responsibility for carrying out the assessment should be clearly defined. This team should be empowered to specify and steer the assessment process within the given framework (e.g. goals, scope, resources, parties involved, methodology, outputs).

8.8 The production of output and recommendations for the use of the output

The output of assessment should be a report about the assessment process and its results. It should include additional guidelines for the use of these outputs. The output should make transparent the distinction between the defined targets and the actual service.

9 Performance indicators

9.1 General

Performance indicators are used to measure the efficiency and effectiveness of a utility in achieving its objectives (particularly those identified in [Clause 5](#)).

Performance indicator systems should be considered as a key assessment tool among the various existing assessment tools (see [Clause 7](#) and [Clause 8](#)).

Performance indicators should be used within the context of a comprehensive service assessment system. This system should include, among other tools, a coherent set of indicators and the related components that allow for a clear definition of these performance indicators and assist in their interpretation.

9.2 Performance indicator systems

9.2.1 Key components of a performance indicator system

A performance indicator system comprises a set of the following key components:

- performance indicators;
- context information;
- variables.

In addition, specific targets for each indicator should be established and routinely monitored, tracked and adjusted as needed.

9.2.2 Performance indicators

Individual performance indicators should be unique and collectively appropriate for representing the relevant aspects of the service in a true and unbiased way.

Each performance indicator should:

- be clearly defined, with a concise and unequivocal interpretation;
- be assessed from variables that are easily and reliably measured at a reasonable cost;
- contribute to the expression of the level of actual performance achieved in a certain area;
- be related to a specified geographical area (in the case of comparison analysis, it should be for the same geographical area);
- be related to a specific time period (e.g. annual, quarterly);
- allow for a clear comparison with targeted objectives and simplify an otherwise complex analysis;
- be verifiable;

- be simple and easy to understand;
- be objective and avoid any personal or subjective appraisal.

Performance indicators are typically expressed as ratios between variables. These ratios may be commensurate (e.g. %) or non-commensurate (e.g. $\$/\text{m}^3$). In the case of non-commensurate ratios, the denominator should represent one dimension of the system (e.g. number of service connections; total water main length; annual costs). This allows for comparisons through time or between systems.

Variables that can vary substantially in time (e.g. annual extraction or discharge volumes), particularly if not under the control of the utility, should be avoided as denominators in the indicator ratios. An exception can be made when the numerator varies in the same proportion as the denominator.

A clear processing rule should be defined for calculating each indicator. The rule should specify all the variables required and their algebraic combination. The variables may be data generated and managed within the utility (utility data) or externally (external data). In either case, the quality of the data should be assessed (see 9.3) and verified. The interpretation of the performance indicators should not be carried out without taking into account the context, particularly if it is based on comparisons with other cases. Therefore, complementary to the performance indicators, the context information should consider also the characteristics of the system and the region in which the services are provided.

Additional information on performance indicators and grading systems for performance indicators is provided in [Annexes A](#) and [B](#).

9.2.3 Variables

Each variable should:

- a) fit the definition of the performance indicator or context information it is used for;
- b) refer to the same geographical area and the same period of time or reference date as the performance indicator or context information it will be used for;
- c) be as reliable and accurate as the decisions made based on it require.

Some of the variables are external data and mainly informative, and their availability, accuracy, reference dates and limits of the corresponding geographical area are generally out of the control of the utility. In this case, variables should also:

- whenever possible be collected from official sources, which include information on the accuracy and reliability of the variable(s);
- be carefully documented and controlled in terms of source, mode of collection, and so on, for a reliable performance indicator assessment or interpretation.

9.2.4 Context information

Context information defines the inherent characteristics of a system that are relevant for the interpretation of the performance indicators. There are two possible types of context information:

- information describing pure context and external factors that are not under the control of the utility (e.g. demographics, topography, climate);
- characteristics that can only be influenced by management decisions in the long term (e.g. age of the infrastructures).

9.3 Quality of the information

The quality of the data should reflect the importance of the assessment being conducted.

A scheme providing information on data quality is needed so that users of the performance indicators and context information are aware of the reliability of the information available. The value of the performance indicators can be questionable without this scheme.

The confidence grade of a performance indicator can be assessed in terms of its accuracy and reliability. The accuracy accounts for measurement errors in the acquisition of input data. The reliability accounts for uncertainties in evaluating the reliability of the source of the data.

An example of a confidence-grading scheme is presented in [Annex B](#).

9.4 Example of a performance indicator

Performance indicators are relevant to service assessment criteria to which they link. The following example shows, for one of the objectives proposed in [Clause 5](#), possible performance indicators relevant to one of the service assessment criteria shown in [Clause 7](#). More examples are given in [Annex A](#).

EXAMPLE

Objective: written contacts.

The user expects written contacts (e.g. letter, e-mail, fax, sms) to be responded to and dealt with within a reasonable amount of time and in a respectful manner.

Possible service assessment criteria: conformity with the maximum specified response time.

Possible performance indicator: response to written complaints (%).

Definition: $(\text{number of written responses within the target time during the assessment period} / \text{number of written complaints during the assessment period}) \times 100$

Processing rule: $I_{QS34} = \frac{F_{22}}{F_{23}} \times 100$

where

I_{QS34} is the performance indicator of efficiency in responding to written complaints, in per cent;

F_{22} is the number of written responses;

F_{23} is the number of written complaints.

Comment: This indicator may be assessed for periods shorter than one year, but special care is required in result interpretation when used for both internal and external comparisons. This indicator is applicable in the case of a guaranteed standards scheme.

International Water Association (IWA) code: QS34.

Annex A (informative)

Example of performance indicators

A.1 General

This annex presents specific examples of performance indicators developed in accordance with the assessment criteria contained in [Clause 7](#) and the methodology presented in [Clause 8](#). The performance indicators should be used to assess the performance of the service against the objectives set in accordance with users' needs and expectations included in [Clause 5](#).

Some of the assessment criteria listed in [Clause 7](#) for service to users require some qualitative assessment or estimation of data. Even though the principles of performance indicator use are contrary to the use of estimated data, when necessary, these estimated data should be obtained in a systematic way and in agreement with all the stakeholders involved in the assessment process.

The examples given in this annex are not exhaustive. Other similar examples of performance indicators could be developed or found in other references (e.g. References [\[15\]](#) and [\[16\]](#)) for application of this document. Performance indicators are sensitive to local conditions and need to be adapted. The performance indicators in this annex are offered as examples only and should not be used without confirmation of their relevance and applicability.

The interpretation of the performance indicators should refer to the context information, which includes the characteristics of the system and the region.

A.2 Access to drinking water services

Performance indicator: population per public tap or standpipe (persons/tap).

Definition: resident population served by the water delivered through public taps or standpipes per number of public taps and standpipes.

Processing rule: $I_{QS9} = \frac{F_3}{F_8}$

where

I_{QS9} is the performance indicator of population per public tap or standpipe, in persons/tap;

F_3 is the number of persons served by public taps or standpipes;

F_8 is the number of public taps and standpipes.

Comment: This indicator is assessed for a reference date. This indicator is relevant only for developing regions where a significant part of the supply is provided by public taps and standpipes.

IWA code: QS9.

A.3 Provision of the service

A.3.1 Time to establish new service provisions

Performance indicator: new connection efficiency (days).

Definition: total time spent for establishing new connections during the assessment period/number of new connections installed during the assessment period.

Processing rule: $I_{QS23} = \frac{F_9}{F_{10}}$

where

I_{QS23} is the performance indicator of new connection efficiency, in days;

F_9 is the new connections establishment time, in days;

F_{10} is the number of new connections established.

Comment: This indicator should not be assessed for periods shorter than one year, since this may lead to misleading conclusions. If a shorter assessment period cannot be avoided, special care is required in interpreting results. External comparisons on such time bases shall be avoided. This indicator refers to new contracts, when service connections already exist.

IWA code: QS23.

A.3.2 Repairs

A.3.2.1 Interruptions per connection

Performance indicator: interruptions per connection (number/1 000 connections/year).

Definition: [(total number of interruptions during the assessment period × 365)/(assessment period × number of service connections)] × 1 000.

Processing rule: $I_{QS14} = \frac{D_{36} \times 365}{H_1 \times C_{24}} \times 1\,000$

where

I_{QS14} is the performance indicator of interruptions per connection, in number/1 000 connections/year;

C_{24} is the number of service connections;

D_{36} is the number of service interruptions;

H_1 is the assessment period, in days.

Comment: This indicator should not be assessed for periods shorter than one year, since this may lead to misleading conclusions. If a shorter assessment period cannot be avoided, special care is required in interpreting results. External comparisons on such time bases shall be avoided.

IWA code: QS14

A.3.2.2 Average interruption time

Performance indicator: average interruption time (days).

Definition: average duration of all interruptions taking place during the assessment period.

Processing rule: total time of interruptions during the assessment period (in days)/total number of interruptions during the assessment period.

Comment: This indicator should not be assessed for periods shorter than one year, since this may lead to misleading conclusions.

A.3.3 Price of service

Performance indicator: affordability of connection charges (%).

Definition: price of a new service connection in an area requiring network extension with respect to the average income in the area.

Processing rule: (price of a new connection to the service in an area requiring network extension/average monthly household income in the area) $\times$ 100.

Comment: The procedure to estimate the monthly household income in the area should be clearly specified beforehand and in agreement with all the stakeholders involved.

A.3.4 Quantity of drinking water supply

Performance indicator: time with water-use restriction in place (%).

Definition: percentage of time each year where a voluntary or legally enforceable water-use restriction was in place.

Processing rule: [days during a year when a voluntary water-use restriction was in place (number) + days during the year when a legally enforceable water-use restriction was in place (number)] $\times$ (100/365)

Comment: The value 365 should be replaced by 366 when the year is a leap year. Only water-use restrictions that are due to insufficient water quantity at source should be included in the calculation of this performance indicator. Water utilities may choose to indicate voluntary and legally enforceable restrictions with separate performance indicators.

A.3.5 Drinking water quality

Performance indicator: quality of supplied water (%).

Definition: (total number of treated water tests complying with the applicable standards or legislation during the assessment period/total number of tests of treated water carried out during the assessment period) $\times$ 100

Processing rule: $I_{QS18} = \frac{(D_{62} + D_{63} + D_{64} + D_{65})}{D_{51}} \times 100$

where

I_{QS18} is the performance indicator of the quality of supplied water, in per cent;

D_{51} is the number of treated water quality tests carried out;

D_{62} is the number of complying aesthetic tests;

D_{63} is the number of complying microbiological tests;

D_{64} is the number of complying physical-chemical tests;

D_{65} is the number of complying radioactivity tests.

Comment: This indicator may be assessed for periods shorter than one year, but special care is required in interpreting results when used for both internal or external comparisons.

IWA code: QS18.

A.3.6 Aesthetic aspects of water

Performance indicator: water quality complaints (%).

Definition: (number of water quality complaints during the assessment period/number of service complaints during the assessment period) × 100.

Processing rule: $I_{QS30} = \frac{F_{18}}{F_{15}} \times 100$

where

I_{QS30} is the performance indicator of water quality complaints, in per cent;

F_{15} is the number of service complaints;

F_{18} is the number of water quality complaints.

Comment: This indicator may be assessed for periods shorter than one year, but special care is required in interpreting results when used for both internal or external comparisons.

IWA code: QS30.

A.3.7 Pressure of drinking water supply

Performance indicator: pressure complaints (%).

Definition: (number of pressure complaints during the assessment period/number of service complaints during the assessment period) × 100.

Processing rule: $I_{QS28} = \frac{F_{16}}{F_{15}} \times 100$

where

I_{QS28} is the performance indicator of pressure complaints, in per cent;

F_{15} is the number of service complaints;

F_{16} is the number of pressure complaints.

Comment: This indicator may be assessed for periods shorter than one year, but special care is required in interpreting results when used for both internal or external comparisons.

IWA code: QS28.

A.3.8 Continuity of drinking water supply

A.3.8.1 Continuity of supply

Performance indicator: continuity of supply (%).

Definition: (number of hours when the system is pressurized during the assessment period/(24 × assessment period)) × 100.

Processing rule: $I_{QS12} = \frac{H_2}{H_1 \times 24} \times 100$

where

I_{QS12} is the performance indicator of continuity of supply, in per cent;

H_1 is the assessment period, in days;

H_2 is the time system is pressurized, in hours.