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

Part 2: Stormwater services

Services et systèmes d'alimentation en eau potable, d'assainissement et de gestion des eaux pluviales — Adaptation des services de l'eau aux impacts du changement climatique —

Partie 2: Services de gestion des eaux pluviales

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Foreword

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This document was prepared by Technical Committee ISO/TC 224, *Drinking water, wastewater and stormwater systems and services*.

A list of all parts in the ISO 24566 series can be found on the ISO website.

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 occurrence of climate change is recognized globally. Mitigation programmes have been introduced in many nations, as well as internationally through a number of agreements.

Locally, 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.

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

Part 2: Stormwater services

1 Scope

This document provides guidance on identifying and assessing the impacts of climate change on stormwater systems and on developing strategies for adapting 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 stormwater 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.

NOTE Combined sewer systems are included in this document in relation to the activities of collection, transport, storage and treatment of stormwater. Non-combined wastewater systems are covered by ISO 24566-4[1)].

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
governance
system of directing and controlling

[SOURCE: ISO/IEC 38500:2015,[2)] 2.8]

1) Stage at the time of publication: ISO/DIS 24566-4.

2) Withdrawn.

3.2
metric
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* (3.4)

[SOURCE: ISO/TS 18864:2017, 3.20, modified — the admitted term “data” has been added.]

3.3
stormwater
water resulting from rainwater, melted snow and ice draining from roofs, roads, footpaths and all other ground surfaces

Note 1 to entry: Stormwater can either be collected and stored for direct use or collected and discharged into a sewer system or environment and/or infiltrated into the soil.

[SOURCE: ISO 20670:2023, 3.91]

3.4
strategy
organization's approach to achieving its objectives

[SOURCE: ISO 30400:2022, 3.1.6, modified — “Organization” was added to the definition and notes to entry were removed.]

3.5
user
user of this document
one who applies the recommendations of this document for whatever purpose

[SOURCE: ISO 14258:1998, 2.1.4, modified — “User” was added as a preferred term; in the definition, "requirements” was changed to “recommendations”; examples were removed.]

4 Objectives

4.1 General

The main objectives for this document are:

— to demonstrate how the assessment principles set out in ISO 24566-1 can be applied to the management of stormwater in urban areas;

— to assist water services to identify, assess and adapt to climate change’s expected impact on stormwater services.

4.2 Other

Other objectives may be established from time to time, to suit changing circumstances within the community.

5 Impacts of climate change on stormwater systems and responses

5.1 General

The impacts of climate change on stormwater systems should be established and responses considered.

5.2 Impacts

The impacts of climate change are dependent on the:

— nature and effects of climate change;

— condition of the stormwater system and its assets;

— design parameters of the system and its components;

— nature of the system's service area;

— nature of the stormwater system's catchment;

— operation of the system.

The impacts on stormwater systems include:

— infrastructural capacity problems:

  — increased flows;

  — overwhelmed retention and treatment facilities;

  — increased number of bypass discharges;

  — changes in the receiving water bodies including sea level rising;

— infrastructural structural problems:

  — subsoil subsidence, changes in subsoil conditions and collection system damages caused by drought or freeze–thaw cycles;

  — damage or loss of assets due to more intense storms, hurricanes, typhoons;

  — operational problems;

  — increased interactions with wastewater collection and treatment systems;

  — increased pluvial flooding from the surrounding areas;

  — increased flooding through capacity problems changing receiving body water qualities (e.g. untreated overflows, increased pollution);

  — increased health and nuisance problems (e.g. toxic, noxious or greenhouse gases, insects, including insect-borne disease, and other vectors, odours) which can arise from changing flows.

The impacts on the service area of the stormwater system can include:

— risk to lives and public health;

— extensive 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;

— depopulation.

5.3 Responses

Responses are essentially adaptive, generally regarding:

— 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. they 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:

— stormwater 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 programmes 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 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:

a) understand and assess the current situation, vulnerabilities and opportunities;

b) assess future situations and vulnerabilities, including awareness and communication;

c) develop adaptive strategy(ies) including a target-setting process;

d) conduct a financial risk assessment;

e) 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, vulnerabilities and opportunities relevant to the stormwater system they manage. The following outline is recommended.

7.2 Describe and characterize the current stormwater system

7.2.1 Typical assets of a system

The infrastructure assets of a stormwater system will typically comprise:

— the pipe networks;

— ancillary facilities (e.g. pumping stations and electro-mechanical controllers such as motorized weirs and gates, retention tanks);

— discharge structures (e.g. combined sewer overflow, outfalls, infiltration facilities);

— pollution control structures [e.g. Gross Pollutant Traps (GPTs), screens, retention and settlement basins];

— water-sensitive urban design elements (e.g. constructed wetlands, rain gardens, sponge city systems, rainwater tanks on public and private land, re-use facilities).

7.2.2 Governance

In order to make plans for adapting stormwater 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 the following.

— Describing how stormwater is governed currently, including:

  — which organization is responsible for which parts of the stormwater system;

  — which organisations are in the catchment area, what their responsibilities are and how they can contribute to stormwater management.

— Determining what level of development phase best characterizes the stormwater system. This can help to determine the most appropriate management or adaptation response to climate change impacts.

— Identifying other relevant organisations related to such services/resources in the service area or catchment area that can be affected by climate change impacts to the stormwater 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);

  — receiving 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 stormwater 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 stormwater as a resource (either potable or non-potable).

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 characterize the stormwater system from an operations and asset management perspective.

Guidance on the identification, assessment and management of assets and operation is given in ISO 24516-3.

Key factors included in operations and asset management include vulnerability to flooding events, power losses and societal impacts, including mental health and post-traumatic stress disorder (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 stormwater 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 24516-3.