Poročilo o delu Inštituta za vode Republike Slovenije za leto 2013

PROGRAMSKI SKLOP: I. SKUPNA EU POLITIKA DO VODA

PROJEKT: **I/1/2 PRIPRAVA IN ZAGOTOVITEV STROKOVNIH PODLAG NA PODROČJU EKOLOŠKEGA STANJA**

NALOGA: I/1/2/2 Vrednotenje ekološkega stanja jezer; sodelovanje pri pripravi CEN standarda za vrednotenje hidromorfološke spremenjenosti jezer

Nosilec naloge: **Dr. Gorazd Urbanič, univ. dipl. biol.**

Ljubljana, december 2013

PROGRAM:	Program dela IzVRS za leto 2013
	Poročilo o delu za leto 2013
NASLOV NALOGE:	Vrednotenje ekološkega stanja jezer; sodelovanje pri pripravi CEN standarda za vrednotenje hidromorfološke spremenjenosti jezer
ŠIFRA NALOGE:	I/1/2/2
NAROČNIK:	REPUBLIKA SLOVENIJA MINISTRSTVO ZA KMETIJSTVO IN OKOLJE
IZVAJALEC:	INŠTITUT ZA VODE REPUBLIKE SLOVENIJE Hajdrihova 28c 1000, Ljubljana
NOSILEC NALOGE:	doc. dr. Gorazd Urbanič, univ. dipl. biol.
AVTOR(JI):	dr. Monika Peterlin, univ. dipl. ing. grad. doc. dr. Gorazd Urbanič, univ. dipl. biol.

DIREKTOR IZVRS Igor Plestenjak

(žig)

KRAJ IN DATUM: LJUBLJANA, december 2013

KAZALO VSEBINE

1 UVOD

V prilogi V Vodne direktive (Direktiva 2000/60/ES) je navedeno, da vrednotenje keološkega stanja mora biti izvedeno v skladu z obstoječimi CEN oz. ISO standardi ali tistimi standardi, ki bodo objavljeni v prihodnje. Obvezna uporaba metodologij v skladu s standardi je navedena za biološke, fizikalno-kemijske in hidromorfološke elemente kakovosti. Nekateri CEN standardi metod vrednotenja stanja voda so že objavljeni, medtem ko so drugi še v pripravi. V okviru evropske skupine za standardizacijo metod vrednotenja stanja voda, poteka tudi priprava evropskega standarda za vrednotenje hidromorfološke spremenjenosti jezer.

2 ZAPISNIK S SREČANJA

V letu 2013 smo se udeležili delovnega srečanja srečanja V Aix en Provence. Kratek zapisnik srečanja je podan v nadaljevanju.

Srečanje evropske skupine za standardizacijo metod vrednotenja hidromorfološke spremenjenosti jezer

Datum srečanja: 5.6.-8.6. 2013

Kraj srečanja: Aix en Provance, Francija

Udeleženec: dr. Monika Peterlin

Organizator: European Commiteee for Standardisation

Namen: Priprava predlogov za dopolnitev predloga standarda

Delovna skupina pri CEN za vrednotenje hidromorfološke spremenjenosti jezer pripravlja Smernice za oceno HM obremenitev jezer. Skupina je bila ustanovljena z namenom koordinacije med državami in vzpostavitev standardov na nivoju EU, ki bodo ustrezno upoštevali raznolikost jezer v EU.

Na sestanku smo po posameznih vsebinah obravnavali draft standarda EN 16039: 2011. *Water quality – Guidance standard on assessing the hydromorphological features of lakes*. Nekatere vsebine so še v razvojni stopnji. Največji problem je v tem, da niso znani vplivi posameznih pritiskov na ekosisteme jezera, zato so meje zaenkrat postavljene statistično.

3 URADNI ZAPISNIK S SREČANJA (V ANGLEŠČINI)

DETERMINING THE DEGREE OF MODIFICATION OF LAKE HYDROMORPHOLOGY: FIFTH WORKSHOP ON DEVELOPING A CEN GUIDANCE STANDARD

Irstea, Aix-en-Provence, France
6-7 June 2013

Draft report

This workshop was arranged under the auspices of the European Committee for Standardization (CEN) to discuss and amend the text drafted by those attending the previous workshops (Verbania, February 2010; Mainz, January 2011; Peterborough, February 2012; Peterborough, November 2012) on a CEN standard for assessing the degree of modification of lake hydromorphology.

Name	Init.	Affiliation	**Country**
Phil Boon (chair)	**PB**	Scottish Natural Heritage	UK, Scotland
Christine Argillier	**CA**	Irstea	France
Jean-Marc Baudoin	**JMB**	Irstea/Onema	France
Delphjne Nicolas		Irstea	France
Chris Bromley	**CB**	Scottish Environment Protection Agency	UK, Scotland
David Smith	**DS**	Environment Agency	UK, England
Hanna Soszka	**HS**	Institute of Environmental Protection	Poland
Monika Peterlin	**MP**	Institute for Water of the Republic of Slovenia	Slovenia
Marzia Ciampitiello	**MC**	CNR – Institute for Ecosystem Study	Italy
Angela Boggero	**AB**	CNR – Institute for Ecosystem Study	Italy
Snežana Radulović (minutes)	**SR**	Faculty of Sciences, University of Novi Sad	Serbia

Apologies for absence had been received from Kristian Meissner (Finland) and Goražd Urbanič (Slovenia).

Thursday 7 June 2013

Session 1: Introduction and context – Phil Boon

The aim of this session was to introduce the participants to each other and to provide a brief reminder and update on the work undertaken so far on developing CEN standards for lake hydromorphology.

1.1 Opening remarks

PB opened the workshop and welcomed the 10 delegates, representing six countries. PB expressed thanks to Irstea, Aix-en-Provence for supporting the workshop and invited the delegates to introduce themselves.

PB reminded the group that the first CEN standard on lake hydromorphology had been approved in February 2011 and published as EN 16039. Progress with the second standard had been reported at the annual meeting of CEN/ TC 230/ WG 2/ TG 5 held in Vilnius (Lithuania) in May 2013. PB gave a brief summary of the discussion.

JR expressed the view that despite the widespread use of Lake Habitat Survey (LHS) around Europe, more needs to be done to get maximum value out of this growing international dataset. This should include greater publicity, as well as increased analysis so that more effective applications can be developed.

1.2 Spreadsheet of data on lake hydromorphology (Dave Smith)

DS introduced the group to the new version of the spreadsheet containing data on lake hydromorphology (circulated a few weeks before the workshop) and explained principles used in amending it. The previous version contained scored data from(438 lakes in eight countries: (Slovenia (2), Poland (16), Italy (17), England (60), Scotland (20) Serbia (16), Finland (10) France (303)) derived from LHS survey using the protocol in the draft standard. This had been updated with a set of lake types based on the slope of the littoral zone and mean depth. PB stressed the importance of doing this and having a quantitative score band where is possible, and thanked DS and JR for compiling the spreadsheet.

The new version of the spreadsheet contains three new columns on typology and one new row. The first added column shows whether the lake is unregulated, actively regulated or passively regulated (i.e. has a control structure but no abstraction). The second new column is for the combined alkalinity and depth types as used in MImAS. The two depth types are: vs =mean depth<3m; ShD =>3m. The three alkalinity types are: peat or humic low alkalinity; moderate alkalinity; high alkalinity or marl). The third new column suggested by DS defines littoral slope/depth index (mean depth/mean distance to a depth of 1 m). This row contains the guidance notes from Annex A of the standard.

Session 2: Brief update on recent work on lake hydromorphology assessment in Europe

The aim of this session was to set the context for work on the standard by providing updates on recent work carried out on lake hydromorphology assessment, in the form of brief presentations by participants followed by discussion.

Some of the main points mentioned were:

- Two methods for assessing lake hydromorphology are being used in France, one to describe the natural environment of lakes, the other to record alterations. Remote sensing and LHS both contribute to data collection. The aim is to develop an index of modification as well as looking at the impact of hydromorphology on lake biology. Work is also under way in France to gather hydromorphological data (e.g. bank and littoral characteristics, lake depth variation, substrates) on all lakes monitored for the EC Water Framework Directive.

- In Poland a lake assessment based on invertebrates has been proposed; this also takes account of lake morphology. However, in Poland most lakes are near-natural with no significant changes to hydromorphology.

- A PhD is commencing (at Stirling University in Scotland) on the relationships of aquatic plants and invertebrates with the hydromprphological features of 25 lakes. These features include water level fluctuations and lake bathymetry. LHS data are also being collected.

- JR is co-supervising a PhD student at Dundee University on the vulnerability and sensitivity of lakes to the effects of climate change.

- A LIFE project has now been completed in Italy looking for links between hydromorphology (using LHS) and biota (macrophytes, invertebrates, fish, plankton). In some cases relationships were found with substrate, bank material, etc. but hab-plots were not always close to biological sampling sites.

- Further analysis of the data collected by JR's Serbian PhD student is continuing, examining the relationship between hydromorphology, plants and invertebrates.

- The lake-shore modification index used in Slovenia has been presented at an ECOSTAT workshop.

- The Environment Agency in England has issued a research contract to investigate the sensitivity of lakes to hydrological changes (e.g abstraction, compensation flow).

Session 3: Developing a CEN standard for assessing the degree of modification of lake hydromorphology

This session comprised the main part of the workshop. The aim of this session was to discuss and modify the draft text for each section of the proposed CEN standard. The principal focus was to revise and expand the scoring protocol produced at the Peterborough workshop (November 2012), informed by basic, raw data from a range of individual lakes.

Using the lake spreadsheet, each of the feature categories in the second lake hydromorphology standard was discussed for each country.

3.1 Hydraulics – Assessment category 1

Water level variability

The group worked through the data country by country. MC and JR discussed the problem of defining the 'structure' (weir) in Italian data, as some of them have not been used actively for decades, so they have no influence onthe natural level of the lake. JR and DS stressed that it is very important to include that sort of information in the scoring system. DS suggested the term 'naturalisation of fluctuation' as a pragmatic approach where a lake functions as if it were natural because the regulating structure no longer has any impact. PB reminded the group that the weir, according to MC, was there to maintain the minimum level and yet it was said by MC that the level has risen over the last two decades – consequently the weir has no effect any more. JR said that the original weir (or any kind of a barrage) was put there for some reason and that it must be taken into account.

CB explained the Scottish data, where assessments were based on LHS results, which indicate that in most lakes the water level regime is natural. However, in some cases there have been significant modifications. For example, in Loch Na h Earba, the water level varies up to 5 m due to hydropower generation. CB said that Scottish lakes have a range of 1-15% in water level variability, so he had scored lakes as 1 rather than 3. Nevertheless, the effects of structures are both scale-dependent and type-specific. CB opened a discussion on using aerial images (by looking for drawdown scars) and comparing them with old maps, in order to get more information on the history of shore development.

SR introduced the group to the Serbian data. These were rather difficult for scoring (similar to those in Italy), as most of the lakes are naturalised reservoirs, with barriers where some of them are no longer functional, so scores for 'regulated or not' are not easy to determine.

CB stressed that some sort of reference data would be necessary, otherwise it is difficult to assign scores of 1 or 3 with any degree of consistency.

The group discussed how to improve the scoring system. The basic principle is to know the natural range of water level variation, so that the percentage change can be estimated. PB asked DS to explain again how his proposed slope ratio would work in practice, in other words what kind of score band would be produced from this ratio. DS had proposed a score that takes into account mean depth and the slope of the littoral zone. Although he had combined those he thought it might be better to keep them separate. DS explained that shallow lakes would be more sensitive to water level changes – especially the biota in a shallow littoral zone.

CB and JR reminded the group of the similarities of this approach to MImAS. PB asked for clarification on how the sensitivity of a particular lake towater level change could be used to develop a scoring system. JR said that MImAS includes a simple classification into 'active

outflow regulation' and 'passive outflow regulation' and makes a distinction between very shallow lakes (<1.5m) and others. He felt this could be the basis of a scoring system.

JR stressed that 'departure from natural' is what we are trying to assess, so the question to address is 'what are the significant hydromorphological metrics for making that assessment?' These should include mean annual range, seasonal characteristics of the water level regime, ramping rate, etc. Some discussion followed on whether or not there is a need to include the biological effects of water level change. CA was strongly in favour but PB was not. CB suggested dividing these two things – hydromorphological variability itself and its effect on lake ecology. PB agreed, but also stressed that we had the same question at the beginning and felt that it might take a decade of work (e.g. running various PhDs) before we understand (for example) how lake macrophytes respond to water level change or invertebrates to vegetation structure.

Water balance (includes residence time, stratification and mixing, water level fluctuations)

The discussion moved to the next category. PB reminded the group of the definition given in the guidance: *Water balance is composed of a number of different elements: range, timing, duration, ramping rate and periodicity. If stratification or mixing is substantially modified, a score of 5 should be allocated. If there is any abstraction or augmentation from the lake or the catchment (e.g. for hydropower production) a score of 1 cannot be assigned.*

After this clarification, PB suggested that the group should look at the spreadsheet and see how it works with real data.

JR repeated that this category is similar to the previous category, in that if that there is any obstruction affecting water balance the lake cannot be scored as 1. PB reminded the group that we had already agreed (minutes from Peterborough, November 2012, page 3 paragraph 6) that we would include 0 as the bottom score ('*In general, if there is no control structure on the lake there should be a presumption that a score of 0 will be allocated. PB noted that the equivalent standard for rivers only has 1, 3, 5 score bands but the group felt there was no need to do the same for lakes*').

The group checked the data country by country, and agreed with PB that this is one of those categories where rather few data are available. However, DS said that he had found it fairly easy to assign scores to the lakes in England and Wales where water balance in most lakes is natural. For Scottish lakes more information was available (from CB), in the form of text (e. g. for Loch Leven *Natural water level range unknown. LHS results indicate that the level has been lowered by up to 4m, that there is a 2m high retaining structure (sluice) and that there may be water level fluctuation of 0-2m, or for Loch Ussie - there is a non-operational Scottish Water asset present on the loch, the water level is no longer artificially varied and should now be fluctuating naturally, but the shoreline may still be recovering from the damage caused when the pressure was present).*

The possible danger of double counting was discussed, but JR explained that 'water regime' is not the same as 'water balance'.

Action 1: JR to clarify the difference between residence time and water balance change.

MC briefly summarized the Italian data. There is not much historical information available on water balance (e.g. historical maps on planform to indicate drawdown changes). DS

reminded the group of the other sources mentioned in the text of protocol – modelling linking precipitation with water balance; Lake Habitat Survey (LHS) database; regular physico-chemical measurements at the deepest part of the lake; temperature and oxygen profiles; remote sensing data to indicate shoreline exposure; discussion with lake managers on whether there are water-mixing measures (e.g. aeration systems).

The grouped moved on to the data from Finland data, where these referred to stratification. The group agreed that stratification is quite important (JR) but there was no information about changes – whether the lake stratifies frequently or seasonally. JR noticed that it would be interesting if we had calculated water balance, and give some values in percentages to comprehend the magnitude of changes observed.

After some further discussion on the unavailability of water balance data for Italian lakes and the variability of the data for lakes in France, the group turned its attention to how to improve the protocol. JR suggested developing a qualitative score band with clearer guidance and thresholds for features that can be observed such as residence time and stratification. JR volunteered to do this for the second day of the workshop.

3.2 Morphometry – Assessment category 2

Slope profile of shore zone

PB reminded the group that the previous workshop had agreed to add some percentage values to change in slope profile although this is very difficult without repeat survey. There may be some scope to use a section of the shoreline that is unmodified as a way of assessing the degree of change.

MP explained how scores had been derived for Slovenian lakes lakes – essentially using the information to describe them as near- natural (scored as 2). MP pointed out that more thought is needed on how to provide scores with greater confidence.

The focus of the group moved to the English lakes. DS had managed to use data from LHS and aerial photographs to apply the quantitative score band. There was a lengthy discussion on artificial waters, beginning with the Norfolk Broads as their origin is not natural. PB emphasised the paradox of using the same system to score natural and artificial lakes - if an excavated pit has not become naturalised it cannot be scored as 1.

PB suggested that the present score bands (quantitative and qualitative) were adequate but further guidance is needed to help in scoring.

Action 2: PB to add a note to the guidance: 'In the case of artificially dug lakes the natural slope is taken to be that of similar-sized lakes, once geomorphological processes have been formative.'

Action 3: DS to add guidance in the protocol on how to assign scores for artificial lakes.

For Italian lakes LHS data were used, so for a 40% changed slope profile, score = 4. For Lake Maggiore both quantitative and qualitative scores were given. PB reminded the group what was said in the text of protocol (in Procedure for scoring: *Users should note whether the lake being assessed is natural (N), heavily modified (H) or artificial (A). Annex A sets out*

guidance on how to allocate scores for each feature category. It contains two separate procedures for scoring - using score band A with quantitative data, or score band B with qualitative data. Score band A is a 5-point scale (1 = lowest degree of modification, 5 = highest degree of modification). Score band B is a 3-point scale (1, 3, 5; following the same general approach as for score band A). Users should state which scores have been assigned based on quantitative data and which on qualitative descriptions, as this determines the degree of confidence in the assessment). It is clear from this that only one score band should be used.

Planform

The group discussed whether planform assessments should be made on shoreline length or the shoreline development index, and agreed that it should be on shoreline length. The group agreed that any changes to the text for slope profile should also be made to the text for planform.

Depth distribution

The protocol provides the following guidance on scoring depth distribution: 'Need information on the mean surface area of the lake and the depth per % of the area, need information on mode of formation'. The group agreed that this is a very difficult feature to assess and that we cannot expect more data soon, although MC said that some of these surveys are planned in Italy, but the data in the spreadsheet for Italian lakes are simply the relationship of volume and depth. However, the group agreed that a quantitative score band should be added and participants were encouraged to gather together some 'real' data before the next workshop.

3.3 Bedforms/ Landforms and substrate – Assessment category 3

The significance of these features depends on the characteristics of the shoreline (e.g. slope, substrate, inflows). Where significant amounts of erosion and/or deposition are recorded it is important to distinguish one from the other, so that appropriate management can be put in place. JR and CA discussed the French lakes, as the numbers could be interpreted in different ways (e.g. as engineering and artificial beaches)

Landform (erosion /deposition character)

The group noted that very little new information had been added for this feature, and that most was derived from LHS. For example, four out of eight hab-plot beaches (total no. = 10) at Loch Badanloch (Scotland) showed signs of aggradation and one further hab-plot showed deposition of sand over the natural littoral substrate, possibly due to forestry activity in the catchment, suggesting that about 50% of the shore was affected by altered erosion/deposition = a score of 4). PB stated that LHS is a good source for deriving the data in this category and suggested that some guidance should be added to the standard after the workshop.

Action 4: JR, DS and CB to add some further guidance to landform assessment on how to use LHS survey data. This could start by saying, 'If using LHS to complete this section, only use the following hab-plot sources…..'

MP described a situation in Slovenia where huge floods had brought large amounts of gravel into lakes. How should this be assessed, as it is a natural process?

Action 5: Add a note to the protocol to explain what this feature covers and what it does not.

Bank structure and modifications – Extent of artificial bank material (% of shore perimeter) – Littoral substrate - extent of artificial material/imported natural substrate

PB reminded the group of the guidance in Annex A. In the absence of any new data the group agreed to leave the protocol unchanged.

Lake bottom bedforms

This includes assemblage of natural bedform features (e.g. dunes, scour holes, ripples) and their associated properties (texture, structure). DS pointed out that there are usually no data for this feature, so lake bottom bedforms should be assumed to be natural unless there is information to the contrary. In the absence of any new data the group agreed to leave the protocol unchanged.

Extent of artificial material/imported natural material in open water

In the absence of any new data the group agreed to leave the protocol unchanged.

3.4 Connectivity and continuity – Assessment category 4

Riparian zone

PB reminded the group that the guidance for this feature is divided into two parts: *'Natural exchange with groundwater'* and *'Connectivity of migratory movement between littoral and riparian zone'*. Both categories are assessed through other parts of the protocol and are therefore not scored here.

Shore zone

The same applies to *Natural erosion/deposition patterns*, which is assessed elsewhere and therefore not scored here. Further guidance says 'Conspicuous evidence of bank erosion, conspicuous evidence of unvegetated sediment deposits; non natural grain size distribution in substrate'.

Open water

This feature has only a qualitative score band. The group agreed that data are rarely available for this feature, but the feature should still be retained in the protocol.

Migratory movement

The group focused on new data in the spreadsheet, particularly comparing scores 3 and 5 for the English and Scottish lakes (with dam heights of 3.5m, 5 m, 6 m). JR, CA and CB discussed how to make the scoring system consistent. JR stressed that it is very important to include a structure in the lake catchment. The group agreed and PB confirm that it would be add to the text a it was included in river standard.

Friday 7 June 2013

Applying Lake-MImAS to the spreadsheet data (JR)

This item was added to the agenda during the first day of the workshop. JR explained how the available data would work in the Lake-MImAS system (water balance – includes residence time, stratification and mixing, water level fluctuations), especially for 75 French lakes (where most of the data were available) and Italian lakes. JR noted that for the French lakes most of the high-amplitude depth ranges occur in reservoirs. He suggested considering shallow lakes separately and separating reservoirs from natural lakes. JR concluded that on average 5m range for British lakes is relatively small compared with lakes in mainland Europe and that the scoring system would need to accommodate these really large ranges. If a starting point in the mean annual range could be identified, a score could be assigned based on percentage change.

PB asked JR how to separate artificial and natural lakes and opened the discussion. MP and JR agreed that mean annual level could be the starting point. PB suggested having two different ways of assessment and to look at these at the next workshop. One would be, 'What is the range of amplitude in the lake?' and second working out the percentage deviation from the expected range.. The group agreed to use a similar approach for residence time.

Action 6: JR to produce a new scoring system for amplitude, and group members to use this for testing their data before the next workshop

The group discussed the impact on a lake of abstraction elsewhere in the catchment. It was agreed that a note should be added to the protocol saying that abstraction in the wider catchment should be included when assigning scores.

3.5 Aquatic vegetation – Assessment category 5

PB reminded the group that this category is practically the same as in the equivalent standard for rivers, as it considers only aquatic vegetation management. DS said that there is not much new information to add, apart from the Broads (there has been management in the past but management levels are currently very low). The Serbian data are from the previous version of the spreadsheet. PB concluded that it is generally very straightforward to score this category. The group was puzzled with the Finnish scoring but suspected that there is some information behind this score and not obviously seen. CB suggested that LHS hab-plot data could be used for assessing vegetation management, but DS stated that this method would not be reliable. The group discussed at some length the wider concept of vegetation 'management', e.g. by trampling at recreational points on lakes). The group agreed that no changes should be made to the protocol.

3.6 Land cover – Assessment category 6

Land cover is scored only in the riparian riparian zone (including extensive stands of non-native species). No changes were needed to the protocol.

Annex B – Land cover in the lake catchment

The group discussed again (already covered during the previous workshops in Mainz and twice in Peterborough), whether to include this feature in Annex A rather than keeping it separately in Annex B. JR repeated his doubts about keeping it separate, as there were many reasons (ecological and philosophical) to include it in Annex A. This view was supported by SR. PB and the rest of the group disagreed, and stressed that having Annex B does not downgrade the importance of land cover in the catchment, but emphasises the importance of catchment characteristics to lake hydromorphology. However, a suggestion that Annex B should be placed before Annex A was accepted as a compromise.

Introduction, Scope, Principle, Normative references, Terms and definitions

The group went through the introductory sections of the standard and made several changes, especially in response to comments made by CEN/ TC 230/ WG 2/ TG 5.

Weighting and combining scores; interpreting and reporting hydromorphological modifications

These topics were deferred to the next workshop. However, the group noted the use of a 1* score in the rivers standard to indicate extremely low levels of modification. They agreed that this should be used in the lakes standard as well.

Session 5: Plans for future work on the standard

Discussion on the EU COST application for a project on lake hydromorphology, and on future collaboration – Snežana Radulović

SR suggested that JR should take over the COST proposal and improve it (it has failed four times so far). JR accepted and the group agreed.

Any other business

Action 7: DS to make some further amendments to the spreadsheet.

JR suggested that the workshop participants should carry out full JR offered to host the next workshop at Dundee University in the spring of 2014. PB thanked him for the offer and agreed to work with JR on the arrangements.

Action 8: PB and JR to make arrangements for a lakes workshop at Dundee University in 2014

4 VIRI

Direktiva 2000/60/ES evropskega parlamenta in sveta z dne 23. oktobra 2000. Bruselj, 72 str.,11 prilog.

prEN 16039: 2011. *Water quality – Guidance standard on assessing the hydromorphological features of lakes*. (predlog)