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COMMISSION STAFF WORKING DOCUMENT

Third River Basin Management Plans Second Flood Hazard and Risk Maps and Second Flood Risk Management Plans
Member State: Hungary

Accompanying the document

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)

Third River Basin Management Plans
Second Flood Risk Management Plans

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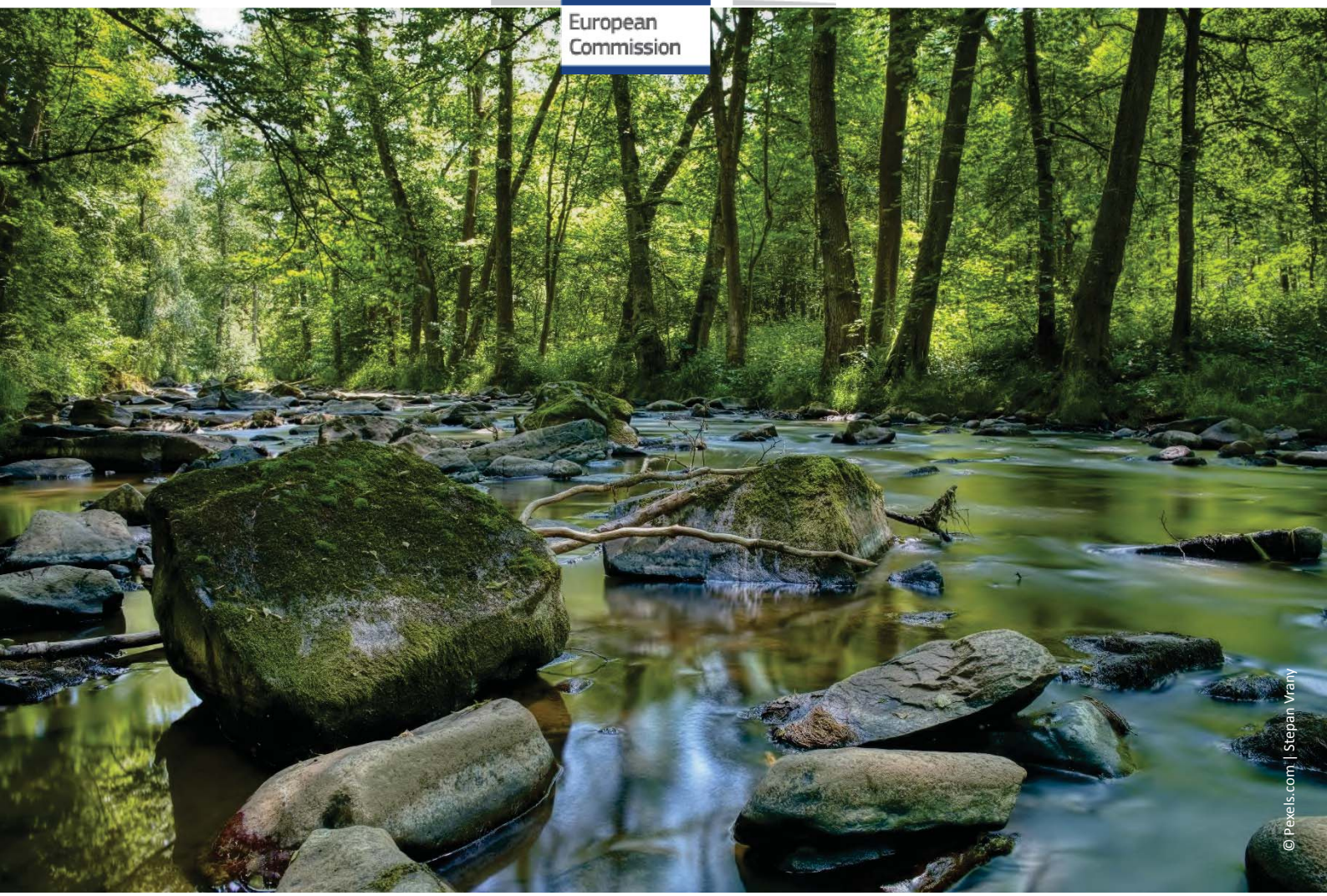
European Commission



Country specific staff working document

Hungary

ENVIRONMENT
www.parlament.gv.at

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SECTION A:

WATER FRAMEWORK DIRECTIVE

1. General info, member state characterisation

Hungary is a land-locked country which shares borders with Member States but also with third countries: in the north Slovakia, Ukraine to the northeast, Romania to the east and southeast, Serbia to the south, Croatia and Slovenia to the southwest and Austria in the west. Hungary has a population of 9.6 million inhabitants[1] and a surface area of 93 thousand km^2.[2] Lake Balaton, covering 598 km^2, is one of the biggest tourist attractions of the country. Two-thirds of Hungary's geographic area is less than 200 metres above sea level while the highest elevation reaches 1000 m.[3]

Hungary has one River Basin District (RBD) which is part of the Danube international RBD. Hungary has 1072 surface water bodies (886 rivers and 186 lakes) as well as 185 groundwater bodies. As a land-locked country, it has no transitional or coastal waters.

BD (Index)	Rivers	Lakes	Groundwater Bodies
Danube (HU1000)	886	186	185

[1] Statistics | Eurostat (europa.eu)
[2] Hungary Facts | Britannica
[3] https://studyinhungary.hu/why-hungary/menu/basic-information-about-hungary.html

However, as it can be seen in the table below, the level of human intervention in the water system is quite considerable and more than half of the river water bodies and lake water bodies are heavily modified. This is due to the presence of weirs and dams, channelisation and straightening of rivers, and bed stabilisation and bank reinforcement as well as inland waterway transport facility installations, tourism and recreational activities (beaches, fishing). A smaller percent of water bodies is artificial (16%) i.e. water bodies created by human activity.

Modifications	Rivers	Lakes
HEAVILY MODIFIED	52%	66%
ARTIFICIAL	16%	16%

Currently, 22.2% of Hungary terrestrial territory is designated as protected areas. Hungary has a total of 851 protected areas, comprising 326 sites designated under national laws and 525 recognized as Natura 2000 sites[4]. The share of species assessments with good conservation status is only 34.9% with more than half with bad conservation status.

Reporting

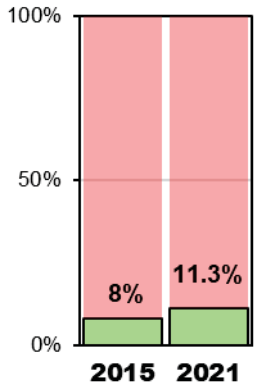
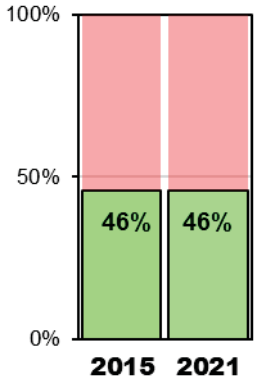
The deadline for reporting the 3rd RBMPs was in March 2022. The Commission and the EEA together with Member States developed an electronic reporting system in WISE (Water Information System for Europe). Its use was voluntary. Some Member States used it to fulfil their obligations, others reported the plans in pdf format. The cut-off date for the WISE e-reporting was September 2023 and the MS were assessed based on the datasets available by this date.

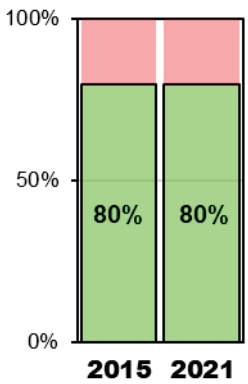
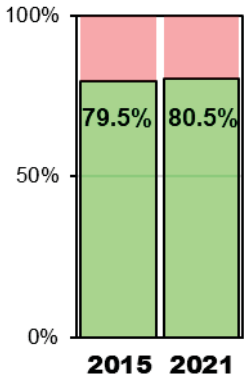
By September 2023 Hungary have not submitted full electronic reporting. Therefore, the assessment is based on the data mining of the pdf RBMPs.

Despite the cut off dates for the production of this report, reporting continued and, for the State of Water report, the EEA aggregated the results available by July 2024 in their products and dashboards available at WISE Freshwater web portal.

[4] https://biodiversity.europa.eu/countries/hungary

Changes in Status, Pressures, Exemptions & Measures

Surface Water Bodies (1072)	Trend (% good status/potential)	Main Pressures & Changes & Exemptions
ECOLOGICAL STATUS		All SWBs are under pressure from diffuse pollution of nutrients from agriculture (causing 84% of SWBs to fail good status) and hydromorphological pressures, and more than half of all SWBs are subjected to point source pollution and water abstraction. HU reports here that scarcity is due to increasing water demands (most abstraction by industry) and climate change impacts. A severe issue is illegal water abstraction for agriculture and domestic water supply. HU achieved a slight improvement in ecological status/potential since the 2nd RBMPs, reporting an increase in SWBs in moderate status and less SWBs in poor and bad condition. Some efforts to improve monitoring have been made, e.g. no more SWBs are in unknown status. Article 4(4) exemptions have been applied on the grounds of natural conditions, justified with a delay between measure implementation and their positive effects. Exemptions under Article 4(5) have been applied to several SWBs for technical feasibility.
CHEMICAL STATUS		The main reasons for failing to achieve good chemical status lies with a small number of uPBT substances, primarily polybrominated diphenyl ethers (PBDEs), mercury and to a lesser degree, perfluorooctane sulphonic acid (PFOS). Besides uPBT substances, primarily metals (cadmium, lead, arsenic, and nickel) which stem from heavy industry emissions and combustion processes, put pressure on SWBs. The percentage of SWBs in good status has not improved, However, the spatial and temporal scale of the monitoring network has improved significantly. SWBs in unknown status have been reduced and confidence of classification is high. Exemptions were applied to 43% of SWBs under Article 4(4) natural conditions, and to 12% under 4(5) for technical feasibility.

Ground Water Bodies (185)	Trend (% good status/potential)	Main Pressures & Changes & Exemptions
QUANTITATIVE STATUS		Water abstractions affect 100% of all GWBs, and water demand is reportedly increasing. Households and services make up 75% of groundwater abstractions, although HU has a significant issue with illegal water abstraction for agriculture and domestic supply. An additional pressure is put on groundwater bodies by the impacts of climate change (increased evaporation, decreased recharge). The quantitative status of HU's groundwater bodies has not improved since the 2nd RBMPs. HU applies exemptions under Article 4(4) for natural conditions to most failing GWBs. Article 4(6) has been applied to 8 GWBs due to lowering water tables because of climate change, and 4(7) to 4 GWBs for new modifications.
CHEMICAL STATUS		Main pressures and pollutants on GWBs are not explicitly reported, yet indication is given that point and diffuse pollution of urban, industrial, and agricultural origin affect groundwater bodies as they affect SWBs. Among this is untreated wastewater, nutrients from agriculture, urban run-off, and industrial wastewater, as well as sites of past contamination. While most GWBs are subject to chemical monitoring, there are gaps in monitoring methodology and implementation, e.g., some chemicals are not included. Thus, accuracy of the trend of slight chemical status improvement is uncertain. About 20% of GWBs fail to achieve good chemical status, and another 19% are at risk of falling to less-than-good status by 2027. Article 4(4) have been applied to 35 groundwater bodies (18.9 %) for natural conditions

2. Horizontal aspects

2.1 Governance

Hungary has designated the Hungarian Danube RBD and has prepared one single national RBMP and four sub-basin plans. Hungary registered a delay in the publication (19 May 2022) of the official government decision. Hungary has a multi-actor type of governance with multiple ministries responsible for water management, environment, nature conservation and climate. The Ministry of Interior had the task amongst others of preparing the River Basin Management Plan as well as the interaction with the European Commission.

Hungary has an overarching National Water Strategy, adopted in 2017. The RBMP was coordinated with the Floods Risk Management Plan (FRMP), the documents undergoing parallel processes of elaboration and revision. The RBMP addresses the links with the FRMP including also the analyses of the relationship of flood risk measures with the WFD. Coordination with the MSFD is mentioned only in connection with the implementation of the Urban Waste Water Treatment Directive to mitigate eutrophication[5] and reduction of plastic litter[6].

The entire territory of Hungary is located in the international Danube RBD. The Danube Basin level coordination is performed by an international River Basin Commission (International Commission for the Protection of the Danube River – ICPDR) to which Hungary is a contracting party. In addition, Hungary has bilateral agreements with all its neighbouring countries.

One initiative of Hungary worth mentioning here is that it is leading the recently started project "Development of a harmonized water balance modelling system for the Danube River Basin" aka "Danube Water Balance", financed by the Interreg Programme Danube Region (30 month). The aim of the project is to establish a robust water balance model as Danube countries proved to use different calculations and models. This is a great initiative that will help the Danube countries by providing the knowledge about the available water resources in the river.

It is also worth highlighting that the timetable, the work programme, the consultation plan for the RBMP, the overview of significant water management issues and the draft RBMP were submitted for consultation for six months, according to the WFD requirements. Moreover, the RBMP includes in an annex all comments received during public consultation and responses[7] concerning the draft RBMP. Only 38 % of all comments were considered in the final version either fully or partially and 12% were deemed irrelevant. Based on 217 comments (46 %), no amendment was necessary, or the proposed suggestion was already included in the plan.

[5] Source: Sub-section 2.4 of the 3rd RBMP (page 1662)

[6] Source: Table 3-1. Significant Water Management Issues (page 1674) and Table 8-17. Summary of Programme of Measures of the 3rd RBMP (page 1743)

[7] Annex10-3, https://vizeink.hu/wp-content/uploads/2022/10/VGT3/mellekletek/10_3_melleklet_VGT3_velemenyek_valaszok.xlsx

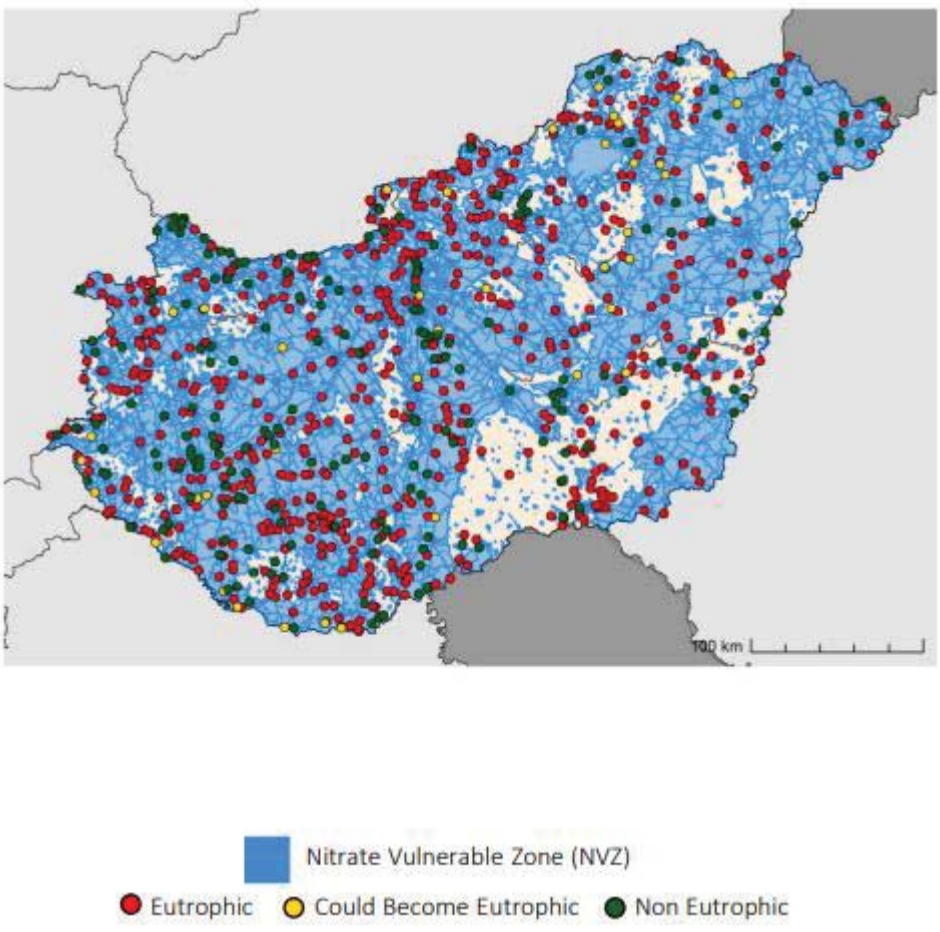
2.2 Characterization of River Basin District

Hungary has 1072 surface water bodies namely 886 rivers and 186 lakes. It is noted positively that reference conditions have been established for all lake and river types for all biological, hydromorphological and physico-chemical quality elements. Groundwater bodies are delineated based on geological characteristics. Out of the 185 groundwater bodies, 115 (62 %) have a significant relationship with surface water bodies.

Surface waters

In terms of pressure, diffuse pollution and hydromorphological pressures affect all surface water bodies while point source pollution and water abstractions constitute significant pressures for a majority of surface water bodies. Priority substances that are present in a large number of water bodies are mercury, cadmium, brominated diphenyl ethers, heptachloride, fluoranthene, most of them being persistent, bioaccummulative and toxic.

Figure 1 - Map of the monitoring points showing eutrophication assessment in Hungary, according to the reporting of the Nitrates Directive



Source: Joint Research Centre of European Commission (n.d.). JRC NITRATES DIRECTIVE - Reporting Period 7 (2016-2019) Trophic Status. [online] water.jrc.ec.europa.eu.
Available at: https://water.jrc.ec.europa.eu/portal/apps/dashboards/cb6034c2a75e4df282f8a62f90c16caa
Note : 0% of the monitoring stations are above the threshold of 50mg/l

Groundwaters

Abstraction pressures affect 100 % of groundwater bodies.

Hungary defines a significant pressure as one which exceeds the threshold value or emission limit specified in a water protection or environmental protection law, or has such a significant negative impact on the condition of water bodies and protected areas that it prevents good status or puts the achievement of good status at risk. If a water body is not at good status or potential, and the status is worsening or not improving according to the schedule, then the pressure causing the issue is considered significant.

To note, the invasive alien species (IAS) has not been found as a significant pressure on waters. Nevertheless, the RBMP foresee measures to prevent and manage the introduction and spread of invasive alien species in accordance with the relevant EU legislation. In total, there are 30 aquatic species of EU concern in Hungary[8].

3. Policy elements contributing to biodiversity and climate change adaptation

3.1 Surface Water: what is their ecological status or potential

All surface water bodies have been classified for ecological status or potential. This classification is based on both surveillance and operational monitoring[9]. Hungary uses grouping[10] if there is no monitoring present in a water body for measuring chemical quality elements (nitrogen, phosphorus, etc.). 96% of river water bodies and 76% of lake water bodies are classified using monitoring data. The rest of both categories are classified using expert judgement. The one-out-all-out principle is reported as having been used.

A very important change is the very considerable improvement in the knowledge of the status of the water bodies. The number of unknowns has sharply decreased, most strikingly for lakes and there are also no longer any water bodies (river or lake) with an unknown status.

Figure 1 depicts the evolution between the 2nd and 3rd RBMPs. For rivers, there are no water bodies in high ecological status or maximum ecological potential; There are only 12 % of rivers having reached good ecological status / potential, and almost two thirds of them being in “moderate ecological status / potential”, however these shares have increased compared to the previous cycle. For lakes, the number of water bodies in good ecological status / potential has slightly increased, and also a

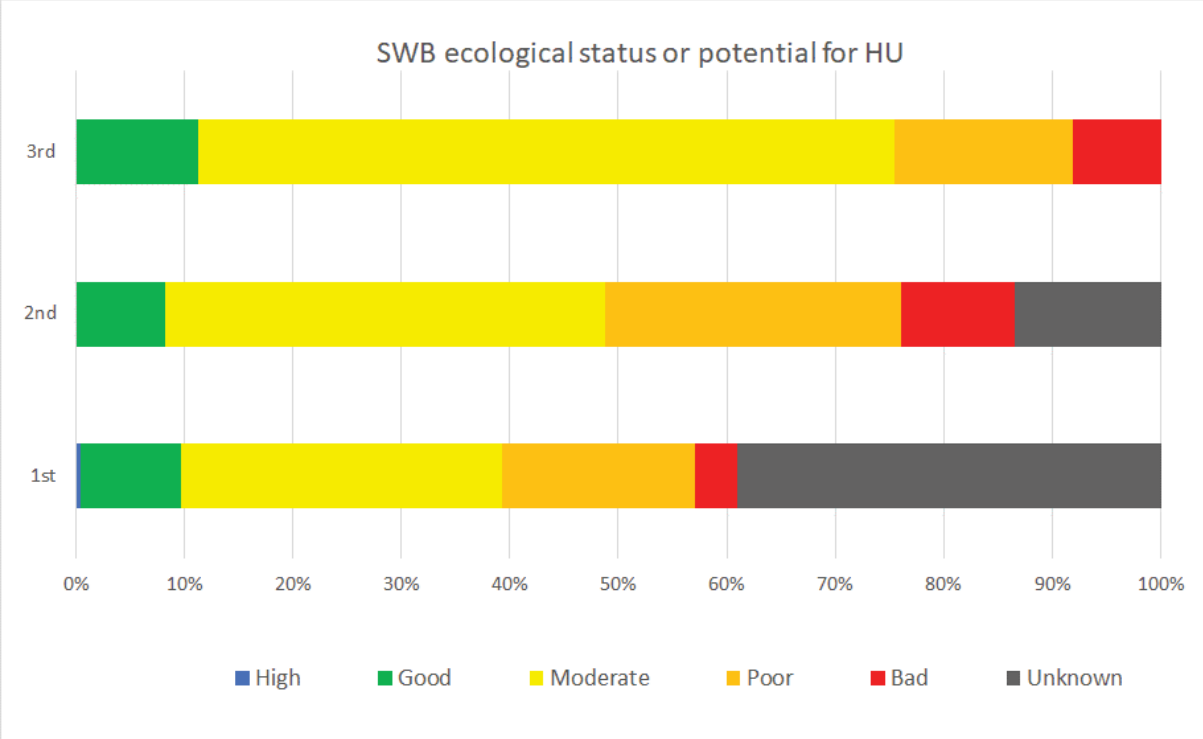
[8] EASIN - European Alien Species Information Network: https://easin.jrc.ec.europa.eu/easin/

[9] The WFD distinguishes between surveillance and operational monitoring: i) operational monitoring to determine the status and which covers all water bodies at risk and ii) surveillance monitoring aimed at identifying impacts and long-term changes

[10] Grouping of water bodies means using of monitoring data collected from another site, located on another body of water that presents the same typology, the same types, and the same magnitudes of anthropogenic pressures.

significant increase of moderate ecological status / potential can be seen. The percentage of lakes with high ecological status or maximum ecological potential decreased slightly.

Figure 2 - Ecological status / potential of surface water bodies in the 1st RBMP, 2nd RBMP and 3rd RBMP



Source: Data mining

Since no data is provided for the expected status of the surface water bodies by 2027, it is not possible to assess the gap in reaching good ecological status.

3.2 Hydromorphological changes and artificialization (HMWBs and AWBs)

The number of heavily modified river water bodies is very high and has even increased since the 2nd RBMP from 394 to 463 (41 % of all river water bodies). We see the reverse trend for lakes since that number has decreased from 124 to 123 (14.9 % of all lakes). According to the authorities, this is not due to a change in classification but rather an improvement of the data coverage. The methodology remained almost the same introducing the weighting of the different types of modifications depending on the biological sensitivity. Similar to the 2nd RBMP, the main uses are, for

- rivers: storage for fisheries, aquaculture, fish farms, and land drainage and irrigation for agriculture, although some uses are reported as unknown

- lakes: tourism, recreation, and flood protection.

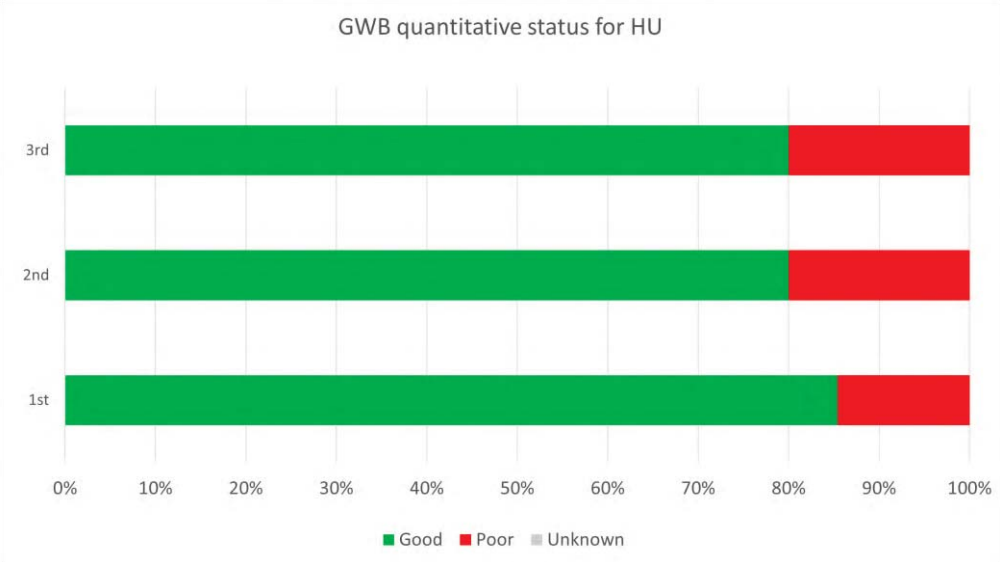
The main physical alterations of heavily modified water bodies are weirs and dams, channelisation and straightening of rivers, and bed stabilisation and bank reinforcement. It also includes inland waterway transport facility installations, tourism and recreational activities (beaches, fishing).

Good ecological potential is reported to be defined at water body level, based on the identification of mitigation measures. Good ecological potential was reported in the RBMP to be defined based on biological quality elements. Their Maximum Ecological Potential (MEP) and Good Ecological Potential (GEP) class boundary values were estimated by numerical modelling. According to information in the RBMP, the classification values for biological quality elements in Artificial and Heavily Modified Water Bodies are estimated based on monitoring data with the same methodology as for natural water bodies. The methodology takes into account the Biological Quality Elements (BQEs) most sensitive to hydromorphological alterations, namely benthic invertebrates and fish for rivers, and phytoplankton and phytobenthos for lakes. Information with respect to physico-chemical quality elements was not found in the RBMP. The comparison of GEP and GES has been included in the RBMP but only for macrophyte and macroinvertebrates.

3.3 Groundwater bodies - have they sufficient water – quantitative status

It is worth noting that all groundwater bodies are subject to quantitative monitoring in the 3rd RBMP, in some cases by grouping. As it was already the case in the previous cycle, 80% of groundwater bodies are in good quantitative and 20% of groundwater bodies are in poor quantitative status. This is indeed very high percentage of the groundwater bodies.

Figure 3 - Quantitative status of groundwater bodies in the 1st RBMP, 2nd RBMP and 3rd RBMP



Source: Data mining

Equally worrying is that there are 32 (17.3 %) groundwater bodies in good quantitative status for the moment but identified as being at risk becoming in poor status. This is a very considerable increase in this risk compared to the 2nd RBMP where 20 groundwater bodies (10.8 %) were identified at risk of being in poor quantitative status. This would lead to conclude that the pressures on abstractions are increasing and may hinder the achievement of the environmental objectives. The absence of reported causes to fail good quantitative status, leads to absence of knowledge about the possible related impact on associated aquatic ecosystems or depending terrestrial ecosystems.

In addition, it must be noted with some concern, that furthermore, illegal water abstraction from groundwater was estimated in the 2nd RBMP to reach 16 % of total water abstraction in the country while illegal water abstraction from surface water was not estimated.

Regrettably, no information could be found in the Hungarian River Basin Management Plan about Hungary's expectation in 2027.

3.4 Protected Areas (identification, monitoring, objectives and measures)

Hungary has several protected areas including Natura 2000 sites, nutrient sensitive areas, Bathing Waters and Drinking Water Protection Zones. There are no protected areas designated for economically significant species. Compared to the previous cycle, it can be noticed that there is almost no change related to protected areas apart from bathing places i.e. an increase is seen from 236 to 257 in the 3rd RBMP.

Table 1 - Number of water bodies associated with protected areas in Hungary

RBMP	Length (km)	Surface area (km²)		Number
	Natura 2000 rivers	Natura 2000 lakes	Nitrate sensitive area	Bathing water
2nd	6 900	1 047	65 278	236
3rd	6 900	1 047	65 048	257

In the 3rd RBMP, the Hungarian authorities mention the challenges encountered when designating new protected areas e.g resistance from the owner of the aquifer or the local municipality where the water body is located as e.g. it can conflict with further plans for development of the local areas.

The 3rd RBMP indicates that Hungary is succeeding in achieving and maintaining the good condition of water bodies by simultaneously fulfilling nature conservation goals. Protected areas are associated with about 90 % of the river water bodies and 70 % of lakes in Hungary.

Monitoring of protected areas is carried out in an integrated manner, e.g. monitoring sites for Nitrate Vulnerable Zones and operational monitoring points for nutrients under WFD are the same.

According to the RBMP, bathing waters had a total of 145 areas with excellent water quality with a further 45 having good or moderate status. There is no problem with lakes and smaller stagnant waters in terms of achieving the bathing water requirements.

Hungary did not report electronically to WISE at the time of this analysis and for this reason specific data on the status of surface and groundwater bodies associated with protected areas could not be further described.[11]

Additional objectives and additional measures have been established as follows:

1) for Drinking water protection areas, additional measures have been identified for drinking water abstraction points that serve 50 people or abstract more than 10m^3/day, i.e. a total of 58 none of which have any exemptions applied. A total of 863 areas have been identified as requiring additional measure for the protection of drinking water supplies;

2) Natura 2000 sites out of which about half of them have had article 4(4) exemptions applied. Two packages of key measures for the improvement of Natura 2000 areas have been identified. These measures above have been applied within a total of 107 Natura 2000 areas.

No additional measures have been identified within the RBMPs regarding Nitrate Vulnerable Zones and nutrient sensitive areas.

3.5 What is being done to prevent/reduce hydromorphological pressures

Significant hydromorphological pressures (e.g. dams) are reported for rivers and lakes and are assigned to specific sectors. Hydrological alterations are mainly related to aquaculture, agriculture and, to some extent, hydropower. Dams, barriers and locks are mainly related to flood protection, irrigation, urban use and recreation. Physical alterations are mainly related to flood protection, agriculture, urban development and to some extent navigation. To note, agriculture accounts for 55 percent of the country's territory in terms of land use, which is remarkable among EU member states[12]. The share of organic farming is around 6% of the total utilised agricultural area[13].

Information on systematic and periodical permit review of impoundment and abstraction was not found. A VIZIR database is in place that contains the register of physical modifications of water bodies, including barriers, has been developed since 2015 e.g. by VIZEK project (https://vizek.gov.hu/) digitalised the authorisation process.

Regrettably, the revision of e-flow values and the legislation in relation to water abstractions is in progress hence not yet in place. Also. the Integrated Water Resource Management Plan (IVOT) has not yet been published.

Natural water retention measures were reported as operational measures to tackle significant hydromorphological pressures, abstractions and diffuse pollution from urban run-off. These include soil erosion control measures and water retention in agricultural areas. Measures in relation to land drainage, soil erosion and sediment loads or compacted agricultural soils include pollutant and

[11] Hungary subsequently highlighted the information presented in its RBMPs on status of water bodies, including information on protected areas. Hungary reported an overview summary of the protected areas, including their status and relevant maps (page 1702-1706 of the RBMP)

[12] https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Agricultural%20Sector%20in%20Hungary%20Faces%20Structural%20Changes_Budapest_Hungary_HU2023-0010.pdf

[13] https://agridata.ec.europa.eu/extensions/IndicatorsSectorial/AreaUnderOrganicFarming.html

sediment deposition reduction using crop production technologies, soil erosion control by planting vegetation and landscaping (gully bunds, sediment barriers), water retention in agricultural areas to increase infiltration and reduce run-off and urban stormwater management.

3.6 What Hungary is doing for abstractions and water scarcity

Water abstraction is identified as a significant pressure at the RBD level, thus nationally. In addition, water scarcity is acknowledged as the most significant issue facing Natura 2000 habitats particularly the groundwater-dependent habitats and rivers, floodplain woodlands, marsh meadows, hardwood forests, mudflats and natural riverbanks. However, no definition of water scarcity has been developed in the RBMP. As noted in the European Drought Observatory for Resilience and Adaptation (EDORA) project, 12 general water scarcity / drought management plans have been prepared by Hungary, covering the areas of the 12 regional Water Directorates (VIZIG).

There have been no significant changes in the way the WFD is implemented in Hungary regarding water abstraction and water scarcity management since the 2nd RBMP despite the increasing risk identified for certain water bodies to turn to bad quantitative status. Indeed, as mentioned earlier, just as in the previous cycle there are 37 groundwater bodies in poor quantitative status (i.e., 20 % of total groundwater bodies) but there is a higher number of water bodies at risk of failing to achieve good status.

There are authorisations/permitting/concession regimes in place, as well as registers for both abstraction and impoundment. However, water abstractions from surface water or groundwater do not require registration, if they do not exceed 500 m^3 per year. Permits are generally issued for a period of time established by the relevant authorities. Permits can be refused or revised under specific conditions, in order to maintain or achieve the environmental objectives in the RBMP.

The 3rd RBMP states that water demand is increasing and refers to various users of water, providing the shares between consumptive uses, but not the relevant trends over time. It is noted that industry (including energy) takes up 82 % of total surface water abstraction, whereas households and services take up 75 % of groundwater abstraction and agriculture 2 % of total groundwater abstraction. The 3rd RBMP mentions that the main estimation method is direct measurement / monitoring, including mandatory water metering for surface water and groundwater abstractions. However, a significant volume of abstraction might be unaccounted for since Hungary reports that there is a serious problem of illegal water abstraction for agriculture and domestic water supply. This is also confirmed by a study done by Hungarian Centre for Ecological Research[14] that states that a very high proportion of groundwater abstractions is illegal with only 10% of the wells being officially authorized.

It is worth highlighting that the Plan explains that the legislation was amended in 2016 to prevent and minimise illegal groundwater abstraction and to introduce a more encouraging water price policy over exploited water bodies. The VIZEK Framework website (https://vizek.gov.hu/) was developed to support the electronic authorization process ("Manage your water law matters electronically!"), thus also supports the development of electronic data management. However, the underlying legal

[14] https://mta.hu/data/dokumentumok/Viztudomanyi%20Program/Hungarian%20Water%20Research%20Programme%20Challenges%20and%20Resesarch%20Tasks%202019.pdf

framework to underpin this digitalisation seems to be under development based on a national integrated water resource management plan.

Regrettably, taking into account that 20 % of the groundwater bodies are in poor quantitative status without any progress since the 2nd RBMP, coupled with a large volumes of illegal water abstractions, it would appear that the existing framework and its enforcement is insufficient. In addition, most of the measures planned in the 2nd RBMP have not been implemented and, thus, have been reintroduced in this cycle with few new measures included.

3.7 Adaptation to climate change

Hungary has recorded droughts in the following years: 2003, 2015, 2018, 2022, with impacts that have affected crop and livestock production, inland waterway navigation and public water supply. [15] The European Drought Atlas projects that as a result of 1 in 50-year drought events, a resultant reduction in the transport of goods of 10-20 % will occur.[16]

It is worth highlighting that Hungary developed and adopted in 2019 a Drought Management Plan along with specific drought indicator including a range of drought mitigation measures. However, no details on the projected impacts of these measures have been provided, nor how these interlink with water scarcity management areas.

Climate change adaptation measures are included in the RBMP. The measures are categorised based on their relevance to climate change mitigation and adaptation outlining if they have a direct / indirect effect, and prioritising measures identified as 'significant importance' e.g. land conversions (nature-based solutions such as reinstatement of natural floodplain), modifications of water allocations to meet ecological needs, and water management practices to rehabilitate surface – and groundwater connectivity. All measures included in the RBMP are assessed based on their relevance to climate change, . The assessment[17] is based the EU 'Non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient'[18].

Hungary has stated publicly that it is envisaging irrigation development as an adaptation measure for maintaining competitiveness in agriculture. However, considering the issues with over and illegal abstractions of water for agricultural uses, it will be important for Hungary to develop comprehensive measures to develop a water resilient, and water efficient agriculture and not just rely on expanding irrigation. Without a change of practices this may lead to maladaptation, creating even more dependency on increasingly unreliable rain and river flows.

As regards floods, flooding is a common occurrence in Hungary, with climate change exacerbating the issue. The Floods Directive requires to consider the impacts of climate change on the occurrence of floods, and therefore in the preparation of Flood Hazard and Risk Maps (FHRMs) and Flood Risk Management Plans (FRMPs). More information on these can be found in Section B. However,

[15] Blauhut and Stahl (2023) Drought Impact Database, Deliverable 1.4, Confidential report.
[16] Rossi et al., (2023) European Drought Risk Atlas.
[17] Conducted in the RBMP Background Material 8-3 document- Climate Risk Assessment regarding the PoM

[18] EC DG CLIMA (2011) Non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient. Available at: https://climate-adapt.eea.europa.eu/en/metadata/guidances/non-paper-guidelines-for-project-managers-making-vulnerable-investments-climate-resilient/guidelines-for-project-managers.pdf

considering the close relationship between overall water management and floods management and the importance of climate change on both, consideration climate change are jointly addressed in this section.

Since the first FHRMs, Hungary carried out an extensive trend analysis of the long term measured hydrological data series and stated in its reporting that the impact of climate change was taken into account by extrapolating the measured hydrological data to future periods.

The second FRMP has a chapter providing detail on the impacts of climate change, including how it was addressed in the new projects. The FRMP refers to Hungary's second National Climate Change Strategy. Moreover, it provides an analysis of flash flood risks in the context of climate change. The FRMP indicates that climate studies project new flood extremes, with a 20 % increase in flood damages in this century along larger and medium-sized rivers in Hungary, referring to a 2010 project that studied climate change impacts. The plan provides detailed information on flash flood risks. The FRMP provides further information in terms of the effects of climate change, and in particular flash floods, on small watercourses and mountainous and hilly areas where climate change is expected to increase the frequency and intensity of extreme weather phenomena.

4. Policy elements contributing to zero pollution

4.1 Surface Water: what is their chemical status

Monitoring

In the 3nd RBMP, it should be noted positively that monitoring in rivers has increased from 651 water bodies to 812 water bodies (representing 92 % of all river water bodies). Similarly, the monitoring in lakes has increased from 77 water bodies in the 2nd RBMP to 111 water bodies in the 3rd RBMP (60 % of all lake water bodies). Grouping has been used to classify the remaining water bodies where monitoring was not undertaken.

Hungary does not have any coastal or territorial waters being a land-locked country. It does however have transboundary waters. As mentioned earlier, Hungary is a member of the International Commission for the Protection of the Danube River (ICPDR). Monitoring to support the transboundary aspects of the Danube is reported at the ICPDR level. The 3rd RBMP states that monitoring has been completed at a frequency compliant with the WFD. This means that monitoring in surface water (both rivers and lakes) has been undertaken on a monthly basis for at least one full year in every six-year reporting period.

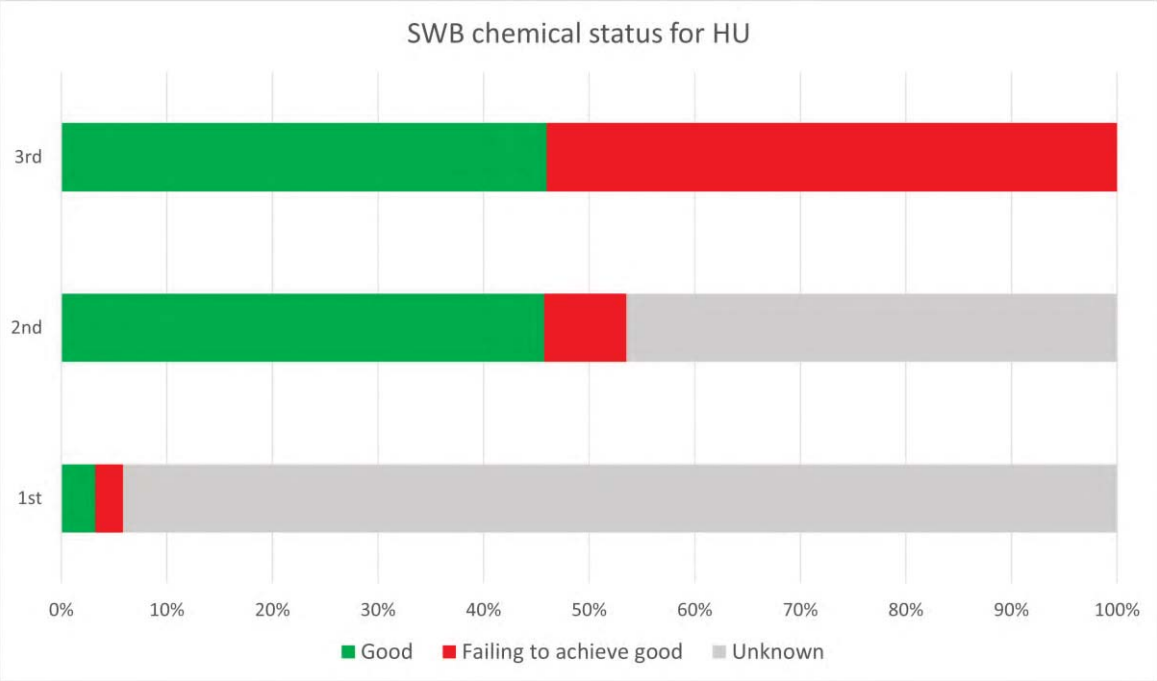
46 substances[19] are included within the routine monthly monitoring as an expansion of previous monitoring rounds under the 2nd RBMP.

It is noteworthy that in the 3rd RBMP, there is no more water body in "unknown" status. According to the 3rd RBMP, 46 % of the total number of water bodies are in good chemical status. If the Persistent, bioaccumulative and toxic (PBT) substances were to be excluded, 79 % of rivers (703 water bodies) and

[19] Note the RBMP does not indicate which substance is the additional one beyond the 45 substances included in the EQSD.

80 % of lakes (150 water bodies) would be in good chemical status. This reflects that a small number of PBT substances (polybrominated diphenyl ethers, mercury, polyaromatic hydrocarbons, perfluorooctane sulfonic acid and its derivatives and heptachlor and heptachlor epoxide) and non-PBT substances (arsenic, but also cadmium, lead, and nickel, along with the hydrocarbon fluoranthene) cause significant number of water bodies to fail in achieving good chemical status. Regrettably, no information could be found in the Hungarian River Basin Management Plan about Hungary's expectation in 2027.

Figure 4 - Chemical status of surface water bodies (SWBs) in Hungary in the 1st, 2nd, and 3rd RBMPs



Source: Data mining

4.2 Groundwater Bodies: what is their chemical status

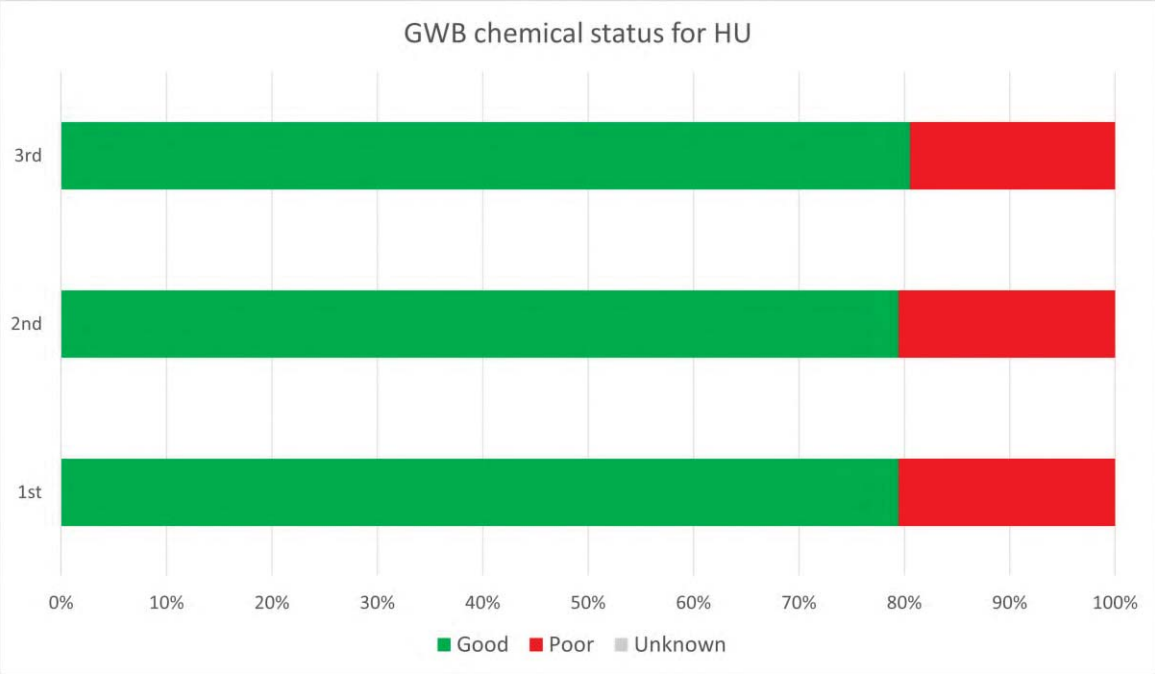
Similarly to the 2nd RBMP, the total number of delineated groundwater bodies in Hungary is 185 clustered in 66 groups of groundwater bodies (based on geochemical indicators). However, 2 groundwater bodies have been re-delineated and classified as transboundary in the 3rd RBMP. All groundwater bodies are subject to chemical monitoring in the 3rd RBMP, in some cases by grouping.

The assessment of the general chemical situation of a groundwater body is conducted with two different methods, depending on the type of the monitoring site. For drinking water monitoring sites, the assessment is based on the proportion of the total volume of groundwater represented by monitoring sites exceeding a groundwater quality standard or threshold value compared to the total

volume of the whole groundwater body[20]. For other monitoring sites, the assessment is based on the number of monitoring sites exceeding a groundwater quality standard or threshold value[21].

In the 3rd RBMP, 81% of groundwater bodies are in good chemical status revealing a very slight improvement compared to the previous cycle. Moreover, there are 20 (10.8 %) groundwater bodies which are now in good chemical status but identified as at risk of being in poor status. Regrettably, this is a slight deterioration trend since in the previous cycle the number of water bodies at risks was 17 groundwater bodies (9.2 %). The top pollutants causing failure to achieve good chemical status of groundwater bodies are nitrates (25 groundwater bodies) and sulphates (9 groundwater bodies). Moreover, the top pollutants showing sustained upward trends in groundwater bodies are nitrates, ammonium and sulphates. Regrettably, no information could be found in the Hungarian River Basin Management Plan about Hungary's expectation in 2027.

Figure 5 - Chemical status of groundwater bodies (GWBs) in Hungary in the 1st, 2nd, and 3rd RBMPs.



Source: Data mining

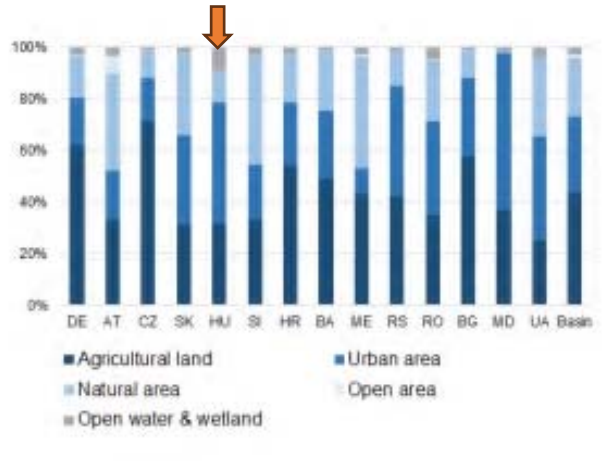
4.3 What Hungary is doing to combat pollution from agriculture

Agricultural pressures have been identified as significant in the 3rd RBMP. The international RBMP for Danube includes assessments of nutrient loads including considerations of the agriculture shares as can be seen in the figure below.

[20] If the volume of groundwater representing exceedances is over 3.5%, then the groundwater body is assessed in poor chemical status.

[21] If there are more than 3 monitoring sites with exceedances in a groundwater body, then the groundwater body is assessed in poor chemical status.

Figure 6 - Share of sources in the overall Total Nitrogen emissions in the Danube countries for the reference period (2015-2018)



Source: Danube River Basin Management Plan Update 2021

However, while the Plan mentions nutrient loads and references to model-based assessment, no details are given on the necessary quantified nutrient load reduction to achieve the environmental objectives, nor the part attributed to agriculture. These quantified gap analyses miss for pesticides too.

While the planned measures correspond to identified pressures, without some knowledge about the gap to target, it is difficult to ascertain if the measures would be sufficient. The expectations about the effectivity of the agricultural measures are uncertain: A reduction of the load of phosphorus could be expected while the trends for nitrogen is uncertain. The expectations around pesticide pollution are not reported.

The Nitrate Directive is a basic measure under the Water Framework Directive. Therefore implementation of basic measures[22] for the control of diffuse pollution from agriculture at source is mandatory in Nitrate Vulnerable Zones and voluntary under the Hungarian Agro-environmental Programme. The majority of listed measures are mandatory measures under existing legislation. The implementation of basic measures covers microbiological, nitrate, organic, pesticide, phosphorus and sediment pollution. Only one measure is specifically mentioned to be voluntary (i.e. *Pesticide use in accordance with voluntary environmental conditions*). Many of the agricultural measures are ongoing measures that continue through several cycles. 2027 is the deadline for the implementation of all measures.

Measures of the 3rd RBMP aim at reducing soil degradation and efficient nutrient management. The RBMP describes the relevant measures covering the mix of basic and supplementary measures. The details of the measures are elaborated (aim, methodology, financial backing, future indicators). There is only an indication of the number of water bodies that will be impacted by the measure and nothing about the size of the agricultural areas impacted, or the amount of water area or length impacted nor the estimated and quantified effectivity. Regrettably, the Hungarian RBMP does not include clear reference to the international Danube RBMP and how the measures will contribute to the achievement of the overall nutrient reduction targets.

[22] See Article 11(3)(h) of the Water Framework Directive

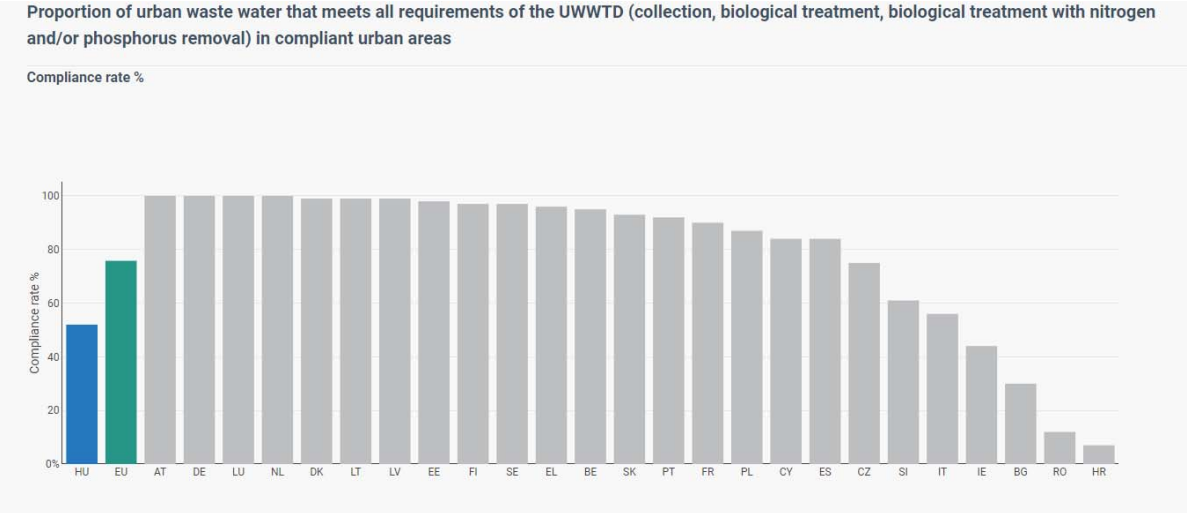
Hungary refers to the Rural Development Programme 2014 - 2022since the size of agricultural areas affected by water protection exceeded 1,600,000 hectares and concluded that there is synergy between goals in the CAP Strategic Plan 2023-2027 and the RBMP. All agricultural measures are financed and co-financed by the CAP[23]. Unfortunately, only a small improvement in the state of water can be seen until 2022 despite the fact that the measures of the 2nd RBMP should have had a much greater effect based on their surface of land on which they are applied.

4.4 What Hungary is doing to combat pollution from other sectors

The 3rd RBMP addresses chemical pollution in general terms. Hungary covers both point source and diffuse pollutions for each sector with basic and / or supplementary measures. These include preventative measures and mitigating ones. While in principle all drivers are subject to measures, it is not possible to assess the expected level of progress.

The RBMP includes measures on point sources from urban wastewater treatment plants and industrial wastewater treatment plants. The assessment of several indicators showed a delay in the application of measures, with only 6% of the budget allocated to finished projects and the other projects still ongoing or having to start. Decontamination projects were postponed due to their large costs and volumes. For nutrients, there is information on the measures that will be taken per water bodies and point sources, however, nothing related to how much the planned measures are likely to achieve. There is a strong focus on updating the discharge permits for both industrial and municipal wastewater treatment plans. This is very welcome since, as shown in the Figure 6, only 52% of the urban wastewater meet all the requirements of the Urban Waste Water Treatment Directive. Also, more monitoring is included as a measure to improve the knowledge base.

Figure 7 - Proportion of urban wastewater that meets all requirements of the UWWTD



Source: UWWTD country profile, WISE Freshwater portal

Hungary provided more targeted information on basic measures required under Article 11(3) (c to k). Use of an authorisation and / or a permitting regime to control wastewater point source discharges (Article 11(3)(g)) was reported for surface and groundwater. A register of wastewater discharges

[23] Mapping and analysis of CAP strategic Plans (2023 – 2027) Mapping and Analysis of CAP Strategic Plans - European Commission (europa.eu)

(Article 11(3)(g)) is available for surface and groundwater. Small wastewater discharges (<15 m^3 / business day) are exempted from controls and some direct discharges to groundwater are authorised in accordance with Article 11(3)(j).

Unfortunately, the RBMP does not provide any information on the pollution reduction expected by implementing the above measures.

4.5 What Hungary is doing to combat significant pressures – overall assessment of the Programmes of Measures

Key issues identified in Hungary are: 1) Agriculture: reducing nutrient pollution and irrigation abstraction demand; 2) Urbanisation: wastewater treatment and other diffuse pressures; 3) Flood Protection: hydromorphologiocal pressures on rivers; 4) Sustainable use of thermal waters: for recreation, heating and agriculture; 5) Reduction of hazardous substances emissions: in industry, agriculture and wastewater and also 6) impacts of climate change.

Hungary performed a prioritisation of the measures prior to their selection. Hungary's first priority is the implementation of the basic measures under the WFD, followed by the additional basic measures (i.e. regulatory measures to achieve the objectives of Art. 11(3) of the WFD). In Hungary, all basic and supplementary measures are mandatory. The rationale for the prioritisation was to favour measures targeting the prevention of deterioration of status. As such when selecting measures, their relevance and effectiveness were assessed as most important and on a water body basis.

In total, there are 127 national basic measures and 55 national supplementary measures. The reported significant pressures are well covered with operational KTMs in Hungary, whereas all the KTMs have been assigned to measures, with the addition of six new measures.[24]

Regrettably, Hungary did not provide quantitative gap indicators on the expected gap to good status for 2027, although all pressures have been clearly linked to their measures.

5. Exemptions and economics

5.1 To what extent are exemptions applied in Hungary

Hungary makes a considerable use of exemptions.

Article 4(4) exemptions (time related exemptions which can be applied on grounds of technical feasibility, disproportionate costs or natural conditions)

All Article 4(4) exemptions have been justified on the grounds of natural conditions.

[24] KTMs 26-31 (Managing heat loads; Modernisation and regulation of infiltration and recirculation; Protecting damaged protected aquatic, wetland and terrestrial habitats from impacts on water flow, in addition to other measures; Protection of damaged protected aquatic, wetland and terrestrial habitats from impacts on water quality, in addition to other measures; Specific measures to protect bathing sites; Prevention of accidental pollution)

The exemptions for quantitative groundwater body status under Article 4(4) have been applied to 33 groundwater bodies (17.8 %), while exemptions for chemical status have been applied to 35 groundwater bodies (18.9 %).

The exemptions for chemical status under Article 4(4) have been applied to 461 surface water bodies.

Hungary invokes exemptions for ecological status / potential under Article 4(4) WFD for surface waters, due to the following pressure: urban wastewater, industrial and other point sources; diffuse pollution, hydromorphological pressures and river basin specific pollutants.

Article 4(5) exemptions (lowered objectives)

These exemptions have been applied on grounds of infeasibility with information provided at the water body level. They have been applied to:

13 surface water bodies for ecological status / potential and 66 water bodies for Specific Pollutants (chromium); and

126 surface water bodies for chemical status (PAH and fluoranthene)

Article 4(6) exemptions (temporary deterioration)

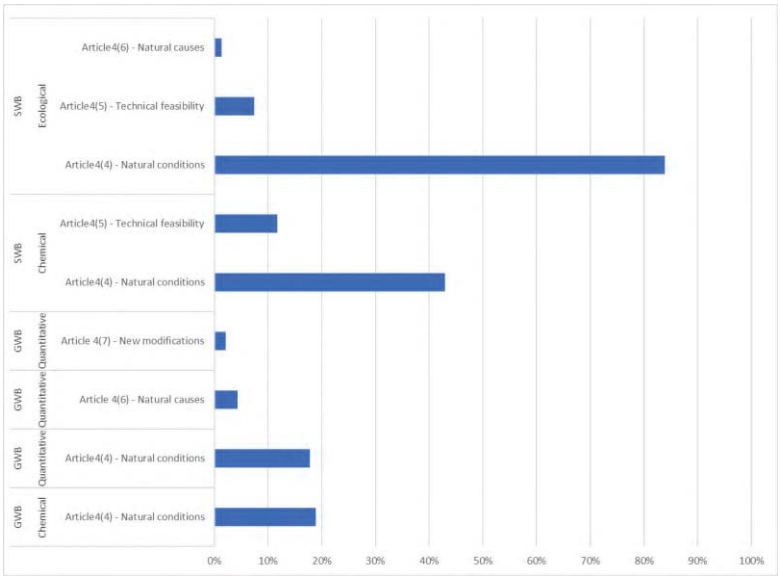
They have been applied in the Tisza sub-basin for reason of prolonged drought to 15 surface water bodies (11 rivers and 4 lakes) and 8 groundwater bodies. A national study on the water resources of Hungary for the 1981-2020 period was conducted, determining (inter alia) the changes in hydrology and hydromorphology during the monitoring period used for the 3rd RBMP. The analysis identified surface water bodies where the water stock decline was greater than 20 %, and where the hydrological status assessment (within the WFD hydromorphological status assessment) did not reach good status. Where this combination was met, an exemption under Article 4(6) of the WFD was applied. The study may be used for justifying the exemption subject to it being ascertained that the registered water stock declines were only attributable to exceptional and not reasonably foreseeable circumstances. However, it is expected that, for the future and taking into account the results of this study, the pressure on relevant water bodies and the risk of more frequent and severe drought and the long-term trends linked to climate change are taken into due account as they now pose a systemic challenge and require adapted measures to be taken.

Article 4(7) exemptions (deterioration or prevention of achievement of good status/potential as a result of new modifications or new sustainable human development projects)

They have been applied to 4 groundwater bodies in the Nyírség eastern edge and the Nyírség – Lónyay main canal catchment (quantitative status). It must be highlighted that no exemptions under Article 4(7) were applied in the 2nd RBMP.

Figure 7 summarises the percentage of water bodies subject to each type of exemption (and reason).

Figure 8 - Type of exemptions reported to be applied to surface water and groundwater bodies for the 3rd RBMPs



Source: Data mining

5.2 Use of economic analysis and water pricing – cost recovery

The RBMP provides a summary of the economic analysis and the implementation of WFD Article 9. The economic analysis covers most analysis elements as listed in WFD Annex III, but there is scope for improvement. As regards the long term forecasts of water demand and supply, the emphasis is on a "socio-economic forecast" until 2027, thus not long term, with the aim to identifying the driving forces underlying the changes in water status and water consumption.

The investments, their costs and financing are specified in an Annex to the RBMP, but there doesn't seem to be a clear comprehensive overview of the investments, in particular for those after 2027. The economic analysis also lacks assessments of the most cost-effective combination of measures.

Water services are clearly identified in the RBMP at the hand of Hungary's legal definition in place since the 1st RBMP[25] namely: 1. Public water supply; 2. Urban wastewater services; 3. Agricultural water supply (irrigation, fish farming, fishing, other); 4. Discharge and storage for hydroelectric power generation; and 5. Water abstraction for own use. Financial cost recovery rates have been calculated for these water services at national level.

Importantly, the RBMP does not seem to report on water uses aside from water services. This directly implies that Hungary does not provide an account on whether the contributions of the various water user sectors (agriculture, industry households) can be considered adequate. .

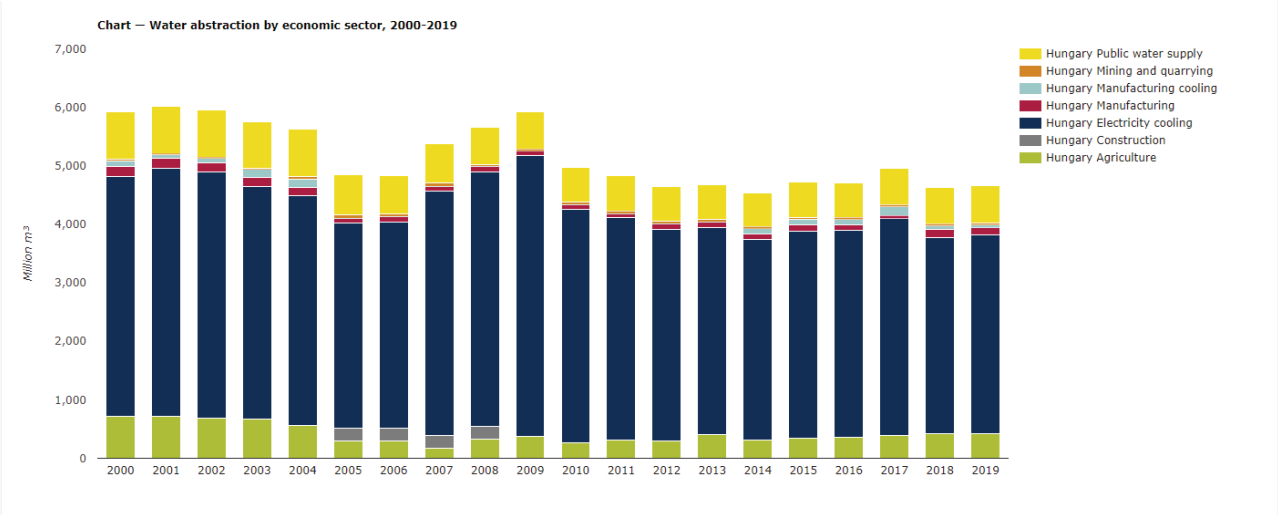
Financial cost recovery rates have been provided at national level for the various water services (except self-abstraction) together with the underlying costs and revenues, but only one for water supply and sanitation services together, and for hydropower without a clear specification of the underlying costs. Capital costs are reported for the former, but the presence of subsidies aimed to provide debt relief to

[25] Act LVII of 1995

water sector entities and also substantial grants in the funding of water utility investments (both reported in some detail), may have complicated the definition of capital costs and hence the interpretation of the reported cost recovery rates.

The RBMPs provide further qualitative information on subsidies, including directly on the provision of water services, allowing setting water tariffs below cost break-even level. The RBMP states that about two third of the revenues of water utilities come from end users. The support scheme to agricultural water users has been reformed in 2017. The blanket payment exemption (in force since 2014) was replaced by subsidies covering less than full costs, but still considerable, namely on average about three quarters of the "basic costs" and about half of the variable costs. A large part of these subsidies take the form of a price exemption granted to the smaller irrigation water permits. The RBMP does not provide a clear explicit account of the rationale of the subsidies, i.e. linking it explicitly to the mitigation factors and explaining sufficiently clearly the extent of the 'established practices" clause.

Figure 9 - Water abstraction by economic sector in Hungary between 2009 and 2019,



Source: EEA Wise (using Eurostat data, but also OECD and own data) as Eurostat data are not available for all economic sectors in all MS [1].

An overview of water tariffs is provided for the three broad water users sectors, namely households, industry and agriculture (including irrigation, fishing lakes and rice production) There is a flat unit rate in place for all consumption levels set by the various water service provides thus allowing geographical variation related to costs differences (albeit possibly dampened by subsidies). In contrast to this qualitative information, the RBMP provides quantitative information on the structure and rates of water abstraction (called water resource charge) as well as pollution charges.

[1] Conventional statistic abstraction data of Eurostat, EEA and OECD exclude water disappearing after abstraction via leakages or evaporation from the surfaces of reservoirs and canals. Leakage and evapotranspiration losses can however be significant in Member States with many reservoirs and/or older distribution systems, as is illustrated by French data. Page 14, French analytical note on total water consumption (incl. evapotranspiration and losses) adding up to 54.000 million m^3 abstracted, instead of 30.000 million m^3 used: https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-2024-na_136_enjeux_et_usages_de_leau_avril.pdf

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The RBMP only provides a general assurance that the actual pricing policies in place provides adequate incentives to use water efficiently. However, the provided information suggests that the current price policies provide some incentives for a more efficient water use, but unevenly so over the water user sectors and also dampened by substantial subsidies In particular, while pricing has been introduced for the water uptake in the agricultural sector, overall there still appears room for improvements.

The RBMP indicates that Hungary has a national methodology in place for the assessment of environmental and resource costs (ERC) , and it reports quantitative estimates for environmental and resource costs separately. Specific data or capacity problems are not mentioned in RBMP, but neither the use of dedicated economic and environmental model(s) of water economy. It is not fully clear how the calculated ERC have informed the rates of the pollution charges.

There is some quantitative information on the structure and rates of water abstraction (called water resource charge) and pollution charges, for two water user sectors (households and industry) and for water utilities (water supply and sanitation services), but it is not fully clear how the calculated ERC have informed the rates.

However, the RBMP presents a detailed account on the application of the Polluter Pays Principle, namely that i.e. a water load fee is paid by all polluters discharging into water, including water utilities that pass the water load fee to final/end consumers. The amount of the water load feed is determined by the weight expressed in natural units of the total amount of the pollutant emitted each year, the unit fee for water pollutants, the area sensitivity factor, and the sludge disposal factor.

In terms of subsidies, the RBMPs reported subsidies aimed at water users and subsidies provided as debt relief to actors in water sector. It has to be highlighted that for the agriculture sector, from 2017, there has been a significant alteration in the support scheme. In accordance with the established practices, the approach of providing agricultural water for free (payment exemption), which had been in effect since 2014, has been abolished. Regrettably, even though agricultural water uses were in principle subject to the obligation to pay a water resource charge, exemptions were introduced at the same time e.g. no water resource charge will be payable "for irrigation water use, for the amount of water per hectare per water right permit not exceeding 400,000 m^3 per year". This has substantially reduced the payment of the water resource charge for water used for agricultural irrigation.

6. WFD recommendations

Recommendations - Hungary should:

1. Increase the level of ambition and accelerate actions to reduce the compliance gap as much as possible until the next reporting cycle i.e. by 2027. This implies:

    a. Tackling obstacles identified in the implementation of measures such as administrative capacities and resources;
    b. Design and implement robust and proportionate measures to address water abstraction including illegal abstraction and water scarcity issues. For example, consider revision of the existing concession, authorisation, and / or permitting regime to control surface and groundwater abstractions, as well as its

enforcement. Unauthorised water abstraction from both surface water and groundwater bodies should be tracked and addressed effectively.

2. Increase investments and ensure adequate funding including implementation of cohesion funding to effectively implement the Programmes of Measures to reach the objective of the WFD by e.g. developing long – term investment plans and clearly identifying the source of financing for implementation of all measures in particular related to wastewater treatment and decontamination of sites.

3. Identify and put in place additional measures to reduce existing persistent environmental challenges (pressures) preventing the achievement of good status. This implies for example:

    a. the measures show concretely the expected results to achieve the objectives set for each water bodies;
    b. reduction of nutrients and other chemical pollution including setting of nutrient loads to achieve the objectives of WFD and Nitrates Directive.;
    c. Stepping up efforts for the implementation of all necessary restoration and mitigation measures by especially prioritising nature-based solutions;
    d. For Heavily Modified Water Bodies, Hungary should provide an economic or other analysis to assess the beneficial objectives served by other means which are a significantly better environmental option;
    e. The mitigation measures shows exactly how their implementation improve the status of the various BQEs;
    f. Hungary should continue its efforts to implement and report hydro morphological measures for all water bodies affected by hydro morphological pressures also to meet international commitments to remove obstacles to river continuity. Given the importance of the hydro morphological pressures to cause failure in ecological status in Hungary mitigating measures should receive priority attention wherever possible.

4. In the light of the water scarcity challenge experienced by across the EU, Hungary should:

    a. Proactively establishes an explicit link between the implementation of e-flows and the authorisation process and / or review of permits to control water abstractions and impoundments, also considering further impacts from climate change;
    b. Enhance the international cooperation on water abstraction and water scarcity considering the climate and socio-economic changes in the Danube;
    c. Give information on how the projected impacts of drought including an analysis of climate change impacts on existing pressures at water body-level are assessed;
    d. Take effective measures to promote water reuse;
    e. If/when planning new dams or reservoirs, carefully assess their environmental impacts, including as regards the objectives of the WFD and ensure that such interventions are part of coherent water resilience strategies, which, amongst others, duly considers long-term climate scenarios.

5. To more effectively achieve the objectives of the WFD, Hungary should further enhance transboundary cooperation in particular:

a. Delineation and characterization of the water bodies as well as status assessment methodologies (e.g. commonly agreed reference conditions for biological quality elements);
b. Clear explanation should be provided on how the Hungarian RBMP contributes to addressing the MSFD's objectives and the overall coherence in the implementation of the WFD and MSFD (under the cooperation carried in the international RBMP) and also to the achievement of the Danube nutrient reduction targets;
c. Harmonisation efforts
    i. towards a better comparable assessment of significant morphological alterations;
    ii. between data on significant hydromorphological pressures on national and international level and data reported on implementation of hydromorphological measures.

6. On the use of economic tools, Hungary should:

    a. consider re-evaluating its pricing policies so that to provide incentives for a more efficient water use;
    b. continue to present transparently how financial, environmental and resource costs have been calculated and how the adequate contribution of the different users is ensured;
    c. to continue to transparently present the water-pricing policy and provide an overview of estimated investments and investment needs.

7. As regards monitoring, assessment, data management and reporting Hungary should:

    a. Further strengthen the application of the national methodology to define significant pressures, across RBDs, and limit reliance on expert judgement;
    b. provide detail information on the inventory of emissions, discharges and losses and particularly links to the pressure assessment;
    c. provide details of the substances are discharged into water and are included in the monitoring program;
    d. include the trend analysis as a result of long-term surveillance undertaken in biota and sediments
    e. improve the groundwater chemical status assessment methodology, including coordination of threshold values with neighbouring countries; details on how the baseline levels for substances, which occur both naturally and from anthropogenic sources are considered as part of trends assessment; details on how upward trends are distinguished from natural variation with an adequate level of confidence and precision;
    f. maximise the efforts to ensure electronic reporting of WFD data to facilitate comparison between implementation cycles and allow for easier monitoring of progress in reaching the objectives of the WFD;
    g. continue the efforts to transparently justify every exemption;
    h. ensure that all measures necessary for achieving good status or potential by end of 2027 are identified and initiated (implemented) during this cycle, to avoid unjustified time exemptions beyond 2027 (i.e. other than exemptions based on natural conditions) or an unjustified conversion to Article 4(5) exemptions in 2027 (i.e. other than based on objectively established disproportionate costs/unfeasibility after identification of all measures necessary to achieve good status);

i. Ensure a proper implementation of Article 4.7 in relation to all projects potentially deteriorating status of water bodies (also if this would only be temporary).

SECTION B:

FLOODS DIRECTIVE

7. Flood risk management under floods directive (FD)

The Directive requires each Member State (MS) to scan its territory for flood risks, assess the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity, identify the significant risks, map the flood extent and the potential adverse consequences, and take measures to reduce the flood risk. These activities are reflected in (a) the preliminary flood risk assessments, or PFRAs (including the identification of areas of potential significant flood risk, or APSFRs), (b) the preparation of flood hazard and risk maps, or FHRMs, and (c) the establishment of flood risk management plans, or FRMPs. The preliminary assessments, mapping and planning for flood risk are repeated in six-year cycles.

There is one Unit of Management (UoMs) in Hungary, which is the same as the Water Framework Directive's River Basin Districts (RBD). Fluvial, pluvial, and groundwater floods are considered as potentially significant sources of flooding in Hungary. Hungary designated 419 Areas of Potential Significant Flood Risk (APSFRs). The impacts of climate change on flood risk have been considered in Hungary at the time of the second preliminary flood risk assessment. There is an extended summary on how climate change issues were taken into consideration including the update of the climate scenarios, what internationally recognized climate models were adopted and used to model temperature, precipitation, etc. climate parameters and how these will impact the hydrological and drought processes in the 2021-2050 and 2071-2100 periods.

7.1 Flood hazard and risk maps

At the time of the first PFRAs Hungary identified two APSFRs. For the second FHRMs information for 23 APSFR was reported in EIONET, which is far less than the 419 APSFRs Hungary reported at the time of the second PFRAs. In the first FHRMs Hungary included fluvial and groundwater floods, not directly related to APSFRs. In the second FHRMs fluvial and groundwater floods are mapped on the basis of eight planning unit areas (which it is not clear how they compare to the APSFRs).

Hungary is using a website which includes PDF format FHRMs[26], as a result it is difficult to get an overview. FHRMs were prepared at the national level and show the whole country. Hungary has identified 23 APSFRs, for which it is unclear if all have been mapped[27]. Maps for floods with low probability (fluvial/river floods (1/1 000 years) and for pluvial/streams and groundwater floods (1/100 years)), with medium probability (fluvial/river floods (1/100 years) and for pluvial/streams and groundwater floods (1/33,3 years)) and with high probability (fluvial/river (1/30 years) and for pluvial/streams and groundwater floods (1/10 years)) are provided. Flood extent is shown on all maps. Water depth is shown on all maps. Number of inhabitants is shown on all maps. Likewise, type of economic activity and IED installations are shown. Potentially affected protected areas identified in Annex IV(1)(i), (iii) and (v) to Directive 2000/60/EC are not shown consistently in the FHRMs for bathing sites and abstraction for drinking water, however there are some pdf maps for specific locations.

[26] https://vizeink.hu/akk-elso-felulvizsgalata/#up01, dedicated to flood risk management, provides access to FHRMs.

[27] Hungary subsequently clarified that APSFR areas were merged from 419 to 23 (without though the total surface having been reduced), where eight plus eight planning units are affected by fluvial and ground water flooding and seven planning units are affected by pluvial flooding.

In terms of changes of contextual information (i.e. the way in which information about the maps is conveyed to the public) since the first FHRMs, albeit still in pdf format, more detailed FHRMs have been published for the eight planning units (as opposed to a less detailed FHRM covering the entire country). Also there is a detailed methodological description on the updating of the maps; and the preparation of medium and high probability maps for groundwater flooding.

In terms of changes in methodologies used to prepare flood hazard maps since the first FHRMs, Hungary used an improved methodology to prepare updated versions of the flood hazard maps and more detailed databases to prepare the basic modelling information. In the case of groundwater floods, medium and high probability maps were produced in addition to the low probability map already prepared at the time of the first FHRMs.

In terms of changes in methodologies used to prepare flood risk maps since the first FHRMs, risks to inhabitants, to economic activity, to IED installations and (partially) to WFD protected areas are shown on the pdf maps.

Climate change in the second FHRMs

As regards the consideration of climate change effects in the preparation of flood hazard and risk maps, reference is made to section 3.7 on 'adaptation to climate change'.

7.2 Flood risk management plans

Objectives and measures

The FRMP is publicly accessible and can be downloaded from a webpage[28] which is part of the government website on water management. The Hungarian FRMP sets a main objective and identifies additional principles and objectives for flood risk management, also citing objectives from a separate water management plan, the 2017 Kvassay Jenő Plan (KJT). The objectives refer to the protection of human health. The FRMP also identifies "long-term" objectives, which refer to land use and spatial planning, though it is not clear how these long-term objectives are related to the other objectives. The FRMP does not specifically set out objectives that refer to the protection of economic activity, though it does cite the FD's provision (in Article 7(2)) that this should be addressed. The FRMP's objectives state that, during the implementation of measures to reduce the flood risk, undesirable environmental effects should be minimised. The FRMP also cites the KJT's objectives, which refer to coordinated management and preservation of activities related to, among others, natural resources and natural values. The FRMP moreover cites the FD's provision (in Article 7(2)) stating that environment should be addressed. The objectives do not refer to the protection of cultural heritage, though it does cite the FD's provision (in Article 7(2)) that this should be addressed. The second FRMP identifies 49 new, potential flood risk management projects. In addition, 45 measures were reported to EIONET: these appear to be projects set out in the first FRMP. The 49 new, potential projects have been chosen based on prioritisation using cost-benefit analysis. The FRMP does not explain how the new projects will be monitored. Project reports have been prepared for the 45 measures reported to EIONET, many of which have been completed. Hungary has reported priority for the measures. Almost all measures (43

[28] https://vizeink.hu/akk-elso-felulvizsgalata/#up01

out of 45 measures, or 96 % of the total) are moderate priority. One measure is high priority, and another one is very high priority: these are both protection measures.

The costs and benefits of 28 of the 45 projects reported to EIONET are provided. The FRMP provides the costs of the 49 proposed new projects, which were prioritised based on cost-benefit analysis. The FRMP provides little further information on funding sources, though its discussion of public awareness actions includes a reference to the national budget. The FRMP identifies water retention as a key element of flood risk management. While it refers in particular to structural water retention projects, the FRMP also mentions the role of natural water retention. The FRMP calls for the harmonisation of flood risk management measures with WFD objectives. The FRMP provides an overview of the impact of floods on Natura 2000 sites in floodplains but provides few details on nature conservation in its measures. The FRMP refers to long-term flood prevention by addressing land use in floodplains. The new projects listed in the FRMP have a strong focus on flood protection. Three-quarters of the measures reported to EIONET are for flood protection. The FRMP refers briefly to emergency planning. One preparedness measure was reported to EIONET. As noted above, the FRMP refers to the importance of spatial planning and land use in flood plains.

The second FRMP does not specify indicators that could be used to assess progress towards its own objectives. The FRMP and a separate document state however that risks in flood plains protected by embankments and other structural measures have decreased by 10 % with the implementation of structural projects under the first FRMP. The FRMP notes that this is based on a simplified risk assessment that focuses on property risks over a 30-year period; the risk-reduction effect of each project is assessed separately. Moreover, the second FRMP presents estimates of the risk reduction obtained under each of the 28 projects (for which costs and benefits were calculated) under the first FRMP, using this approach.

In Hungary's reporting to EIONET, half of the measures (23 measures) are indicated as completed. Thirteen measures are reported as on-going construction; four measures as on-going recurrent (e.g. maintenance works). The sole preparedness measure is reported as completed, along with 18 protection measures and three prevention measures. The only recovery and review measure is reported as on-going recurrent, along with one protection and two prevention measures. Ten protection and three prevention measures are on-going construction. Three protection measures are reported as abandoned or interrupted. Two protection measures (4 %) are reported as not started. These are for the first and second phase of the 'Differentiated embankment development strategy', which has not yet been implemented[29]. It appears that this strategy refers to the preparation of the strategy for the future projects identified in the FRMP.

Hungary's second FRMP provides an estimate of the costs for many but not all of its measures reported to EIONET. The FRMP provides cost estimates for its proposed new projects. The FRMP describes the method used to select and prioritise its new measures on the basis of flood risks and costs and benefits. (For measures reported to EIONET, however, all but two are indicated as having 'moderate' priority, so only a minor change compared to reporting for the first FRMP.) The number of measures remains unclear, in particular in terms of the relationship between the measures reported to EIOENT, those listed in the FRMP, and those listed in other documents uploaded to EIONET.

[29] FRMP, chapter 6.1.2.

Governance

The FRMP does not discuss transboundary coordination, either within the International Commission for the Protection of the Danube River (ICPDR), which has prepared an international FRMP for the whole Danube basin, or bilaterally with neighbouring Member States.

The FRMP[30] provides only limited information on public consultation mechanisms, though it indicates that documents and information on stakeholder meetings were available online[31] and that consultation lasted for six months.

Consideration of climate change

As regards the consideration of climate change effects in the preparation of flood risk management plans, reference is made to section 3.7 on 'adaptation to climate change'.

Progress identified in the second FRMPs

Hungary's second FRMP provides an estimate of the costs for many of its measures. It also provides cost estimates for its proposed new projects. Moreover, the FRMP describes the method used to select and prioritise its new measures on the basis of flood risks and costs and benefits. Hungary reported half of its measures completed, a major increase from the first to the second FRMP. In addition, the second FRMP briefly refers to the role of insurance. The FRMP refers to the use of CBA for packages or 'variants' of flood risk protection projects. The second FRMP makes clearer references to climate change impacts and to adaptation, which can be considered progress. The FRMP also cites Hungary's Second National Climate Change Strategy and its actions. Further, the FRMP provides an analysis of flash-flood risks related to climate change, identifying local areas that are facing these risks.

8. FD recommendations

Based on the reported information and the FHRMs and FRMPs assessed and uin addition to the progress achieved, Hungary should:

- produce a national GIS based portal for FHRM, with easy access for the public;
- reflect clearly also in the FHRM the potential future impacts of climate change (also based on future scenarios), or discuss such in a background document;
- provide detail on how the FHRM was used in the choice of objectives and measures of the FRMPs;
- include summary maps of APSFRs in the FRMP;

[30] FRMP, chapter 6.1.
[31] https://vizeink.hu/

- include information on the international coordination undertaken with other Member States via the international river basin commission during the development of the PFRA the FHRM and the FRMP;

- include in the FRMP specific objectives and where possible linked to quantitative indicators and be timebound. An assessment of the progress made towards the achievement of the objectives should be included in the FRMP;

- clarify the links and priorities between different objectives, principles and sub-objectives in the FRMP;

- set out the methods used to monitor measures in the FRMP;

- discuss provisions on the protection of cultural heritage at risk from flooding in the FRMP;

- set out the nature and number of measures that are being and will be implemented in the FRMP;

- there seems to be a single preparedness measure in the FRMP, for one specific area, and it is completed. Consider a review for a need of additional preparedness measures.

- provide detail on the public consultation and active stakeholder involvement, in particular, the comments received, and how they were taken into account in the final plan;

- where appropriate, consider in the FHRM flow velocity or relevant water flow and the FRMP flood conveyance routes, as these are relevant to emergency response.