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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 24566-3

Drinking water, wastewater and storm water systems and services — Adaptation of water services to climate change impacts —

Part 3: Drinking Water services

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Secretariat: **AFNOR**

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This document is circulated as received from the committee secretariat.

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Foreword

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

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

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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.

The committee responsible for this document is ISO/TC 224, *Drinking water, wastewater and stormwater systems and services*. It has prepared the following related documents:

ISO 24566-1, *Drinking water, wastewater and storm water systems and services — Adaptation of water services to climate change impacts — Part 1: Assessment principles*

ISO 24566-2, *Drinking water, wastewater and storm water systems and services — Adaptation of water services to climate change impacts — Part 2: Storm Water Systems*

ISO 24566-4, *Drinking water, wastewater and storm water systems and services — Adaptation of water services to climate change impacts — Part 4: Waste Water Systems*

Also, and directly related to this project are two other existing documents:

ISO 24527:2020, *Service activities relating to drinking water supply, wastewater and stormwater systems — Guidelines on alternative drinking water service provision during a crisis*

ISO 24528:2021, *Service activities relating to drinking water supply, wastewater and stormwater systems — Guideline for a water loss investigation of drinking water distribution networks*

ISO/TS 24541:2020, *Service activities relating to drinking water supply, wastewater and stormwater systems — Guidelines for the implementation of continuous monitoring systems for drinking water quality and operational parameters in drinking water distribution networks*

The following additional document is also recommended to users:

ISO 14091:2021, *Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment*

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

The fact that climate change is occurring is recognized globally. Accordingly, mitigation and adaptation programs have been introduced in many nations, and internationally through a number of agreements.

At the local level, operators of water services have had to assess the impacts and options for responding to the effects of climate change, some of which are slow and long-term, while others are acute, arising from extreme weather events and changes.

This document gives guidance on identifying impacts of climate change to drinking water systems, on developing strategies for the adaptation to these impacts, and provides examples of responses taken in respect of drinking water systems.

Drinking water, wastewater and storm water systems and services — Adaptation of water services to climate change impacts —

Part 3: Drinking Water services

1 Scope

This document provides guidance on identifying and assessing impacts of climate change on drinking water systems and on developing strategies for the adaptation to these impacts. The assessment of the impacts is based on the assessment principles described in ISO 24566-1.

This document also provides examples of some of the impacts of climate change on drinking water systems and of the responses that have been implemented by municipal water services or by the relevant jurisdiction (e.g., municipality or region served by the service). The examples of responses illustrate adaptation strategies that have been applied.

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, definitions and abbreviations

For the purposes of this document, the terms and definitions provided in ISO 24513:2019 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/>

In accordance with the decision of TC/224, key terms and definitions from ISO 24513:2019 may be repeated here below for ready reference. Additional terms not found in ISO 24513:2019 are also included.

3.1

adaptation

adaptation to climate change

process of adjustment to actual or expected climate and its effects

Note 1 to entry: In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.

Note 2 to entry: In some natural systems, human intervention can facilitate adjustment to expected climate and its effects.

[SOURCE: ISO 14090:2019, 3.1, modified — The preferred term “adaptation” has been added.]

3.2

climate risk

potential of negative climate change impacts that reflects the interaction among vulnerability, climate change exposure and hazard

[SOURCE: ISO 14050:2020(en), 3.8.12]

3.3

drinking water

DEPRECATED: potable water

water intended for human consumption

Note 1 to entry: *Requirements for drinking water quality specifications* are generally laid down by the national *relevant authorities*. Guidelines have been established by the World Health Organization (WHO).

[SOURCE: ISO 24513(en), 3.2.2.1]

3.4

governance

system of directing and controlling

[SOURCE: ISO/IEC 38500:2015, 2.8]

3.5

metric

metrics

data

verifiable measure that captures performance in terms of how something is being done relative to a standard, allows and encourages comparison, supports business strategy

[SOURCE: ISO/TS 18864:2017(en), 3.20]

3.6

strategy

strategies

organization's approach to achieving its objectives

[SOURCE: ISO 30400:2016(en), 3.5]

3.7

user

user of this document

one who applies the recommendations of this document for whatever purpose

[SOURCE: ISO 14258:1998(en), 2.1.4, modified — Definition revised and examples removed]

4 Objectives

The objectives for this document are:

- to demonstrate how the Assessment Principles set out in ISO 24566-1 can be applied to the management of drinking water;
- to assist water services to identify, assess, and adapt to climate change's expected impact on drinking water services.

5 Impacts of climate change on drinking water systems and responses

5.1 General

The impacts of climate change on drinking water systems should be identified and responses considered.

5.2 Impacts

The impacts of climate change are dependent on the:

- nature and effects of climate change,
- condition of the drinking water system and its assets,
- design parameters of the system and its components,
- nature of the system's service area,
- nature of the drinking water system's catchment, and the,
- operation of the system.

The impacts on drinking water systems include:

- infrastructural capacity problems:
 - increased or decreased flows due to changing source water availabilities;
 - treatment capacity problems due to changing source water quality (algae blooms, salt water intrusion, turbidity, pathogens, NOM, micropollutants, etc...);
 - underused source water and treated water storage and treatment facilities;
 - increased or decreased flows due to demand changes;
 - overwhelmed source water and treated water storage and treatment facilities;
- infrastructural structural problems:
 - subsoil subsidence, changes in subsoil conditions and pipe network damages caused by drought or freeze/thaw cycles;
 - damage or loss of assets due to more intense storms, hurricanes, typhoons;
- operational problems:
 - interactions with source waters volumes (decreases and increases);
 - pluvial flooding from the surrounding areas impacting treatment plants and other above ground assets;
 - increased health and nuisance problems for staff (e.g., insects and insect-borne disease and other vectors).

The impacts on the service area of the drinking water system can include:

- risk to public health and lives;
- property damage through flooding;
- damage or loss of infrastructure assets;
- long-term impacts on the development of the service area:
 - deterioration of assets;

- less economic and social development potential such as tourism, biodiversity, agriculture, forestry, energy;
- depopulation.

5.3 Responses

Responses are adaptive and generally applicable to:

- infrastructure;
- operation and maintenance;
- management;
- governance;
- societal behaviour and issues.

Adaptive responses can also have a consequential mitigative character in regard to climate change, i.e., reduce the production of greenhouse gases. Adaptive responses tend to anticipate longer-term climate change conditions such as continuing higher frequencies of events or longer durations of events beyond the capability to adjust through operational changes.

Adaptive responses can require changes of a continuing nature to:

- drinking water system design;
- infrastructure;
- treatment processes;
- operations and asset management.

Adaptive responses within the structure and management of the organization itself can include:

- risk management including risks due to climate change impacts;
- adapting monitoring and early warning systems to determine climate change impacts;
- adopting a catchment management approach including forming partnerships with other organizations;
- crisis management programs adapted to climate change impacts;
- increasing preparedness and the range of possible actions of urban actors (e.g., communities, public and private enterprises);
- establishing permanent data backup systems outside the risk zones;
- improve data sharing with other affected or interested organisations.

Adaptive response strategies and their development are covered in [Clause 10](#).

6 Methodology

6.1 General

It is recommended that users of this document follow a five-step approach:

1. understand and assess the current situation, vulnerabilities and opportunities;
2. assess future situations and vulnerabilities including awareness and communication;

3. develop adaptive strategy(ies) including a target-setting process;
4. conduct a financial risk assessment;
5. monitor, review and update.

Individual steps may be repeated as necessary in the methodological process.

6.2 Key functions

Within each step the following key functions should be considered:

- governance;
- strategies;
- risk management;
- operation and asset management;
- metrics and targets.

7 Assessment of current situation, vulnerabilities and opportunities

7.1 General

Users of this document should assess and document the current situation, risks and vulnerabilities, and the opportunities relevant to the drinking water system they manage. The following outline is recommended.

7.2 Describe and characterise the current drinking water system

7.2.1 Typical assets of a system

The infrastructure assets of a drinking water system will typically comprise:

- the pipe networks (both supply and distribution);
- treatment plants;
- raw water reservoirs;
- ancillary facilities (e.g., pumping stations, flow and pressure control valves, distribution system re-disinfection booster stations, and distribution system storage tanks for treated water).

7.2.2 Governance

In order to make plans for adapting drinking water management to the impacts of climate change, current governance arrangements should be assessed. The assessment should cover the entire service area and, if possible, the entire catchment area and should include:

- describing how drinking water is governed currently, including:
 - which organisation is responsible for which parts of the drinking water system;
 - which organisations are in the catchment area and what are their responsibilities for or which can contribute to drinking water management;
- determination and allocation of water for drinking purpose;
- conservation and rejuvenation of water bodies (surface or ground water);

- determining what level of development phase best characterises the drinking water system. This can help to determine the most appropriate management / adaptation response to climate change impacts;
- identifying other relevant organisations in the service area or catchment area that can be affected by climate change impacts to the drinking water systems. For example, such organisations can be responsible for or contribute to managing:
 - surface water run-off (e.g., pluvial and fluvial flooding, run-off from roads, sewer backups);
 - wastewater (e.g., non-separated and separated systems, treatment plants);
 - surface waters;
 - groundwater;
 - water supply;
 - irrigation and drainage.

Such organisations can include:

- regulatory authorities;
- governmental entities;
- public organisations or agencies;
- public or private owners or operators;
- the community at large.

7.2.3 Strategies

The current management strategies for the drinking water system and their interdependencies (e.g., from or with all relevant organisations) should be identified, documented and reviewed in order to assess their suitability for:

- managing the impacts of climate change;
- identifying gaps in the analysis;
- considering drinking water as a resource (either potable/non-potable);
- modifying any existing master plan.

The user should review operational strategies and procedures, as well as operation and asset management plans, asset condition and other asset-related information in order to characterise the drinking water system from an operations and asset management perspective.

Guidance on the identification, assessment and management of assets and operation is given in ISO 24516-1 and ISO 24516-2.

Key factors included in operations and asset management include vulnerability to drought, pollution and flooding events, power losses and societal impacts including mental health and PTSD effects.

Reviews should be performed for each of the critical components involved in the functioning of the system.

7.2.4 Risk management

The current procedures for the identification, assessment and management of climate-related drinking water risks and how they are currently integrated into the overall risk management policies and practices of the system should be described and documented. In particular, including the existing procedures and means

dedicated to crisis management, and whether they are formalized in emergency action plans or not, should be clearly identified.

Guidance on risk identification, assessment and evaluation is given in ISO 24516-1.

7.2.5 Operation and Asset Management

The current operation and asset management practices established and followed in the management of the drinking water system such as crisis management procedures and business continuity plans, should be identified, described, and documented.

Guidance on identification, assessment and evaluation of assets and operations is given in ISO 24516-1.

Managers of drinking water systems have a responsibility to identify, inventory, and manage the assets of the systems which often are principally public domain assets such as:

- drinking water distribution systems and assets (e.g., pipe networks, generally located within roads and public parking areas such as shopping malls);
- drinking water storage reservoirs and tanks;
- ancillary facilities (e.g., pumps and pumping stations, flow and pressure control valves, distribution system re-disinfection booster stations, and distribution system storage tanks for treated water).

Managers should establish a full inventory of the assets related to drinking water including:

- the length, location, type of materials of construction, age and condition for all pipe network assets;
- the size, location, materials of construction, age and condition for all storage reservoirs and tanks.

7.2.6 Metrics and targets

The current metrics and targets (i.e., desired metric levels) used for the management of the drinking water system should be identified, described, and documented, together with sources used to establish these metrics and targets such as local monitoring points (hydraulics, meteorology, turbidity, NOM, etc.), GIS or hydraulic models. These can include annual, seasonal, peak / non-peak and frequency metrics appropriate to the locality. An assessment of strengths and weaknesses of the collected data (e.g., level of confidence in the accuracy of the data, its completeness and plausibility) should be carried out. If necessary, plans to improve the metrics and targets should be developed.

Relevant metrics and targets can include:

- assets (e.g., number, age, size, type of material, etc.):
 - network (e.g., length of network, condition, renewal rate);
 - treatment plants;
 - raw water reservoirs;
 - ancillary facilities (e.g., pumping stations, flow and pressure control valves, distribution system re-disinfection booster stations, and distribution system storage tanks for treated water);
 - water sensitive urban design elements (e.g., constructed wetlands, rain gardens, sponge city systems, rainwater tanks on public and private land, and re-use facilities);
- water quantities:
 - flows and volumes;
 - peaks: seasonal, monthly and forecasted peaks;
 - reuse potential;