SLOVENSKI STANDARD
SIST EN 16039:2012

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Kakovost vode - Navodilo za ocenjevanje hidromorfoloških značilnosti jezer

Water quality - Guidance standard on assessing the hydromorphological features of lakes

Wasserbeschaffenheit - Anleitung zur Beurteilung hydromorphologischer Eigenschaften von Seen

Qualité de l'eau - Guide pour l'évaluation des caractéristiques hydromorphologiques des lacs

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Water quality - Guidance standard on assessing the hydromorphological features of lakes

Qualité de l'eau - Guide pour l'évaluation des caractéristiques hydromorphologiques des lacs

Wasserbeschaffenheit - Anleitung zur Beurteilung hydromorphologischer Eigenschaften von Standgewässern

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Foreword

This document (EN 16039:2011) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2012, and conflicting national standards shall be withdrawn at the latest by March 2012.

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WARNING — Working in or around water is inherently dangerous. Surveyors should conform to EU and national health and safety legislation, and any additional guidelines appropriate for working in or near lakes.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard contains lists of lake features and guidance on how to record, analyse and interpret the data obtained from desk-top, remote sensing and field surveys. In this document the word ‘lake’ is used as a generic term for standing waters including natural and modified lakes, reservoirs and excavated pits.

The physical character of a lake is defined by its morphometry (size and shape) and by its hydrological regime, both of which are contingent on the landscape setting of the lake-catchment system and its environmental history. Ensuring that the key features and associated physical processes operating within lakes are consistently recognised enables legitimate comparisons to be made among different lake types. This is required for a range of purposes, including the EC Water Framework Directive (WFD), the EC Habitats Directive, and lake management and restoration. The WFD requires physical features of surface waters to be considered when assessing ’ecological status’ and refers to these features as hydromorphological. Annex V of the WFD lists two categories of hydromorphological ‘quality elements’ for assessing lakes – ‘hydrological regime’ and ‘morphological conditions’ – each sub-divided into a number of specified ‘quality elements’. Those in the hydrological category comprise the quantity and dynamics of flow, level, residence time and connection to groundwaters, whilst those in the morphological category are lake depth variation, quantity and structure of the substrate and the structure and condition of the lake shore zone.

The Habitats Directive applies to a wide range of terrestrial, freshwater and marine habitats and species. The Directive requires Member States to maintain or restore these to ‘favourable conservation status’, partly by designating Special Areas of Conservation (SACs). For lakes, the process of selection and monitoring SACs involves recording and regularly assessing a suite of physical, chemical and biological features. A standard approach to hydromorphological assessment, while not specifically required by the Directive, thus enables the contribution of physical structure and hydrology to favourable conservation status to be assessed, and allows comparisons to be made between Member States.

NOTE In this document, ‘assessment’ is used as a broad term referring to the general description and characterization of lake features and the pressures that impinge upon them. It is not used to imply particular levels of ‘quality’ or ‘value’, whether related to ecological status under the WFD or more generally.

1 Scope

This European Standard is applicable to lakes, which are water bodies occupying one or more basins with surface areas greater than 1 ha (0,01 km^2) and maximum depths (at mean water level) greater than 1 m. All types of permanent lakes, including natural, modified and artificial, freshwater and brackish, except for those systems which regularly connect to the sea, are included in this European Standard, though canals are excluded.

Based on these criteria, it can be estimated that there are at least 500 000 natural lakes across Europe, most of which are located in the glaciated landscapes in northern and western provinces and in Scandinavia. Lakeland districts also occur locally in areas such as the Danubian plain and around the Alps. Elsewhere, naturally occurring lakes are relatively sparse and in such areas reservoirs or pits are more common.

This European Standard is designed to:

a) support environmental and conservation agencies in meeting the monitoring requirements of the WFD (Article 8, Annex II and Annex V);

b) generate data sets appropriate for monitoring and reporting of *Natura* 2000 sites designated under the Habitats Directive and the Birds Directive;

c) provide information supporting other environmental reporting requirements (e.g. in relation to biodiversity or environmental impact assessment);

d) support lake management and restoration initiatives.

This European Standard:

e) defines the key term of 'hydromorphology' and other terms relating to the physical characteristics of lakes and their hydrological regimes;

f) details essential features and processes of lakes that should be characterised as part of a hydromorphological survey and for determining the hydromorphological condition of a lake;

g) identifies and defines the key pressures affecting European lakes;

h) provides guidance on strategies for collecting hydromorphological data depending on resources available and the anticipated use of the assessment; a hierarchy of approaches is recognised from the 'overview method' utilising existing databases, maps and remote sensing data through to recognised field-based survey techniques such as Lake Habitat Survey (LHS);

i) offers guidance on data presentation;

j) establishes guidance on data quality assurance issues.

This European Standard does not deal with biological assessments in lakes such as the presence or absence of individual species or community composition, nor does it attempt to link specific hydromorphological features with their associated biological communities or to create a classification based on such links. However, it is relevant where plants or other organisms form significant structural elements of the habitat (e.g. a gradation from riparian to littoral vegetation).

With respect to the WFD, the hydromorphological condition of a lake only contributes to its status classification at high ecological status (HES). Hydromorphological conditions are not defined for good and moderate status but shall be sufficient to support the biological elements.

2 Normative references

EN 14614, *Water Quality — Guidance standard for assessing the hydromorphological features of rivers*

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1
aquatic macrophyte
larger plant of fresh water which is easily seen with the naked eye, including all aquatic vascular plants, bryophytes, stoneworts (Characeae) and macro-algal growths

NOTE This definition includes plants associated with open water or wetlands with shallow water.

3.2
attribute
specific recorded elements of a hydromorphological feature

EXAMPLE 'Silt' and 'boulders' are natural substrate texture attributes, 'sheet piling' and 'gabions' are attributes of engineered banks.

3.3
bank
physical edge of the lake shore, or of the island(s) within

NOTE Generally defined by a wave-cut break in slope at or near the water's edge of the lake, but can also be defined as the line along which riparian (terrestrial or land) conditions change to littoral in-lake conditions.

3.4
basin
defined hollows which are permanently or temporarily filled with water

NOTE Basin size and shape (morphometry) strongly control the fluxes of substances in lakes and the structure and function of lake food webs.

3.5
bathymetry
systematic survey of size, shape and water depth distribution in a lake

NOTE Bathymetry is the basis of deriving morphometric parameters and to predict thermal stratification, residence time and sediment redistribution processes.

3.6
bay
indent of the lake shore which can span from metres to many kilometres in size

NOTE Bays are normally protected by a promontory (or headland) projecting from the shore which reduces exposure. Bays often contain beach deposits.

3.7
bedform patterns
topography of the lake bed may be simple or complex depending on the size and shape of the system and the nature of local sediment transport processes

NOTE Deposition produces bedforms such as sand and gravel bars, whilst erosion results in scour features such as troughs.

3.8
bedrock
in situ naturally consolidated rock either underlying drift deposits such as glacial till or exposed by past or current erosion processes

3.9
beach
sub-zone of the exposed shore above the water line of a lake defined by the accumulation of sediment (texturally will range in grain size from clays and silts through to boulders) depending on the energetics of the wave environment and the geomorphological history of the site

3.10
catchment
drainage basin contributing water and sediment into a lake

NOTE Also recognised as drainage area.

3.11
continuity
uninterrupted movement of water, sediment and organisms into, out of and within a lake system

3.12
delta deposits
sediment deposits formed where an inflowing stream enters the lake

NOTE The size and style of the deposits depends on upstream catchment characteristics and reworking of the sediments by wave and current action in the lake. At least some of the delta sediments are expected to be above water.

3.13
direction of the main axis
compass bearing along the axis of the maximum length of a lake, e.g. NW-SE

3.14
ecological potential
set out in Annex V of the WFD the environmental objective of heavily modified water bodies (HMWBs) or artificial water bodies (AWBs) is to achieve good ecological potential, rather than good ecological status

NOTE This means that the system is managed to optimise biological quality accepting its altered hydromorphological condition that cannot be mitigated without significant adverse effect on specified uses.

3.15
ecological status
expression of the quality of the structure and functioning of aquatic ecosystems, by comparing the prevailing conditions with reference conditions

NOTE As classified in accordance with Annex V of the EC Water Framework Directive.

3.16
epilimnion
warm upper layer of lake water column vertically mixed by wind driven forces in a thermally stratified lake

3.17
eulittoral zone
area of the lake shore spanning the mean annual high and mean annual low water level

3.18
exposure
measure of the energetics of a shoreline segment obtained from various fetch calculations

3.19
fetch
distance of open water over which the wind can blow and generate wind-driven waves

3.20
headland
promontory of land projecting into water

3.21
hydrological connectivity
degree of coupling (natural or impeded) between the lake basin and surrounding/underlying groundwater and surface water bodies

3.22
hydromorphology
physical and hydrological characteristics of lakes including the underlying physical processes from which they result

3.23
hypolimnion
dense, bottom layer of water in a thermally stratified lake

NOTE Being at depth, it is isolated from surface wind-mixing during summer.

3.24
hypsographic curve
depth–area curve describing the form of the basin

3.25
ice phenology
description of the duration and the timing (dates) of formation (freeze-up) and melting (break-up) of the ice cover

3.26
island
landform protruding from the surface of the lake

NOTE A useful size-based classification for island features is as follows:

— Outcrop: < 0,001 km^2;

— Islet: 0,001 km^2 to < 0,01 km^2;

— Island: 0,01 km^2 to 1 km^2;

— Large island: > 1 km^2.

3.27
lake altitude
elevation of a reference height such as lake mean annual water surface level above reference sea level datum

3.28
lake hydrological type
generalised scheme to describe the water balance of a lake water body according to factors such as the relative importance of surface water compared with groundwater, and flushing rates and seasonal characteristics (water level variability over annual time series)

3.29
lake perimeter
equivalent to the shoreline length measured at a reference level such as the mean annual water level

3.30
lake stratification
variations in water column structure with respect to temperature and density

3.31
lake surface area
planimetric surface area of the lake water body

3.32
lake type
group of lakes that can be broadly differentiated from other groups on the basis of their physical and chemical characteristics

3.33
littoral zone
habitat extending from the water's edge to the lakeward limit of rooted macrophytes or algae on the lake bed

3.34
longshore drift
process of sediment transport along the lake shore (coast) driven by shore-wise currents and wave action

3.35
maximum effective length
length of a straight line connecting the two most distant points on the perimeter of the lake over which winds and waves may act without interruptions from islands and land

NOTE This is distinct from the maximum length which is any line connecting the two most distant points on the shoreline. It must not cross land, but can cross islands. In regular shaped basins, this will approximate to a straight line, but in irregular lakes (such as oxbows) the maximum length may be curved.

3.36
metalimnion
medial region of the water temperature profile separating the epilimnion from the hypolimnion in a thermally stratified lake where the temperature declines at a rate of 1 °C or greater per metre of depth

3.37
morphometry
basin shape, or form, which expresses how water depth varies with surface area (hypsographic curve) and includes both mean and maximum water depth

NOTE Basis for deriving indices used for morphometric analysis of important lake functions.

3.38
near-shore sub-system
includes all shore features typically associated with the littoral zone as well as islands and shallow water features such as sand bars or shoals

3.39
open water (off-shore) sub-system
includes circulatory basins and major embayments extending to either the silt–sand sediment boundary or the attached plant boundary, typically linked to the pelagic zone

3.40
outflow condition
character of the outflow which may be natural or modified by raising or lowering and which may involve engineering structures

3.41
pelagic zone
open water zone extending from the littoral zone to the centre of a lake

NOTE In the deeper parts of the pelagic zone (known as the profundal zone) light does not penetrate and there is no photosynthetic activity.

3.42
planform
view of lake shape from above

EXAMPLE Elongate, circular, etc., and also relevant in relation to the shoreline development index which expresses the degree of irregularity of a lake compared with a circular form of the same area.

3.43
reference conditions
conditions which are totally, or nearly totally undisturbed by human activity

3.44
riparian vegetation structure
physical character of the vegetation that creates habitat in the riparian zone

3.45
riparian zone
area of land adjoining the lake capable of directly influencing the condition of the aquatic ecosystem (e.g. by shading and leaf litter input)

3.46
shoreline length
length of the lake perimeter at mean annual water level

NOTE In practice, lake perimeter is derived from a relevant scaled topographic map.

3.47
shore reinforcement
work undertaken to prevent or mitigate erosion on the banks and shore of a lake

NOTE Hard engineering uses materials such as concrete walls, gabion baskets and sheet piling, whilst soft engineering uses natural materials such as basket-work and planted vegetation such as willow saplings to stabilise banks.

3.48
shore zone
comprises riparian, eulittoral and littoral zones around the perimeter of a lake

3.49
substrate (substratum)
natural sediment or engineered surfaces comprising the shore and bed of a lake

NOTE Natural sediments are generally characterised by texture and organic matter content, while artificial substrates are described by their construction materials (see Annex B).

3.50
water level regime
range, frequency and timing of water level fluctuations