

Physico-chemical supporting elements: *a review of national standards to support good ecological status*

██████████, ██████████ (European Commission-Joint Research Centre)

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The task group on supporting physico-chemical elements reviewed information reported by Member States to WISE on the standards for general physico-chemical quality elements including nutrients. A wide range of supporting physico-chemical elements are used by Member States and a draft report was elaborated on those that are ecologically most relevant and which are used by enough Member States to make realistic comparisons.

In the last ECOSTAT meeting this draft report was presented; to continue the work, Nutrient experts and ECOSTAT Member were requested to:

- write comments to the report and proposed workplan;
- check and correct the values of physico-chemical element boundaries and supplement missing information using excel files and instructions elaborated by Nutrient core group.

1. Overview of the information collected

26 Member states were requested to check the values of physico-chemical element boundaries and supplement missing information reported to WISE data base. 2 Member States (GR, LT) without information included in the WISE Data base were requested to provide physico-chemical element boundaries.

Excepting 4 countries (BE, CY, LU, NL), all nutrients experts and/or ECOSTAT representatives answered to the request sending the files with corrections and comments (Table 1).

Table 1. Overview and summary of the information sent by Member States. Coastal waters (CW); Lakes (LW); Rivers (RW); Transitional waters (TW).




| Member State | Excel Files requested to check | Excel Files reviewed and provided by MS experts | Comments to the Report | Notes (overview of relevant corrections made by MS experts and comments) | Expert/Ecostat representative sending the information |
|--------------|--------------------------------|---|------------------------|---|---|
| AT | RW;LW | RW;LW | Yes | <ul style="list-style-type: none"> - Recommendation on pH calculation - Corrections of some values parameters - Corrections and comments about Broad types - Missing information of parameters has been included | ██████████; ██████████ |
| BE | CW;LW;RW;TW | | | | |
| BG | CW;LW;RW;TW | CW;LW;RW;TW | | <ul style="list-style-type: none"> - Correction of some values parameters in CW, RW and LW files. - Mistake in the RW files: many entries of CW and LW in the RW file (it is necessary to delete). - TW file: parameters values should be deleted | ██████████ |
| CY | CW;LW;RW; | | | | |
| CZ | RW;LW | RW;LW | | <ul style="list-style-type: none"> - Mistake of national types in the WISE database for RW and LW files. | ██████████ |
| DE | CW;LW;RW;TW | CW;LW;RW;TW | Yes | <ul style="list-style-type: none"> - Types and River Basins codes have been corrected - Not filled the column "intercalibration type", because different national types were not always assigned to the same "intercalibration types" by the intercalibration-groups which were | ██████████ |

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| | | | | responsible for different biological quality elements. | |
| DK | | | Yes | | |
| EE | CW;LW;RW; | CW;LW;RW; | | - CW, LW, RW: new entries of national types and parameters have been inserted. | |
| ES | CW;LW;RW;TW | CW;LW;RW;TW | | - Significant modifications and corrections in all the files because the values reported to the WISE database were previous to the current normative in Spain. New entries of national types and values have been included. - Significant mistakes found in the links of the national types and water categories. | |
| FI | CW;LW;RW; | CW;LW;RW; | Yes | - The G/M boundaries of PHC elements are correct in CW, RW and LW files. - LW file: the summary metric needs correction (AA-EQS -> June-September mean), and some links between national and broad types have to be corrected - RW file: some links between national and broad types have to be corrected - CW file: Experts consider that the common IC types CW-BC1 and CW-BC3 are not suitable for nutrient standard work. | |

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| | | | | <ul style="list-style-type: none"> - Important remarks about inner, middle and outer coastal waters of CW-BC9 are included. - Åland's middle and outer coastal waters might be linked to CW-BC9 based on clustering results of the Baltic Sea. - The summary metric for TN, TP and Secchi in Finnish coastal waters is late summer means (July to August), not AA-EQS. | |
| FR | CW;LW;RW;TW | CW;LW;RW;TW | Yes | <ul style="list-style-type: none"> - TW file is correct - CW file: Values of transparency, temperature and DIN have been included. Explanation on Ecotypes and procedure to establish Good status (in the case of DIN) are provided. A file on parameters used for WFD and MSFD purposes is also provided. - RW file: Values are correct. They have included information about typology exceptions - LW file: Corrections of transparency and TP values have been provided. - Significant number of new entries of national types and parameters have been included. | <div style="background-color: #cccccc; width: 100px; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #cccccc; width: 100px; height: 15px; display: inline-block;"></div> ; <div style="background-color: #cccccc; width: 50px; height: 15px; display: inline-block;"></div> |

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| GR | | RW, CW | | <ul style="list-style-type: none"> - Greece data were not included in the WISE database. Greek experts have sent the files with parameters and values to be included in the new version of the report. | <p>██████████; ██████████</p> <p>██████████</p> |
| HR | CW;LW;RW;TW | CW;LW;RW;TW | | <ul style="list-style-type: none"> - Standard values corrected in CW and TW files - Missing information included in LW files - Some values corrected in RW files and explanations on Range have been included | <p>██████████, ██████████</p> |
| HU | RW | RW | Yes | <ul style="list-style-type: none"> - Corrected values are provided | <p>██████████</p> |
| IE | CW;LW;RW;TW | CW;LW;RW;TW | | <ul style="list-style-type: none"> - CW and TW files: Deletion of some entries and inclusion of new information (national types and parameters). - RW and LW files: Experts have listed under CorValueStd the value they report through WISE but under comments. They have listed the standard for that parameter as listed under Irish legislation S.I. No. 77 of 2019; In each file they have added an extra sheet to list the national Lake types and River types but the standards relate to all types. | <p>██████████; ██████████</p> <p>██████████</p> |

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| IT | RW;LW;TW | LW;RW;TW | Yes | <ul style="list-style-type: none"> - RW file: Ammonium, Oxygen saturation and Nitrate values have been corrected - LW: explanation of range values have been included. Some corrections regarding national types and some parameter values. - TW file: Corrections for all parameters, specifying that the standards are the same for all RBD. In addition, experts report some details concerning the rules applied for the use of physico-chemical QEs in the classification of the ecological status of Italian TW, in the case of mismatch between the status of the BQEs (GES or better) and physico-chemical QEs (less than good). | <p>██████████; ██████████;</p> <p>██████████</p> |
| LV | CW;LW;RW;TW | CW;RW;TW | Yes | <ul style="list-style-type: none"> - LW file is ok - RW, CW, TW files: Corrections for Nitrate values | <p>██████████</p> |
| LT | | CW;LW;RW;TW | | <ul style="list-style-type: none"> - LT data were not included in the WISE database. LT experts have sent the files with parameters and values to be included in the new version of the report. | <p>██████████</p> |

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| MT | RW;LW | | | <ul style="list-style-type: none"> - Experts consider that the standard values as reproduced in the excel sheet (as reproduced from WISE) do not reflect appropriate standards and will need to be updated by Malta once such standards are established as relevant. In this regard, it is suggested that such standards are deleted at this stage. |  |
| NL | CW;LW;RW;TW | | | | |
| NO | RW;LW | RW;LW | | <ul style="list-style-type: none"> - LW file: Corrections of values of all parameters. Missing information, explanations on range values, and comments on some national types are included. - RW file: Corrections of all values of pH. Corrections of some values of TN and TP. |  |
| PL | CW;LW;RW;TW | CW;LW;RW;TW | | <ul style="list-style-type: none"> - Every record for Poland has been erased and replaced with a correct one. - PL system is ever-changing, and values reported about 2014/2015 are not valid any more as there were thorough changes in 2016. PL is planning another change (parameters, values and typology) to be implemented in the next RBMPs. These changes are |  |

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| | | | | <p>slight in TraCs, so they can be neglected in pan-European comparisons, but they're large in inland waters.</p> <ul style="list-style-type: none"> - To sum up, in any comparisons Poland is going to have two systems. Actually, as the values for RBMPs 2016-2021 turned out to be interim, PL experts think that they might be omitted anyway and to make things easier, to present 2022+ values only. | |
| PT | CW;LW;RW;TW | CW;LW;RW;TW | Yes | <ul style="list-style-type: none"> - CW file: records 2 to 17 have been corrected since reported values do not refer to ranges but different reference values for salinity classes. Records 20 to 80 have been added to include reference values for different national types and salinity classes. National type A2 (estuaries) has no common intercalibration type (national only).Data for PTRH9 has not been corrected because it must still be revised by the Autonomous Region of Azores (since they report data for PTRH9 river basin district). - TW file: Records 6 and 14 have been corrected since reported values do not refer to ranges but reference values | |

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| | | | | <p>for different national types within the PTRH5 river basin district. Records 20-23 and 24-27 have been added to correct records 6 and 14. National type A3 (coastal lagoon) has no common intercalibration type (national only). Data for PTRH9 has not been corrected because it must be revised by the Autonomous Region of Azores (since they report data for PTRH9 river basin district).</p> <ul style="list-style-type: none"> - RW and LW files: TRH4 and PTRH5 corrections were made regarding the standards applicable to Total Phosphorus and Percent oxygen saturation, since these RBD include rivers and reservoirs with type specific G/M boundaries. For the remaining records, type specific rows were not included, as the same standards apply to all types in the respective RBD. However, it is important to keep in mind that, at this stage, the following reservoir and river types do not have type specific standards applicable to physico-chemical supporting elements: L_CP, R_GRN, R_GRC, R_GRS, ART. For PTRH9 and PTRH10 it was not | |

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| | | | | possible to validate the records, as these RBD are managed by the insular autonomous regions. | |
| RO | CW;LW;RW;TW | CW;LW;RW;TW | Yes | <ul style="list-style-type: none"> - LW, RW files: Mistake detected to be corrected. Both excel files contain all waters categories (rivers, lakes, coastal and transitional), even though they are named "rivers" and respectively "lakes" .Both excel files contain all types of WB: natural, HMWB, artificial.In the given circumstances and depending on the final objective, RO expert made different observations and corrections. Moreover, quite a large number of values had to be corrected for Nitrogen nutrients forms because it is written that they were standardized accordingly. The data should not have been standardized, they were reported in N mg/l from the beginning. - CW files: New values provided for Secchi depth and Ortophosphate. New parameters (DIN, TP) are reported. - TW files: ROTT02 values, and Nitrate values are eliminated. New parameters (DIN and TP) are provided. | <div style="background-color: #cccccc; width: 100px; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: #cccccc; width: 100px; height: 15px; display: inline-block;"></div> ; <div style="background-color: #cccccc; width: 100px; height: 15px; display: inline-block;"></div> |

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| | | | | Secchi depth and Orthophosphate values are corrected. | |
| SE | RW;LW | RW;LW | | <ul style="list-style-type: none"> - RW, LW files: For TP, information on establishment of reference condition, typology, data and ranges is provided. - Information and corrected values for O2 (lakes), pH and Secchi depth is also provided | |
| SI | CW;LW;RW; | CW;LW;RW; | | <ul style="list-style-type: none"> - CW file: Comments on SumMetric - LW file: Correction of the Oxygen saturation %, TP and Secchi depth values for the Type J_SI_4_KB-D>15_1-10. - RW file: 121 new records have been added. BOD5 Sum metric is explained. Description of the national types for linking to broad types is provided. | |
| SK | RW | RW | Yes | <ul style="list-style-type: none"> - Correction of the Sum metric is included. | |
| LU | RW | | | | |
| UK | CW;LW;RW;TW | LW;RW | | <ul style="list-style-type: none"> - LW and RW file: Expert has provided some comments on a new tab on each sheet – general comments are on the lakes sheet, and on each one there are also specific comments relating to particular elements. Expert thinks that there are probably some issues with | |

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| | | | | the WISE data for the UK caused by slight variations in reporting form the different UK countries, and it may be necessary to try to simplify this for the purposes of the current project. | |

2. Overview of the comments to the report

11 countries have provided comments to the report. General and detailed comments have been received. Only 2 countries (FI, PT) have included specific comments to the workplan (as it was requested), agreeing with it.

Table 2. Summary of the comments received in the report.

| Member State | Comments |
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| Austria | <ul style="list-style-type: none"> - When comparing EQS it is not only important how they are calculated (annual average, min, max ...) but also what kind of data are used. - Irrelevant of the question if we consider surface or whole water column sampling more correct, this difference in sampling and calculating should at least be briefly mentioned in the report. Otherwise differences in AA-EQS cannot be interpreted in the right way, if calculated from epilimnion samples in one country and from the whole water column in another country. - Strictly speaking, the annual average of pH should be calculated from the H⁺ concentration, not from the pH values, which are in fact logarithmic data. This may not play a role in most cases, but can lead to deviation of annual mean pH of 0.1–0.2. - Figure 2.1 - lakes: The following parameters are lacking for Austrian lakes: <ul style="list-style-type: none"> ○ Water temperature (calculated as annual mean for the hypolimnion; as a range; only stratified lakes; no EQS for shallow lakes) ○ Oxygen saturation (calculated as annual mean for the hypolimnion; as a range; only stratified holomictic lakes; no EQS for shallow and meromictic lakes) ○ Acid neutralizing capacity (alkalinity): only for the very large and shallow soda lake Neusiedler See (= Lake Neusiedl, Lake Fertő) ○ Electric conductivity: only for the very large and shallow soda lake Neusiedler See (= Lake Neusiedl, Lake Fertő) |

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| | <ul style="list-style-type: none"> - Page 45 on pH: The “lowland very shallow calcareous lake” in Austria is Lake Neusiedl, but the reported lower end of the range is wrong. It is 8, not 9. - The broad European types are doubtful e.g. what is that difference in the broad lake types in Table 6 and Fig. 5? AT gives several recommendations detailed in the word file sent. - On page 160 (Table A6.14) the label of the y-axis should be changed from SRP to TP |
| Denmark | <ul style="list-style-type: none"> - The report clearly shows that there is considerable variation between Member States' standards for the individual physico-chemical quality elements. Even updating and qualifying member states' standards and increasing focus on harmonization seems like a difficult exercise. The reason for the large variation can maybe be explained by a large natural variation in the quality elements in both time and space but also the different methods used by the member states to set standards for the physico-chemical quality elements. The large variation in data shows that there is still a need to continue work on harmonization of the physico-chemical and the hydromorphological quality elements. |
| Finland | <ul style="list-style-type: none"> - No major comments for the proposed workplan for 2020-2021 (pages 91-93). - It is important to acknowledge the restrictions and limitations when using the broad European surface water body typology for comparison, as it generalizes and simplifies many characteristics and details of national typology and classification. For this reason, presenting the standard data for the whole Europe as broad types in the figures seems ok for visualization, whereas for comparison it may not be optimal due to big differences in the N-S gradient in conditions and geography. - The draft report says: “the key question addressed in this report is to what extend standards reported by countries really support good ecological status”. This part is |

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| | <p>still missing from the text. We expect that after addition of this discussion for chapter 4, the member states will have a new possibility to comment on the draft document.</p> <ul style="list-style-type: none"> - Minor comments: - Draft report (p. 41). "...but in Finland, depending of the national type, the minimum value is around 2.5 meter and maximum value is 6.5 meters ." -> The lowest G/M boundary for the Secchi depth in the Finnish coastal national type is 2.3 m (type Ms), and highest 5.8 m (type Lv). - Annex tables of the draft report (from page 95-): the titles of the tables throughout the annex presenting (to our understanding) the number of national water body types where the member state uses the respective standard are confusing ('Metrics used by country'). For instance Table A31 (page 118): the title gives a reader an impression that Finland would have 14 metrics for Secchi. Please, correct the titles of these annex tables. - p. 139, title of the figure A6.4 should be nitrate-N, not total-N. |
| France | <ul style="list-style-type: none"> - Table 1. Member States (MS) don't have the same number of national types. The total number of national types per MS would help the reader to analyse this kind of table; another option could be to indicate a percentage of national freshwater types that could not be matched to a broad type. - More explanation about the data should be given, this is important because some parameters may be monitored but not used to assess the status. - A definition of "ecological relevant" should be included because it is important to be sure that we all share the same point of view. - Countries apply different methods and frequencies for sampling. Even if samples should be representative of the entire |

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| | <p>sampld water body, disccret over time and over space sampling methods make biased data, and biases of each country are different and limit the comparability of data between countries. (A review of sampling methods could be helpful)</p> <ul style="list-style-type: none"> - Important contribution in the chapter 4.1 for discussion is provided. - Small corrections in tables, and some contributions are included along the text. |
| Germany | <ul style="list-style-type: none"> - The report “Physico-chemical supporting elements - a review of national standards to support good ecological status” shows that there are many differences in Good/Moderate boundaries of supportive physical and chemical variables between the Member states. This is not a new result - we know this since the reporting for first river basin management plan. - Generally we think the interpretations that can be drawn from the report are limited and conclusions about variable ambitions of different Member states to implement the WfD are not possible. - The secondary typologies (broad typology and the IC -typology) used to analyze the data from the Member states do to our opinion not help to resolve this problem. We expect rather they (will) confuse the reader. - The report and the analyses do only consider the Good/Moderate boundaries of supportive physical and chemical variables, but not the Very Good / Good boundaries (or the reference values). To our opinion this is a major gap, because the approach used in the report ignores the “reference concept” underlying the WFD assessment / classification concept. |

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| Hungary | <ul style="list-style-type: none"> - The report summaries well the number and standards of physico-chemical parameters and metrics used by each country on basis of common European broad types. Our point of view the comparability of data (parameters, metrics, standards) are limited by variance of geographical characteristics and typology which are aggregated in broad types, rather by different assessment concepts of countries (differences in parameters, metrics). Some tables suggested to be replaced by infographs with visual representations of data, which would increase the overview and readability of the report. |
| Italy | <ul style="list-style-type: none"> - Proposal of the following text to be added to the “introduction” either in par. 1.1 “Objectives” or in Par 1.2 “Approach “It is important to note that Member states apply different combination rules for the supporting elements, as average, worst case or more complex scoring systems. The combination rule is very important, and needs further attention to when making comparisons among Member states, as similar threshold values may give different classification if different combination rules are applied.” |
| Latvia | <ul style="list-style-type: none"> - Section, 3,2,1 Secchi depth is not used as an indicator for humic lakes, because in highly colored bog lakes (dystrophic lakes) the Secchi depth is determined by high content of organic matter. - Fig.3,33 and 3.35. LV values are not in the graphs - Figure A6.4 the title is Tonal Nitrogen but the graphs are regarding Nitrate as N |
| Portugal | <ul style="list-style-type: none"> - We consider validation of standards to be a useful exercise and agree with the workplan. - We have no Case Studies to present at this time. - We noticed that sometimes the introductory text for each of the parameters includes a |

sentence prone to misinterpretations. An example from page 17: “Most (7) countries (BE, BG, ES, PL, PT, RO, UK) use a single value for each national type, but several (5) countries (BG, CY, ES, PL, PT) present standards as a range.” In this case, Portugal appears in both situations as a result of an error already addressed in the attached files, however, for the sake of clarity and considering that other countries are listed in both cases, we suggest the following change: “Most (7) countries (BE, BG, ES, PL, PT, RO, UK) use a single value for each national type, while several (5) countries (BG, CY, ES, PL, PT) present standards as a range, sometimes in addition to a single value.”

- For PTRH9 and PTRH10 it was not possible to validate the records, as these RBD are managed by the insular autonomous regions. We are in contact with our colleagues from the respective River Basin Administrations and will provide you updates as soon as we receive the information.

- TW-CW specific comments on the report:
 - o Sections 3.2.2 Secchi Depth (transitional waters) and 3.2.2 Secchi Depth (coastal waters) must be revised by the Autonomous Region of Azores (since they report data for PTRH9 river basin district). In particular, transparency values of 35m must be confirmed. This will happen during the month of January and we will provide you with the comments/corrections for PTRH9 until the end of the month.
 - o Nutrient boundaries have not changed since 2014. However, we are working on the revision and improvement of classification methodologies for physical-chemical support elements, namely through (i) including new parameters; (ii) definition of type specific boundaries; (iii) testing different metrics (e.g.

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| | <p>average instead of 90th percentile) and (iv) application of Best Practice Guide and Toolkit.</p> <ul style="list-style-type: none"> ○ We expect to have results by the end of 2020. At this time we have no changes to the presented methodologies. |
| Slovakia | <ul style="list-style-type: none"> - Table 1.1. Slovakia have no lakes designated, we have 23 HMWB – in „water bodies/ rivers with changed categories“ – it means in practice: 23 water reservoirs created by damming of rivers (large or mid-sized). These were not intercalibrated - In figure 2.1 is mentioned only CODMn as other determinant for oxygenation concentration. We (SK) have CODCr. The same case is other determinant of salinity (we have Conductivity). We propose to consolidate table 2.1 with the figure 2.1. - Table A7. SK uses 90th percentile in classification schemes for all parameters of physical- chemical EQ, except Oxygen, where the 10th percentile value is used. - Table A58. Mistake. Slovakia uses 90th percentile value |
| Romania | <ul style="list-style-type: none"> - Corrections made in Tables A1, A34, A55, A79 |