ANNEX 1 –DEFINITION OF WATER BODY STATUS IN THE WATER FRAMEWORK DIRECTIVE (WFD)

*"**Good ecological status of a surface water body**"* is achieved if the values of the biological quality elements for the surface water body type show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions. The assessment of the ecological status of the surface water body depends on three types of criteria: biological elements; hydromorphological elements supporting the biological elements; and general physico-chemical and chemical elements (i.e. specific pollutants) supporting the biological elements. It is noted that if there are only very minor anthropogenic alterations to the values of the physico-chemical and hydromorphological quality elements, and the values of the biological quality elements resemble those under undisturbed conditions, then ecological status is assessed as "high", which is a superior classification compared to good. Heavily modified or artificial surface water bodies represent cases, where the reference natural conditions have been significantly disturbed. Thus, depending on the level of this disturbance, they can be closer or more distant to the reference conditions. For such surface water bodies, the environmental objectives refer to the "good ecological potential" (EU, 2000).

*"**Good chemical status of a surface water body**"* is achieved if the concentrations of pollutants in the surface water comply with the environmental quality standards established for priority and other substances under relevant water legislation. Environmental quality standards are required to take into account both chronic and acute exposure to the above chemicals and they are set out for samples of water, sediments or aquatic biota (EU, 2000).

*"**Good chemical status of a groundwater body**"* is achieved if the concentrations of pollutants and changes in electrical conductivity of groundwater caused by human activities: a) meet the quality standards established under relevant water legislation, b) show no evidence of impacts from saline or other intrusion, c) do not cause significant degradation of the chemical or ecological quality of associated surface water bodies, or failure of relevant environmental objectives, and d) do not significantly harm terrestrial ecosystems directly dependent on the groundwater body. Elevated concentrations of naturally occurring substances should not lead to poor chemical status, as they are expected to be accounted for in threshold values for these substances (EU, 2000; CIS, 2017).

*"**Good quantitative status of a groundwater body**"* is achieved if the alteration of groundwater level due to human activities: a) does not cause significant diminution of groundwater, b) does not result in failure of relevant environmental objectives for associated surface water bodies, c) does not significantly harm terrestrial ecosystems directly dependent to the groundwater body. The groundwater level balance is maintained if the average volume of the annual abstraction does not exceed the average volume of groundwater recharge in the long term. Alterations to groundwater levels may cause changes in groundwater flow direction temporarily, or continuously in a spatially limited area, provided that saline or other intrusions are not triggered or likely to be triggered (EU, 2000; CIS, 2017).

Sources:

CIS, 2017, Natural Conditions in relation to WFD Exemptions - Document endorsed by EU Water Directors at their meeting in Tallinn on 4-5 December 2017, Common Implementation Strategy for the Water Framework Directive (2000/60/EC) (https://circabc.europa.eu/sd/a/49b021b3-5d8e-4b4d-946d-4754d1ae0573/NaturalConditionsinrelationtoWFDexemptions.pdf) accessed 09 April 2021.

EU, 2000, Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy(OJ L 327, 22.12.2000, p.0001–0073) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32000L0060) accessed 09 April 2021.

ANNEX 2 – DEFINITION OF SPECIES/HABITAT CONSERVATION STATUS IN THE HABITATS DIRECTIVE (HD)

The "***habitat***" of a species is a part of the environment defined by specific abiotic and biotic factors, in which the plant of animal species lives at any stage of its biological cycle (EU, 1992).

The *"**conservation status of a species**"* means the sum of the influences acting on the species concerned, which may affect the long-term distribution and abundance of its populations within the European territory of the EU Member States. *"**Favourable conservation status of a species**"* is achieved if*:*
a) population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
b) the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future,
c) there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis (EU, 1992).

The *"**conservation status of a habitat**"* represents the sum of the influences acting on a habitat and its typical species, which may affect its long-term natural distribution, structure and functions, as well as the long-term survival of its typical species, within the European territory of the EU Member States. *"**Favourable conservation status of a habitat**"* is achieved if:
a) its natural range, and areas it covers within that range, are stable or increasing,
b) the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future,
c) the conservation status of its typical species is also favourable (EU, 1992).

Sources:

EU, 1992, Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.07.1992, p.7–50) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043) accessed 09 April 2021.

ANNEX 3 – ECOGROUPS OF FRESHWATER AQUATIC HABITATS FROM ANNEX I OF THE HABITATS DIRECTIVE (HD)

HD habitat code	Ecogroup and HD Annex I habitat name
4A: Running Freshwater[1]	
3210	Fennoscandian natural rivers
3220	Alpine rivers and the herbaceous vegetation along their banks
3230	Alpine rivers and their ligneous vegetation with Myricaria germanica
3240	Alpine rivers and their ligneous vegetation with Salix elaeagnos
3250	Constantly flowing Mediterranean rivers with Glaucium flavum
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
3280	Constantly flowing Mediterranean rivers with Paspalo-Agrostidion species and hanging curtains of Salix and Populus alba
3290	Intermittently flowing Mediterranean rivers of the Paspalo-Agrostidion
32A0	Tufa cascades of karstic rivers in the Dinaric Alps
4A: Standing Freshwater[2]	
2190	Humid dune slacks
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3120	Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean, with Isoetes spp.
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
3160	Natural dystrophic lakes and ponds
3190	Lakes of gypsum karst
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
31A0	Transylvanian hot-spring lotus beds
4A: Temporary Freshwater[3]	
3170	Mediterranean temporary ponds
3180	Turloughs

[1] **Running Freshwater** ("Rivers"): All permanent rivers and streams, including rivers, streams, brooks, rivulets, rills, torrents, waterfalls, cascades and rapids.

[2] **Standing Freshwater** ("Lakes"): Lakes, ponds and pools with fresh (non-saline) or slightly brackish water. Included are semi-natural, man-made freshwater bodies like artificially created lakes, reservoirs and canals.

[3] **Temporary Freshwater** ("Temporary streams and ponds"): Running or standing waters with non-permanent water column, drying seasonally (usually in summer).

Non-Mediterranean rivers and lakes are further distinguished (for higher resolution), based on their altitude (i.e. low-land, mid-altitude, highland), while Mediterranean rivers and lakes are separated from the rest surface water bodies of Europe, due to warmer and drier climate conditions.

Sources:

Halada, L., et al., 2020, Proposals of the ecological grouping of the Habitats Directive habitats and species, ETC Biodiversity report 2020, pp. 38.

Halada, L., et al., 2020, Proposals of the ecological grouping of the Habitats Directive habitats and species, Database accompanying the ETC Biodiversity report 2020.

Solheim, A.L., et al., 2019, A new broad typology for rivers and lakes in Europe: Development and application for large-scale environmental assessments, Science of the Total Environment, 697, 134043 (https://www.sciencedirect.com/science/article/pii/S0048969719340203#f0040) accessed 09 April 2021.

ANNEX 4 – ECOGROUPS OF GROUNDWATER-DEPENDENT TERRESTRIAL HABITATS FROM ANNEX I OF THE HABITATS DIRECTIVE (HD)

HD habitat code	Ecogroups and HD Annex I habitat name
4E: Terrestrial habitats in need of high level of groundwater[1]	
	Bogs and Mires
7110	Active raised bogs
7120	Degraded raised bogs still capable of natural regeneration
7140	Transition mires and quaking bogs
7150	Depressions on peat substrates of the Rhynchosporion
	Fens
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
7220	Petrifying springs with tufa formation (Cratoneurion)
7230	Alkaline fens
	Inland salt marshes
1310	Salicornia and other annuals colonizing mud and sand
1410	Mediterranean salt meadows (Juncetalia maritimi)
	Wet Forests
9190	Old acidophilous oak woods with Quercus robur on sandy plains
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
91F0	Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris)
92A0	Salix alba and Populus alba galleries
	Wet Heaths and Scrub
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)
4080	Sub-Arctic Salix spp. scrub
	Wet Meadows
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
	Bogs and Mires / Fens / Wet Meadows
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
	Bogs and Mires / Wet Forests
91D0	Bog woodland
	Fens / Wet Meadows
2190	Humid dune slacks
4D: Freshwater Riparian and Alluvial habitats[2]	
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
3220	Alpine rivers and the herbaceous vegetation along their banks
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation

[1] **Terrestrial habitats in need of high level of groundwater**: These habitats depend on high level of ground water: bogs, mires, marshes, fens, wet meadows. The following categories are distinguished:
• *Bogs and mires*. Bog and mire complexes, usually acid or neutral, including raised bogs, blanket bogs, acidic fens, transition mires, boreal marsh-fens, aapa, palsa and polygon mires.
• *Calcareous fens*. Wetlands mostly with peat or tufa soils permanently waterlogged, with base-rich, nutrient-poor, often calcareous water supply, and with the water table at, or slightly above or below, the substratum.
• *Wet meadows*. Managed or unmanaged grasslands on wet and humid stands.
• Inland salt marches. Habitats of sites submerged by high tides at some stage of the annual tidal cycle of oceans and their connected seas. Similar halophyte communities colonizing the fringes and emerged beds of inland permanent or temporary saline, hypersaline or brackish waterbodies, including lakes, pools, springs.
• *Wet forests*. Forest with permanently or temporary wet soils. Included are forests in alluvial and riparian positions, bog forest, forests of marshes and forests in other wetlands.
• *Wet heaths and shrubs*. Heaths and scrub habitats of wetlands. Included are scrubby habitats in alluvial and riparian sites, scrubs on periphery of water bodies, scrub habitats in bogs, marches, and other wetlands.

[2] **Freshwater Riparian and Alluvial habitats**: These habitats stretch along streams and rivers and depend on (frequent) inundation or high water level in the soil. This group of habitats is linked to hydrological regime of rivers and streams and it is classified under the category of wetland habitats. Wetland habitats are defined by WFD as "habitats, which depend on frequent inundation or on the level of groundwater (e.g. alluvial alder wood, blanket bog, fens)". It is possible to divide this group further to herb-, shrub- and tree-dominated habitats. It is noted that the freshwater bodies are excluded from this type of habitat.

Sources:

Halada, L., et al., 2020, Proposals of the ecological grouping of the Habitats Directive habitats and species, ETC Biodiversity report 2020, pp. 38.

Halada, L., et al., 2020, Proposals of the ecological grouping of the Habitats Directive habitats and species, Database accompanying the ETC Biodiversity report 2020.

ANNEX 5 – KEY METHODOLOGICAL CHALLENGES FOR CROSS-WALK ANALYSIS BETWEEN THE WATER FRAMEWORK DIRECTIVE (WFD) AND THE HABITATS DIRECTIVE (HD)

While conducting the cross-walk analysis between the WFD and the HD, a series of methodological challenges emerged, including the following:

- **The "conceptual" cross-walk between the WFD and HD definitions was relatively easier than the "technical" cross-walk between the WFD and HD data**. Scientific publications rarely distinguish between "GWAAEs" and "GWDTEs" as clear as the WFD does, and they are both covered under the more general term "Groundwater Dependent Ecosystems", including also other types of ecosystems, such as stygofauna. However, recent work of the EEA and ETC BD (Halada et al., 2020) has allowed to identify ecogroups of HD Annex I habitats, which could be matched to the WFD definition of a GWAAE or GWDTE.

- **The national methodologies for the designation of habitats as GWAAEs/GWDTEs under the WFD are not well documented and readily available to the public and scientists for review**. For the purposes of this report our expert team analysed the relevant methodological approaches of France, Ireland and the UK. These were more easily accessible, than other national methodologies searched (e.g. relevant methodologies in the Danube region). A key conclusion was that there are significant differences in the criteria and the scoring system being used. Although this is not necessarily negative, and may show a focus on specificities of national conditions, different methodologies per country create significant burdens in cross-country exercises, due to comparability issues, misinterpretations, and conflicts in assessments for the same type of habitat.

- **Data from WFD and HD reporting differ greatly in terms of: a) spatial units for reporting and assessments; and b) timetables and periods for reporting.** The spatial scale used for the assessment of the conservation status of habitats is gridded and coarse, and it does not match the geometry of water bodies (e.g. lines for rivers, and polygons for groundwaters, lakes, transitional and coastal waters). In addition, any spatial overlaps between the vertical projections of the boundaries of GWBs upon the boundaries of river basins and habitats on the ground surface can be hardly studied visually. This task requires more sophisticated understanding and conceptual modelling. To add to this complexity, different horizons can be located on the same location in the vertical plane, making it strenuous to distinguish the exact GWB interacting with a SWBs or a GWAAE/GWDTE. As the reporting and assessment units are incompatible, the uncertainty on which water bodies are linked with which ecosystems becomes challenging. Under the WFD, Member States have to define GWAAEs and GWDTEs, and assess their condition. Furthermore, under Art.17 of the HD they have to report data on the conservation status of those types of habitats included in Annex I of the HD. However, potential GWAAEs and GWDTEs are not explicitly distinguished as a special category of the reporting of conservation status, making the review of relevant WFD assessments less transparent and straightforward. Moreover, the reporting obligations under the WFD and the HD have different timetables, which creates a gap when trying to compare data from exactly the same period. Although both Directives have 6-year cycles, there is a lag time of two years in the reporting periods.

- **Reporting choices and gaps create additional obstacles for a comprehensive cross-walk analysis between WFD and HD data**. For example, EU Member States are required to provide

the code identifiers of all GWBs and SWBs which are linked together. However, in more than 20% of the linkages this was not done (i.e. 10,698 pairs of GWBs and SWBs with unknown SWB code – "null"). Therefore, our knowledge on the linked water bodies is only partial, although we know that a linkage is reported. For sound implementation of the overall methodology, those linkages where the SWB was unknown, were excluded from the analysis. Furthermore, the reported physical distance between GWBs and SWBs showed a wide range, even reaching up to 300 km. Those SWBs having a distance greater than 2 km (less than 1.5% of the total number of SWBs linked with GWBs) were also excluded from the analysis. Thus, our final sample of linked GWBs and SWB ended up including only 2,743 unique GWBs linked with 31,554 unique SWBs, having a distance between them less than 2 km.

References:

Halada, L., et al., 2020, Proposals of the ecological grouping of the Habitats Directive habitats and species, ETC Biodiversity report 2020, pp. 38.

ANNEX 6 – COMMON CHEMICALS CAUSING LESS THAN GOOD CHEMICAL STATUS IN GROUNDWATER BODIES (GWBS) OR SURFACE WATER BODIES (SWBS) IN EU 27

Common GWB pollutants causing poor chemical status of GWBs:

- EEA_34-01-5 - Pesticides (Active substances in pesticides- including their relevant metabolites-degradation and reaction products)
- CAS_67-66-3 - Trichloromethane
- CAS_127-18-4 - Tetrachloroethylene
- CAS_7440-02-0 - Nickel and its compounds
- CAS_7440-43-9 - Cadmium and its compounds
- CAS_205-99-2 - Benzo(b)fluoranthene
- EEA_33-56-7 - Total PAHs (Benzo(a)pyrene- Benzo(b)fluoranthene- Benzo(k)fluoranthene- Benzo(ghi)perylene- Indeno(1-2-3-cd)pyrene)
- CAS_1912-24-9 – Atrazine
- CAS_7439-92-1 - Lead and its compounds
- CAS_193-39-5 - Indeno(1-2-3-cd)pyrene
- CAS_191-24-2 - Benzo(g-h-i)perylene
- CAS_206-44-0 - Fluoranthene
- CAS_120-12-7 - Anthracene
- CAS_7439-97-6 - Mercury and its compounds
- CAS_87-68-3 - Hexachlorobutadiene
- CAS_608-73-1 - Hexachlorocyclohexane

Common SWB priority substances causing less than good status of SWBs:

- EEA_32-24-6 - Total Benzo(g-h-i)perylene (CAS_191-24-2) + Indeno(1-2-3-cd)pyrene (CAS_193-39-5)
- CAS_7439-97-6 - Mercury and its compounds
- CAS_206-44-0 - Fluoranthene
- EEA_32-23-5 - Total Benzo(b)fluor-anthene (CAS_205-99-2) + Benzo(k)fluor-anthene (CAS_207-08-9)
- CAS_67-66-3 - Trichloromethane
- CAS_7440-02-0 - Nickel and its compounds
- CAS_7439-92-1 - Lead and its compounds
- CAS_7440-43-9 - Cadmium and its compounds
- CAS_608-73-1 - Hexachlorocyclohexane
- CAS_87-68-3 - Hexachlorobutadiene
- CAS_127-18-4 - Tetrachloroethylene
- CAS_120-12-7 – Anthracene
- CAS_1912-24-9 – Atrazine

Note: Chemicals are sorted according to affected GWB area or SWB length.

Sources:

EEA, 2020, 'WISE Water Framework Directive Database', DAT-124-en, published 25 March 2020 (https://www.eea.europa.eu/data-and-maps/data/wise-wfd-4) accessed 13 January 2021.