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COMMISSION STAFF WORKING DOCUMENT

Second River Basin Management Plans - Member State: Bulgaria

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)
Second River Basin Management Plans
First Flood Risk Management Plans

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Acronyms and definitions

EQS Directive	Environmental Quality Standards Directive
FD	Floods Directive
Km	Kilometre
km^2	Kilometre squared
KTM	Key Type of Measure
PoM	Programme of Measures
QA/QC Directive	Quality Assurance / Quality Control Directive
RBD	River Basin District
RBMP	River Basin Management Plan
WFD	Water Framework Directive
WISE	Water Information System for Europe
Annex 0	Member States reported the structured information on the second RBMPs to WISE (Water Information System for Europe). Due to the late availability of the reporting guidance, Member States could include in the reporting an Annex 0, consisting of a short explanatory note identifying what information they were unable to report and the reasons why. This Annex was produced using a template included in the reporting guidance. If Member States reported all the required information, this explanatory note was not necessary.

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Foreword

The Water Framework Directive (WFD) (2000/60/EC) requires in its Article 18 that each Member State reports its River Basin Management Plan(s) (RBMPs) to the European Commission. The second RBMPs were due to be adopted by the Member States in December 2015 and reported to the European Commission in March 2016.

This Member State Assessment report was drafted on the basis of information that was reported by Member States through the Water Information System for Europe (WISE) electronic reporting.

The Member State Reports reflect the situation as reported by each Member State to the European Commission in 2016 or 2017 and with reference to River Basin Management Plans (RBMP) prepared earlier. The situation in the Member States may have changed since then.

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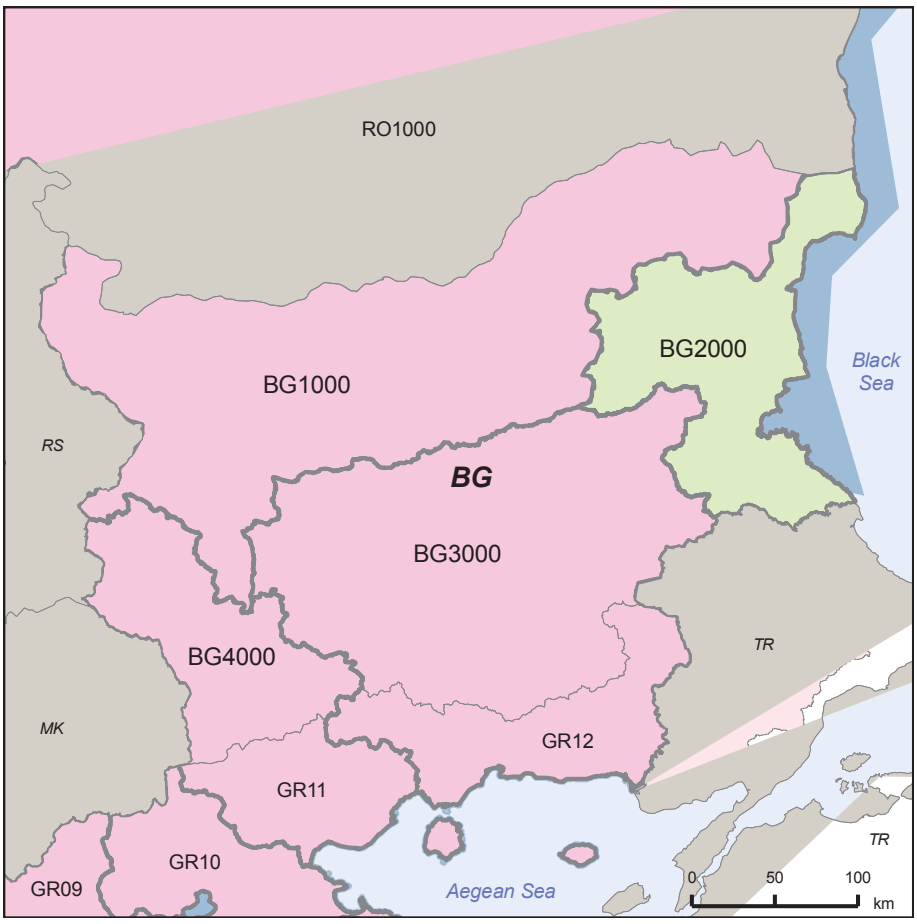
General Information

Map A ***Map of River Basin Districts***



Source: WISE, Eurostat (country borders)

International River Basin Districts (within European Union)
International River Basin Districts (outside European Union)
National River Basin Districts (within European Union)
Countries (outside European Union)
Coastal Waters

The information on areas of the national river basin districts including sharing countries is provided in the following table:

Table A: Overview of Bulgaria's River Basin Districts

RBD	Name	Size (km²)	Countries sharing borders
BG1000	Danube	47235	Serbia, Romania
BG2000	Black Sea	18043 (terrestrial) / 6358 (marine)	Romania, Turkey
BG3000	East Aegean	35236	Greece, Turkey
BG4000	West Aegean	11947	Greece, Serbia, Former Yugoslav Republic of Macedonia

Source: River Basin Management Plans reported to WISE

A number of catchments are shared with other Member States (Romania and Greece) and with third countries (Turkey, Serbia, Former Yugoslav Republic of Macedonia) and there is a varying degree of co-operation with them.

Table B: Transboundary river basins by category and % share in Bulgaria

Name international river basin	National RBD	Countries sharing borders	Co-ordination category			
			1		3	
			km²	%	km²	%
Danube	BG1000	Serbia, Romania	47235	5.8		
Rezovska / Mutludere	BG2000	Turkey			184	24.9
Veleka	BG2000	Turkey			792	80
Mesta-Nestos	BG4000	Greece			2785	49.6
Struma-Strymonas	BG4000	Greece, Serbia, Former Yugoslav Republic of Macedonia			8545	47.2
Maritsa-Evros_Meric	BG3000	Greece, Turkey			35230	66.0

Source: WISE electronic reports
Note: Bulgaria's reports to WISE did not include any category of international cooperation for the Black Sea RBD. It was category 3 in the first RBMP.

Category 1: International agreement, permanent co-operation body and international RBMP in place.
Category 2: International agreement and permanent co-operation body in place.
Category 3: International agreement in place.
Category 4: No co-operation formalised.

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Status of second river basin management plan reporting

A total of four RBMPs of Bulgaria (Danube, Black Sea, East Aegean and West Aegean) were published on 30 December 2016. Documents are available from the European Environment Agency EIONET Central Data Repository https://cdr.eionet.europa.eu/.

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Key strengths, improvements and weaknesses of the second River Basin Management Plan(s)

The main strengths and shortcomings of the second RBMP of Bulgaria are as follows:

- **Governance and public consultation**
  - Bulgaria has improved coordination with Greece, including exchange of information regarding methodologies and the implementation of joint Interreg projects.
  - A wide range of stakeholders were actively engaged in the preparation of Bulgaria's RBMPs.
  - Bulgaria carried out joint consultation of its RBMP and Flood Risk Management Plans; and in the Black Sea RBD, also with the Marine Strategy Framework Directive.
  - Bulgaria did not adopt and publish the RBMP in accordance with the timetable in the Water Framework Directive.
- **Characterisation of the RBD**
  - Type specific reference conditions have not been established for all quality elements. This may lead to some weaknesses in the classification of status/potential according to these quality elements.
  - Further characterisation work has been undertaken since the first RBMPs with the inclusion of the assessment of linkages with surface water bodies and terrestrial ecosystems.
  - For surface and groundwater bodies (except in the Black Sea RBD) significance of pressures is reported to be defined in terms of thresholds and linked to the potential failure of objectives according to the established national approaches. Not all pressure types were assessed and RBMPs do not provide information as to why some pressures have been excluded from the risk assessment.
  - The approach used for defining pressures on surface water bodies in the first RBMPs was refined to determine the relations 'driving force-pressure-status-impact', expand the analysis of pressures (for example by considering more sources of pressures) and implement results from models, projects and research. However the approaches still differed among RBDs and some national methodologies are missing, for example for

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diffuse pressures. For surface water pressure assessment, there is still a high dependence on expert judgement, which raises questions about the comparability of assessments.

- Bulgaria reported that between four and six of the 41 Priority Substances were included in the inventories in each RBD. A combination of Tier 1 (point source information) and Tier 2 (riverine load) was implemented, in accordance with the Guidance Document n°28. The data quality was assessed as uncertain.

- **Monitoring, assessment and classification of ecological status**

  - Although there were errors in reporting, it is clear that the number of monitoring sites increased significantly since the first RBMP. This is particularly the case for surveillance monitoring in rivers and for surveillance and operational monitoring in coastal waters.

  - Both surveillance and operational monitoring sites have been reported in transitional waters, contrary to what happened for the first RBMP. However, there was a large decrease of the number of monitoring sites in lakes. This was mainly the case with surveillance monitoring, but also affected operational monitoring. In particular, operational monitoring in lakes was only done in the West Aegean RBD, even though significant pressures were reported for lakes in the other RBDs.

  - There is an improvement in the monitoring of quality elements compared to the first RBMP, although there are still some significant gaps. There is very little monitoring of hydromorphological quality elements, which was not done in lakes and transitional water bodies and only for some of them in two river water bodies.

  - All coastal water bodies included in surveillance monitoring were monitored for all required biological, hydromorphological and physicochemical quality elements. However, none of the lake and transitional water bodies and only some of the river water bodies included in surveillance monitoring were monitored for all required biological quality elements.

  - The minimum recommended frequency for monitoring biological quality elements was only met at a small proportion of the sites monitored in all water categories.

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- Assessment methods were reported for all relevant biological quality elements in rivers. However there are significant gaps for the assessment methods in the other water categories.

- In addition to the very limited monitoring of hydromorphological quality elements, the classification boundaries for those quality elements are not related to the class boundaries for the sensitive biological quality elements. The hydromorphological quality elements were only used in the classification of rivers in terms of hydrological regime and morphological conditions.

- All the relevant supporting general physicochemical quality elements were assessed in terms of ecological status/potential in all water categories. However, the classification boundaries for some of them are not related to the class boundaries for the sensitive biological quality elements.

- All the standards for coastal and transitional waters are consistent with the good-moderate status boundary of the relevant sensitive biological quality elements, but this is not the case for rivers and lakes.

- 63 chemicals that are not Priority Substances and are, therefore, assumed to be River Basin Specific Pollutants are monitored, in water only. Not all of them are monitored at least at the minimum recommended frequency at all of the sites where they are monitored for surveillance and operational purposes.

- Environmental Quality Standards were reported for 42 substances, relevant to both rivers and lakes. 36 of these substances also had Standards relevant to transitional and coastal waters.

- The classification of all quality elements in lakes, coastal and transitional waters was based solely on monitoring results, in rivers it was based on a combination of monitoring results, expert judgment and grouping. The use of expert judgment for fish, benthic invertebrates, phytobenthos and macrophytes for some river water bodies may indicate some weaknesses in the assessment methods for biological quality elements in rivers.

- Very few river water bodies were classified according to hydromorphological quality elements, even when they were monitored.

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- **Monitoring, assessment and classification of chemical status in surface water bodies**

  - Chemical status was monitored and assessed in all water categories except for territorial waters.

  - Between the two RBMPs, there was a large decrease in the proportion of water bodies in good status and a large increase in the proportion in unknown status across all water categories. Overall, 23 % of surface water bodies in Bulgaria were classified for chemical status with high confidence 44 % with medium confidence and 33 % with low confidence.

  - Since the first RBMP, there has been an increase in the number of sites and water bodies monitored, and the adoption of new common national methodologies for the assessment of chemical status.

  - More than 60 % of sites and water bodies in transitional and coastal water are monitored however the proportion was lower for surface fresh waters (14 % and 28 % of lake and river water bodies respectively). Grouping seemed to be used to some extent to classify non monitored water bodies, however the proportion of unknown status remains high.

  - The operational monitoring programme covered all surface water bodies failing to achieve good status in the Black Sea, East Aegean and West Aegean RBDs, and 67 % of surface water bodies failing to achieve good status in the Danube RBD.

  - All Priority Substances listed in inventories and discharged (between four and six Priority Substances depending on the RBD) were monitored in all four RBDs in Bulgaria. The monitoring frequency for status assessment met the recommended minimum frequency for operational and surveillance monitoring at some sites not at others. The RBMPs and background documents provided no specific justification for the reduced frequency of monitoring. Six substances were not monitored in any RBDs, and they were not considered in the inventories, so it is unclear whether they are discharged.

  - Hexachlorobenzene, mercury and hexabutadiene are not monitored in biota for status assessment in Bulgaria.

  - For trend assessment, there is no monitoring of sediments and/or biota in any RBD.

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- **Monitoring, assessment and classification of quantitative status of groundwater bodies**

  - About 29 % of groundwater bodies are not monitored for quantitative status, but in these cases self-monitoring data was used or the balance method was applied.

  - National methodologies and guidance documents have now been adopted. It remains unclear though how status was assessed without monitoring data.

  - The environmental objectives related to groundwater dependent terrestrial ecosystems and groundwater associated surface waters have partially been considered in the second cycle although they do not cause risk in all river basin districts.

- **Monitoring, assessment and classification of chemical status of groundwater bodies**

  - The coverage of groundwater bodies by monitoring is not fully complete. However, Bulgaria clarified that the total number of monitoring points for chemical status of groundwater bodies in Bulgaria has increased.

  - Not all substances causing risk are yet subject to monitoring.

  - The chemical status situation has worsened: The total groundwater area failing good chemical status increased from 42 % to 45 %. Bulgaria subsequently clarified that this is due to changes in the delineation of groundwater bodies, a new assessment methodology and the additional monitoring data.

  - Groundwater dependent terrestrial ecosystems have been considered in status assessment in all river basin districts where they exist and are related to risk.

  - Groundwater associated surface waters have been considered in status assessment in all river basin districts where they exist and are related to risk. They have not been considered in threshold value establishment in the West Aegean RBD although there is related risk in seven groundwater bodies. Bulgaria subsequently clarified that there was a reporting error and groundwater associated aquatic and groundwater dependent terrestrial ecosystems are not causing a risk of not achieving good chemical status for groundwater bodies.

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- **Designation of Heavily Modified and Artificial Water Bodies and definition of Good Ecological Potential**

  - The national methodology for designation of heavily modified water bodies and artificial water bodies provides a detailed step-by-step approach for designating heavily modified water bodies and artificial water bodies, including consideration of the significant adverse effects of restoration measures and achievement of the benefits by other means.

  - A national method for determining the ecological potential of rivers, lakes and coastal waters has been developed since the first reporting cycle. However, good ecological potential is reported as defined, including reporting of mitigation measures, only in two out the four RBDs (the Danube RBD and the Black Sea RBD).

- **Environmental objectives and exemptions**

  - Environmental objectives for ecological and chemical status of surface water bodies were reported in all RBDs as well as for chemical and quantitative status of groundwater bodies. Information is also provided on when it is expected that the objectives will be achieved.

  - Pressures and pollutants leading to exemptions are reported. Drivers behind pressures and impacts leading to exemptions are not reported.

  - Justification of exemptions regarding natural conditions might be an issue of insufficient implementation of WFD requirements, as relevant information is lacking in the RBMPs and reported background documents, or is not fully in line with the WFD requirements.

  - The application of Article 4(7) might be an issue of insufficient implementation of WFD requirements in some basins as not enough information is reported and a generic approach is followed which is not site and project specific.

- **Programme of Measures**

  - Uncertainties in the status of water bodies means that the gap to good status and the progress required from the implementation of the measures cannot be quantified.

- The annual operation and maintenance costs of the measures have generally not been quantified, so it is not clear how the financing of these measures can have been agreed.

- KTMs have been reported to be in place to address the failure of objectives caused by the substances in groundwater identified in three RBDs - no information has been provided for the East Aegean RBD.

- In general KTMs have been reported for all significant pressure types in both surface water and groundwater. For surface water, some pressure types are not addressed by KTMs in the Black Sea RBD.

- The number of River Basin Specific Pollutants reported as causing failure is very small. No relevant KTMs have been reported for the East Aegean. No data is reported in any RBD on the number of surface water bodies failing objectives as a result of River Basin Specific Pollutants, although KTMs have been reported in some RBDs.

- Information is reported for a small number of substances. Not all Priority Substances reported as causing failures are covered by KTMs. The number of Priority Substances reported is very small.

- Due to the significant number of water bodies assessed in "unknown" ecological and/or chemical status, Bulgaria has not been able to assess the level of significance of the different pressure types and to evaluate the extent of the pressure or chemical substance that is to be reduced to achieve the Environmental Objectives.

- The RBMPs and Flood Risk Management Plans have not been integrated. Although the plans have not been integrated, all aspects have been co-ordinated, and a financial commitment has been made.

- Article 9(4) has only been applied in the East Aegean RBD.

- **Measures related to abstractions and water scarcity**

- Water quantity data have been reported to support the European State of the Environment Report. Water abstraction pressure is not reported as relevant for Bulgaria; however all river basin districts face water quantity-related problems. The Water Exploitation Index + is not calculated

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- Measures promoting efficient and sustainable water use were implemented in the previous cycle in all river basin districts except in West Aegean, and new measures and/or significant changes are planned for the second cycle. No information is reported by when the existing gaps will be closed. Bulgaria reports that it is not possible to quantify the pressures to reduce and measures that are still needed for achieving the environmental objectives.

- The RBMPs do not include a water resource allocation and management plan.

- **Measures related to pollution from agriculture**

  - There is a clear link between agricultural pressures and agricultural measures.

  - No gap assessment for nutrients has been undertaken in any RBDs.

  - Safeguard zones have been established for abstractions for drinking water but also for other purposes (e.g. economically valuable fish species and protected areas).

  - Implementation of basic measures for the control of diffuse pollution from agriculture at source as per Article 11(3)(h) is applied only in Nitrate Vulnerable Zones, except in the West Aegean RBD where the same rules apply across the whole RBD.

  - Supplementary measures for reducing pollution from agriculture are reported.

  - Financing of measures related to agricultural pressures is secured in all basins and estimations of the potential financial contributions of different sectors (domestic, agriculture, industry and services) in the period 2016-2021 for the financing of the Programme of Measures are provided.

  - Information whether the measures are mandatory or voluntary is not available either in WISE or in the RBMPs.

  - The level of ambition is unclear, as the area covered by measures to achieve environmental objectives is not reported.

- **Measures related to pollution from sectors other than agriculture**

  - Bulgaria has identified a wide range of KTMs relevant to non-agricultural sources of pressures causing failure of WFD objectives, and at least some relevant KTMs have been reported for each RBD

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- Measures to tackle urban point sources are reported in all four RBDs, and several actions have been identified corresponding to KTM1.

- However, the RBMP does not make clear whether the funding to tackle urban point sources has already been 'secured' for each of the coming years. Nor is it clear whether the measures will be sufficient to fulfil the legal obligations, and whether measures for agglomerations above 2000 *population equivalent*. have been prioritised in the process.

- Most of the measures presented in the Programmes of Measures do not refer to specific Priority Substances or River Basin Specific Pollutants but only address such pollution in general.

- KTM15 measures ("Measures for the phasing-out of emissions, discharges and losses of Priority Hazardous Substances or for the reduction of emissions, discharges and losses of Priority Substances") have not been identified in the East or West Aegean RBDs.

- **Measures related to hydromorphology**

- Significant hydromorphological pressures and operational KTMs to deal with these pressures are reported in all RBDs. However, it is not possible to draw specific conclusions on the level of ambition because indicators on the gap to be filled for significant pressures and KTM value indicators are not reported.

- Ecological flows have been derived and implemented partly, i.e. for some relevant water bodies, and only in one RBD (Danube) but the work is still on-going. In the other three RBDs (Black Sea, East Aegean and West Aegean), no ecological flows have been derived but there are plans to do it during the second cycle. The Programmes of Measures for the Black Sea, East Aegean and West Aegean RBDs indicate that relevant measures will start in 2017-2018. At the same time, no specific information was found that ecological flows will be applied through a review of permits.

- Natural Water Retention Measures are planned to tackle significant hydromorphological pressures in three RBDs (Danube, Black Sea and East Aegean), although these measures are not described in detail in any of the RBMPs.

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- **Economic analysis and water pricing policies**

  - Concerning cost recovery calculations, it is unclear how environmental and resource costs have exactly been included.

  - No detailed information on the application of the Polluter Pays Principle was found in the RBMPs.

- **Considerations specific to Protected Areas (identification, monitoring, objectives and measures)**

  - In terms of the numbers of Protected Areas designated, only the number of Drinking Water Protected Areas has changed since the first RBMP. This has decreased by around a third in the second cycle.

  - The numbers of surface water monitoring sites for Habitat and Urban Waste Water Treatment Protected Areas have decreased significantly in the second cycle compared to the first.

- **Adaptation to drought and climate change**

  - Climate change was considered in various ways in all river basin districts and it is stated that the Common Implementation Strategy guidance document on how to adapt to climate change was used. The West Aegean RBD also addressed climate change when monitoring change at reference sites.

  - KTM24 (climate change adaptation measures) address significant pressures in two of the river basin districts.

Recommendations

- The preparation of the next RBMP should be carried out in accordance with the WFD timetable, to ensure the timely adoption of the third RBMP.

- Bulgaria should continue to improve international cooperation, including coordinated assessments of the technical aspects of the Water Framework Directive such as ensuring a harmonized approach for status assessment and a coordinated Programme of Measures in order to ensure the timely achievement of the WFD objectives.

- Bulgaria needs to continue its work in order to harmonise the assessment of pressures among RBMPs and to make further progress on the assessment of agricultural pressures on water bodies.

- Bulgaria needs to eliminate inconsistencies between significant pressures and the measures planned to mitigate their effect.

- Bulgaria should continue to strengthen monitoring, in order to increase the confidence in the assessment of water body status. In particular, operational monitoring needs to include all lake water bodies which are subject to significant pressures. Monitoring should also cover all relevant quality elements.

- An increased level of monitoring should lead to a lower dependence on expert judgment for the classification of ecological status/potential.

- Bulgaria should have a clear and transparent method for the selection of River Basin Specific Pollutants.

- Bulgaria should strengthen its assessment method for biological, general physicochemical and hydromorphological quality elements by completing the development of assessment methods which are sensitive to all significant pressures and by progressing in the transfer of the results of intercalibration into national types.

- Bulgaria needs to reduce the number of unknowns. Monitoring should be performed in the relevant matrix, in a way that ensures sufficient spatial coverage and temporal resolution to reach sufficient confidence in the assessment, if necessary in combination with robust grouping/extrapolation methods. Develop the missing analytical methods.

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- Perform trend monitoring in all RBDs, for all relevant substances, in a way that provide sufficient temporal resolution and spatial coverage.

- The definition of good ecological potential needs to be completed for all RBDs, specifically for the East Aegean RBD and the West Aegean RBD.

- Progress in the justification of exemptions should be continued. The specific drivers and impacts which may lead to the application of Article 4(4) and 4(5) exemptions should be assessed and clearly outlined in all RBMPs. The justification should be elaborated in more detail at water body level. In case there is clear evidence that natural background levels are the cause for elevated concentrations, the appropriate adaptation of the reference conditions should be considered instead of applying exemptions. Furthermore, the potential use of 'natural conditions' as an exemption type under Article 4(5) should be revised because exemption types Article 4(5) refers to are either that the achievement of good status would be 'infeasible' or 'disproportionately expensive', whereas 'natural conditions' as such is not considered as an exemption type under Article 4(5).

- With regard to the application of Article 4(7), the types of modifications and justifications should be clearly outlined and made more transparent in all RBDs, including an ex-ante assessment whether planned new modifications may lead to deterioration / non-achievement of good status/potential at quality element level.

- Quantification of indicators of gaps should be quantified for any pressures in any RBD.

- A cost-effectiveness analysis should be carried out and specific prioritisation of measures based on cost-effectiveness analysis should be provided.

- Bulgaria should make sure that all relevant KTMs are reported to control Priority Substances in the East and West Aegean RBDs.

- Bulgaria should ensure that KTMs are in place to address the failure of objectives caused by substances in groundwater in the East Aegean RBD.

- Bulgaria should complete a comprehensive gap assessment for diffuse pollutant loads from agriculture (nutrients, agri-chemicals, sediment, organic matter) across all waters in all RBDs and link it directly to mitigation measures in the third RBMPs (as per WFD Article 11(3)(h)), to facilitate the achievement of WFD objectives. These measures should be specific, have a clear legal basis, and include appropriate advice, monitoring and inspection regimes to ensure their effective implementation.

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- In the third RBMPs, it should be stated clearly to what extent, in terms of area covered and pollution risk mitigated, basic measures (minimum requirements to be complied with) or supplementary measures (designed to be implemented in addition to basic measures) will contribute to achieving the WFD objectives. Sources of funding should be identified (e.g. CAP Pillar 1, Rural Development Programme), as appropriate, to facilitate successful implementation of these measures.

- Bulgaria should continue to encourage coordination between water and agriculture departments in the review and development of the strategy for the delivery of WFD objectives, in cooperation with the farming community to ensure the third RBMP is technically feasible and aligned with all relevant policies and instruments (e.g. Rural Development Programme, CAP Pillar 1, ND etc.). The measures in the strategy should be specific, have a clear legal basis, and include appropriate advice, monitoring and inspection regimes to ensure their effective implementation. Irrigation investments made in the Rural Development Programmemust be carried out to ensure water saved goes back to restore depleted aquifers.

- KTM and specific measures have been identified to tackle the significant pressures from waste disposal sites, contaminated sites or abandoned industrial sites. No gap analysis is provided so it is not clear whether the measures planned will be sufficient to reach good status by the deadline, and to avoid further deterioration. Bulgaria should perform a gap analysis to assess whether the measures planned are sufficient to reach good status and avoid further deterioration, and if necessary to identify additional measures.

- KTM have been reported to tackle diffuse and point source pollution. However it is not clear that all relevant diffuse and point sources have been properly identified. Bulgaria should complete the inventories of emissions, by considering all Priority Substances and other substances from part A of annex I of the EQS Directive. It is strongly recommended to use the methodology from guidance document n°28 for all these substances, and point sources as well as diffuse sources should be considered where relevant. Bulgaria should make sure all individual substances causing failures are addressed by appropriate KTMs and measures, and a gap analysis should be provided to ensure that the measures planned will be sufficient to reach the objective.

- Bulgaria should make sure that the planned measures will ensure compliance with Article 5 of the Urban Waste Water Treatment Directive as regards more stringent treatment, especially in big cities. Bulgaria should make sure funding is secured for the planned actions, and make sure measures are sufficient to tackle the significant pressures

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from UWWTP, by performing a gap analysis, prioritising where necessary agglomerations above 2000 *population equivalent.*

- Bulgaria should ensure the full application of ecological flows, which are now planned in all RBMPs, and that these are applied at the appropriate level and implemented through the revision of permits as necessary.

- The revision and, if necessary, the amendment of all existing permits should be continued, in order to ensure that these permits are compatible with the achievement of the WFD objectives.

- Bulgaria should continue prioritising the use of green infrastructure and/or natural water retention measures that provide a range of environmental (improvements in water quality, flood protection, habitat conservation, etc.), social and economic benefits which can be in many cases more cost-effective than grey infrastructure.

- Bulgaria should continue to apply cost recovery for water use activities having a significant impact on water bodies or justify any exemptions using Article 9(4). It should continue to transparently present how financial, environmental and resource costs have been calculated and how the adequate contribution of the different users is ensured. Bulgaria should also continue to transparently present the water-pricing policy and provide a transparent overview of estimated investments and investment needs.

- Bulgaria should continue its work on groundwater Protected Areas designated under the Birds and Habitats Directives. These Protected Areas should be identified and reported. It also needs to set more stringent objectives for drinking water safeguard zones and include them in the PoMs as mentioned in previous recommendation.

- Bulgaria should ensure that a clear distinction is made between water scarcity and drought in water policy and that a Drought Management Plan or a Water resource allocation and management plan is adopted, particularly in light of the fact that abstraction is identified as one of the significant pressures for surface water and groundwater bodies in the country.

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Topic 1 Governance and public participation

1.1 Assessment of implementation and compliance with WFD requirements in second cycle

1.1.1 Administrative arrangements – river basin districts

Bulgaria has reported four river basin districts: Danube, Black Sea, East Aegean and West Aegean. All four RBDs are part of international RBDs.

1.1.2 Administrative arrangements – competent authorities

Bulgaria reports a large number of competent authorities. Key among these are the four River Basin Directorates, whose main roles are: the monitoring and assessment of groundwater and surface water, co-ordination of implementation, economic analysis, enforcement of regulations, implementation of measures, preparation of the RBMPs and Programme of Measures, public participation, and reporting to the European Commission.

The Ministry of Environment and Water has the following main roles: co-ordination of implementation, economic analysis, enforcement of regulations, implementation of measures, reporting to the European Commission, and monitoring of groundwater and surface water. The Ministry has a supporting role on public participation. Several other Ministries have main roles for the implementation of measures: Energy; Economy; Regional Development and Public Works; Transport, Information Technology and Communications; and Agriculture and Food. Moreover, all these ministries have supporting roles for the enforcement of regulations, while the Ministry of Health also has supporting roles for the monitoring and assessment of status of surface water.

Several national agencies are also identified. The Executive Agency for Exploration and Maintenance of the Danube River undertakes monitoring of surface water[1], as does the Institute of Oceanography[2]. The Executive Environment Agency undertakes monitoring of groundwater and surface water, and so does the National Institute of Meteorology and Hydrology. The National Statistical Office carries out economic analysis.

The Association ViK is also involved in the implementation of measures; so are municipalities in the RBDs (265 authorities).

[1] Bulgaria clarified subsequently that this agency carries out water quantity monitoring of the Danube River.
[2] Bulgaria clarified subsequently that the Institute carries out monitoring of marine waters.

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1.1.3 River Basin Management plans – structure and Strategic Environmental Assessment

No sub-plans are reported for Bulgaria's RBMPs; Bulgaria informed that national programmes for the application of the RBMPs were developed by the economic sector.

1.1.4 Public consultation

For all four RBMPs, the public and interested parties were informed via Internet, invitations, local authorities, media (papers, TV and/or radio), meetings and printed material. In addition, direct mailing was used in the Danube RBD, and written consultation in both the Danube and East Aegean RBDs. For all four RBDs, documents were made available by direct mailing (post) and were downloadable. Documents were available for the required six months. In the Danube, Black Sea and East Aegean RBDs, documents were also made available by direct mailing (e-mail). In the West Aegean RBD, documents were distributed at exhibitions.

The following stakeholder groups were actively involved in all Bulgaria's RBMPs: agriculture/farmers, fisheries/aquaculture, industry, local/regional authorities, NGOs/nature protection and water supply and sanitation. Consumer groups were actively involved in the Danube and East Aegean RBDs. Energy/hydropower was actively involved in the Danube, East Aegean, and West Aegean RBDs. Navigation/ports were actively involved in the Danube and Black Sea RBDs. In the West Aegean RBD, universities and scientific institutes were involved. In all four RBDs, active involvement included regular exhibitions; in the Danube, Black Sea and East Aegean RBDs - involvement in drafting; in the East Aegean RBD, advisory groups; and in the West Aegean RBD, opinions and proposals.

For all four RBMPs, consultation led to: addition of new information, changes to selection of measures, commitment to action in the next RBMP and commitment to further research. Adjustment to specific measures was a result for the Danube and East Aegean RBDs, and changes to the methodology used for the East Aegean RBD. For the Danube only, there was international co-ordination on public participation. Further information on international cooperation with respect to measures is provided in Chapter 9 of this report.

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1.1.5 Integration with the Floods Directive and the Marine Strategy Framework Directive

Bulgaria did not integrate its RBMPs and Flood Risk Management Plans (under the Floods Directive[3]) in joint plans but did undertake joint consultation of its RBMPs and Flood Risk Management Plans.

For the Black Sea RBD, joint consultation with the Marine Strategy Framework Directive[4] was organised.

1.1.6 International coordination and co-operation

For the Danube RBD, Bulgaria reported that an international agreement, permanent co-operation body and an international RBMP in place (designated as category 1 cooperation): indeed, Bulgaria is a member of the International Commission for the Protection of Danube River. Explicit links were made with national RBMPs within the international RBMP. In this RBD, there was international co-ordination of public participation.

For the East Aegean RBD, shared with Greece and Turkey and the West Aegean RBD, shared with Greece, Former Yugoslav Republic of Macedonia and Serbia), Bulgaria reports that an international agreement and permanent co-operation body was in place (designated as category 2). It is not clear, however, the extent to which co-operation covers all Member States and third countries. Bulgaria and Greece signed a Joint Declaration at ministerial level for cooperation on the implementation of European Union water legislation: an important element has been the coordination and exchange of information on methodologies. Bulgaria's RBMPs for East Aegean and West Aegean also mention that cooperation with Greece took place through international projects funded primarily by Interreg programmes. No information was found on cooperation activities with the Former Yugoslav Republic of Macedonia and Serbia in these international RBDs.

Bulgaria's Black Sea RBD is shared with Romania and Turkey. Bulgaria and Romania have signed a Bilateral Agreement on Water Management that covers coordination of shared RBDs, both Danube and the Black Sea. The two Member States have shared information on methodologies and on the development of their RBMPs.

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[3] Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

[4] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

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Information was not found on the extent of Bulgaria's cooperation with Turkey. Both countries (as well as Romania) are among the parties to the Convention on the Protection of the Black Sea Against Pollution, but information was not found on cooperation under this framework related to the development of RBMPs.

1.2 Main changes in implementation and compliance since first cycle

Bulgaria's Administrative Arrangements appear to be more complex compared to the first cycle: the 2012 Commission Staff Working Document[5] listed the Ministry of Environment and Water and the four RBD Directorates, while the WISE reporting indicates several other national ministries, several national agencies and 265 local authorities. These bodies are mentioned in the Member State fact sheet on administrative arrangements for Bulgaria prepared under the Pressures & Measures study[6]: consequently, it is not clear if this represents a change in governance or simply more detailed reporting in the second cycle.

In the first cycle, Bulgaria prepared sub-plans for economic sectors; although no sub-plans were reported for the second cycle, Bulgaria informed that national programmes for the application of the RBMP were developed by the economic sector: consequently, no major change was seen.

International co-operation appears to have strengthened for the East Aegean and the West Aegean RBDs as both are indicated in the WISE reporting as RBD with co-operation agreement and body in place (Category 2), implying that steps were taken to improve co-operation with neighbouring countries in these international RBMPs. For the East Aegean RBD, shared with Greece and Turkey, the 2012 Commission Staff Working Document listed one river basin as having an international agreement in place (Category 3). For the West Aegean RBD, the 2012 Commission Staff Working Document listed one RBD as having an international agreement in place (shared with Greece) and a RBD without co-operation formalised (Category 4) which is shared with Greece, Former Yugoslav Republic of Macedonia and Serbia. Information gathered indicates the co-operation with Greece was strengthened; it is not clear if this was also the case for Former Yugoslav Republic of Macedonia and Serbia. The level of co-operation for the Black Sea RBD was reported as "Null.

[5] http://ec.europa.eu/environment/water/water-framework/pdf/3rd_report/CWD-2012-379_EN-Vol3_BG.pdf

[6] http://ec.europa.eu/environment/archives/water/implrep2007/pdf/Governance-Pressures%20and%20measures.pdf

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1.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *There are insufficient international cooperation/coordination mechanisms established with neighbouring countries like Greece and Turkey in international river basins. This cooperation needs to improve significantly. The river basins shared with Turkey should be correctly designated as international RBDs.*
- *Include in the second RBMPs results of the international cooperation with neighbouring countries.*

Assessment: It appears that international co-ordination has improved for the East Aegean RBD and the West Aegean RBD. In particular, it appears that cooperation with Greece improved, including via a joint declaration at ministerial level as well as the development of Interreg projects. It is not clear, however, if cooperation with non-member countries – Former Yugoslav Republic of Macedonia, Serbia and Turkey – has also improved for the second cycle. These recommendations are partially fulfilled.

- Recommendation: *Ensure the necessary coordination of approaches and methodologies among its four RBDs in the* second *RBMPs. Co-ordination during the RBMP development between the basin and state level as well as among RBDs should be improved in the next RBMP cycle. Elaboration of common methodologies would be necessary.*

Assessment: A review of the different WFD topics suggests that considerable progress has been achieved since the first RBMPs in developing and applying common national methodologies that are used in all four RBDs. This was achieved in part via projects carried about by the Ministry of Environment and Water, and in part by work at international and at RBD levels (e.g. the methodology used for determining confidence levels of water bodies status assessments was original developed for the international Danube RBD, adopted by the Bulgarian Danube RBD and then adopted as a national methodology). The four RBMPs used the common methodologies (when available) and either include copies of these documents in their annexes or contain links to the online documents on the Ministry of Environment and Water's website.

It can also be noted that the four RBMPs follow the same structure, with the same number and titles of chapters and very similar content provided in these chapters. There are differences in the number and format of annexes provided to each chapter across the RBDs, but overall they contain similar annexes. Key annexes such as overview of status of water bodies or Programme of Measures follow the same templates.

This recommendation is fulfilled.

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Topic 2 Characterisation of the River Basin District

2.1 Assessment of implementation and compliance with WFD requirements in second cycle

2.1.1 Delineation of water bodies and designation of heavily modified and artificial water bodies

Overall there is a significant change in the number of water bodies delineated between the first cycle and the second cycle (Table 2.1). For river water bodies there was a 27 % increase overall, including a 63 % increase in the Danube RBD. For lake water bodies, there was a decrease of 35 % in the East Aegean RBD and 46 % in the Danube RBD, whilst there were increases of 33 % in the Black Sea RBD and 50 % in the West Aegean RBD. In the Black Sea RBD, there was an 87 % increase in transitional water bodies and a 31 % increase in coastal water bodies.

In the second cycle, 95 % of identified surface water bodies were natural with 4 % being designated as heavily modified and 1 % as artificial water bodies. It was a fairly similar situation in the first cycle but there was a very slight increase in the proportion of natural water bodies between the first cycle and the second cycle (Figure 2.1). The water uses and physical alterations have been reported for each heavily modified water body category. The RBMPs reported that a national approach for designation of heavily modified water bodies was developed and first applied in the second RBMPs (for details see Topic 7).

The RBMPs reported that the delineation of the surface water bodies was updated as a result of the updated typology, updated objectives and pressures information, new data gathered through monitoring and update of the protected areas, as well as to address some technical errors from the first RBMPs and recommendations received from the European Commission on the first RBMPs. The revised typology resulted in both merging and splitting of water bodies.

Transitional waters (only relevant for the Black Sea RBD) were re-delineated as a result of a study on the typology and classification of surface water bodies carried out in the first cycle ("Update of the typology and classification system for assessment of surface water bodies of categories 'river', 'lake' and 'transitional waters' in the period of the first RBMP"). There is no information about re-delineation of the coastal waters.

The consequences of the re-delineation of surface water bodies mentioned in the RBMPs were: firstly, that there was a need to apply the 'grouping' approach, especially for small water

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bodies, and update the programmes of monitoring; secondly, direct comparison of the status of water bodies between the first and second RBMPs is not possible due to the changes.

Table 2.1 Number and area/length of delineated surface water bodies in Bulgaria for the second and first cycles

Year	RBD	Lakes		Rivers		Transitional		Coastal	
		Number of water bodies	Total area (km^2) of water bodies	Number of water bodies	Total length of water body (km)	Number of water bodies	Total area (km^2) of water bodies	Number of water bodies	Total area (km^2) of water bodies
2016	BG1000	7	14	249	27 084	0	0	0	0
2016	BG2000	4	3	156	2 957	28	816	17	1 464
2016	BG3000	11	38	300	10 543	0	0	0	0
2016	BG4000	15	61	168	2 837	0	0	0	0
2016	Total	37	116	873	43 421	28	816	17	1 464
2010	BG1000	13	21	153	6 690	0	0	0	0
2010	BG2000	3	4	124	6 009	15	109	13	1 428
2010	BG3000	17	42	291	10 551	0	0	0	0
2010	BG4000	10	9	122	2 319	0	0	0	0
2010	Total	43	75	688	25 568	15	109	13	1 428

Source: WISE electronic reports

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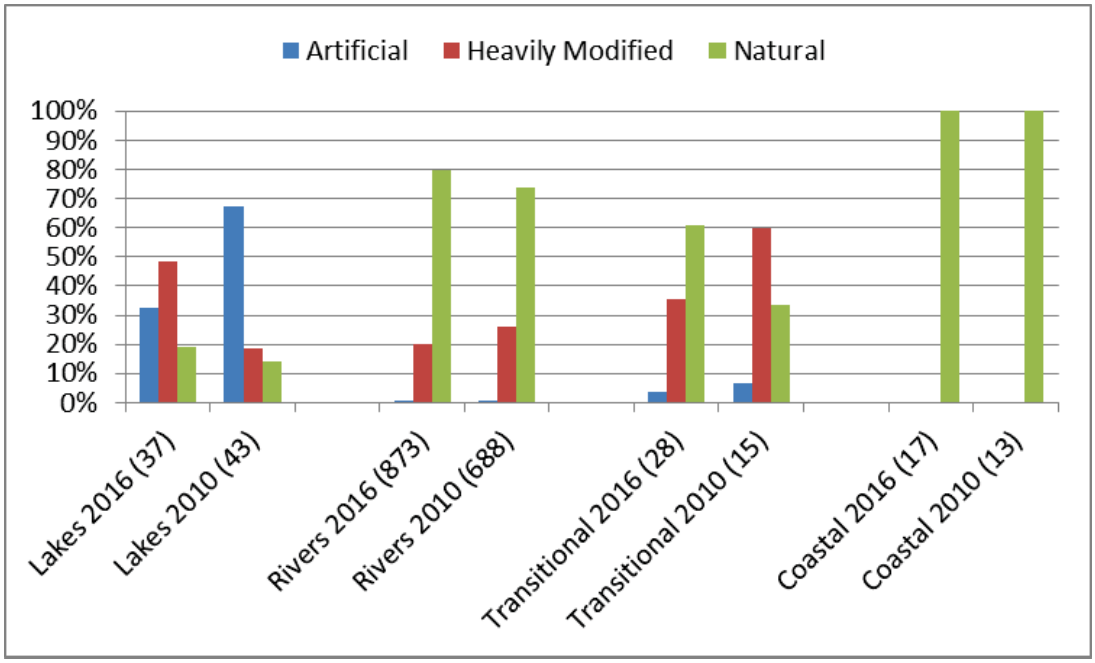
Figure 2.1 ***Proportion of surface water bodies in Bulgaria designated as artificial, heavily modified and natural for the second and first cycles. Note that the numbers in parenthesis are the numbers of water bodies in each water category***



Source: WISE electronic reports.

Table 2.2 shows the differences in size distribution of surface water bodies in Bulgaria between the first and second and cycles. The minimum length of river water bodies has decreased in the Danube RBD and the minimum size of coastal water bodies decreased in the Black Sea RBD. The minimum size criteria reported were a 10 km^2 catchment area for rivers and a 0.5 km^2 surface area for lakes.

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Table 2.2 Size distribution of surface water bodies in Bulgaria in the second and first cycles

Year	RBD	Lake area (km²)			River length (km)			Transitional (km²)			Coastal (km²)		
		Mini-mum	Maxi-mum	Average	Mini-mum	Maxi-mum	Average	Mini-mum	Maximum	Average	Mini-mum	Maxi-mum	Average
2016	BG1000	0.79	6.27	1.93	0.17	27.18	3.56						
2016	BG2000	0.26	1.87	0.87	0.5	17.54	4.27	0.04	32.93	7.14	14.82	401.91	86.13
2016	BG3000	0.13	20.97	3.46	0.02	26.35	3.9						
2016	BG4000	0.4	19.64	4.04									
2010	BG1000	0.5	4.43	1.62	0.55	30	4.16						
2010	BG2000	0.58	2.25	1.22	0.5	18.7	4.77	0.04	32.6	7.26	7.01	453.55	109.85
2010	BG3000	0.03	20.97	2.44	0.02	26.35	3.36						
2010	BG4000	0.09	2	0.85	0.8	22	5.83						

Source: WISE electronic reports.

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For groundwater bodies there was a slight decrease overall of 5 % in the number of water bodies between the first cycle and the second cycle (Table 2.3). The RBMPs explained that the delineation of the groundwater bodies was updated to address some technical errors and reduce fragmentation, to address recommendations from the Commission from the first RBMPs and to use updated data from geological research. The re-delineation was based on geological information, maps and new/targeted research used for the water abstraction permits. The RBMPs do not mention the consequences of these changes to groundwater bodies.

Transboundary river water bodies have been designated for three RBDs: Danube, East Aegean and West Aegean. The same three RBDs also identified transboundary groundwater bodies.[7]

Table 2.3 Number and area of delineated groundwater bodies in Bulgaria for the second and first cycles

Year	RBD	Number	Area (km²)		
			Minimum	Maximum	Average
2016	BG1000	50	27.71	13,158.04	1,480.44
2016	BG2000	40	3.21	3,474.01	737.29
2016	BG3000	41	20.19	6,596.79	963.68
2016	BG4000	38	7.24	3,080.28	409.93
2016	Total	169			
2010	BG1000	50	19	13,034.00	1,471.28
2010	BG2000	40	3	3,466.00	729.9
2010	BG3000	48	20.18	5,094.83	816.25
2010	BG4000	39	8.01	2,409.11	379.91
2010	Total	177			

Source: WISE electronic reports.

Table 2.4 summarises the information provided by Bulgaria on how water bodies have evolved between the two cycles. The water bodies with the most significant changes were river and lake water bodies with some deletions and in addition there was a significant amount of splitting of river water bodies (n = 348).

[7] Bulgaria subsequently clarified that transboundary water bodies (surface and groundwater) are agreed in the framework of the ICPDR in the overall management plan of the international basin of the Danube River Basin. Bulgaria further stated that for the second management cycle, a mapping exercise was carried out to fine-tune the boundaries on one cross-border groundwater body.
Bulgaria subsequently clarified for the Black Sea RBD and East Aegean RBD, the changes in border water bodies with the Republic of Turkey have been discussed during a bilateral meeting in Sofia in 2015.
Bulgaria subsequently clarified for the East Aegean RBD and the West Aegean Aegean RBD, changes in transboundary groundwater bodies are justified in the project "Study of transboundary groundwater bodies between Bulgaria and Greece" in which Greek experts are also involved. The variation of cross-border water bodies was discussed during a bilateral workshop held on 13 May 2016, Sandanski, Bulgaria.
Bulgaria subsequently clarified for the West Aegean RBD, changes in the granite water bodies were presented for the first time at the third meeting of the Greek group, the Bulgarian expert working sub-group held in Athens on 23 June 2015.

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Table 2.4 Type of change in delineation of groundwater and surface water bodies in Bulgaria between the second and first cycles

Type of water body change for second cycle	Groundwater	Rivers	Lake	Transitional	Coastal
Aggregation		19			
Splitting		348		12	3
Aggregation and splitting		46	5		11
Change		4	1		3
Extended area		9	1		
Creation		7	2		
Deletion		26	20		
Change in code		5	14		
No change		435	14	16	
Total water bodies before deletion		899	57	28	17
Delineated for second cycle (after deletion from first cycle)		873	37	28	17

Source: WISE electronic reports. Access to Groundwater data was restricted.

2.1.2 Delineation of small water bodies

Small water bodies are not explicitly discussed in the RBMPs. However, the national methodological document 'Method for determining/updating the borders of surface water bodies during the update of RBMP' contains some information about small water bodies. According to this methodology small water bodies can either be designated as water bodies based on some significance criteria (e.g. category, type, status, pressures), or managed as part of the larger water bodies. The methodology states that small water bodies can be designated as separate water bodies in the following cases:

- the water body is a drinking water safeguard zone (protected area) or another type of protected area under national legislation (the Water Law);
- its designation as a water body is the most effective way for achieving the environmental objectives.

2.1.3 Typology of surface water bodies

The number of surface water body types appears to have decreased overall by about 20 % between the first cycle and the second cycle. The national methodology for typology of surface water bodies has been developed since the first RBMP based on the projects 'Determining the reference conditions and maximum ecological potential for certain types of surface water bodies (rivers and lakes) on the territory of Bulgaria' and 'Development of a classification

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system and assessment of ecological status and ecological potential for certain types of surface water bodies (rivers and lakes) on the territory of Bulgaria (based on the typology system B)' in 2009-2012. The projects resulted in the designation of common national types for surface water bodies - 16 types for rivers and 17 types for lakes. These types and other findings from the projects were integrated in the national legislation with the 'Ordnance N4 on the characterisation of surface water bodies' from 14 September 2012 and applied in the second RBMPs.

Member States were asked to report 'Not applicable' if there is no corresponding intercalibration type for national types. Many national types (heavily modified, artificial and natural) have been intercalibrated. Several of the national types for Bulgaria in all of the RBDs do not appear to have corresponding intercalibration types for all river water body types and 10 lake types[8]. In the Black Sea RBD there are also no equivalent intercalibration types for five transitional water bodies and six coastal water body types[9].

The coordination of typology is not discussed at length in the RBMPs. The chapters on transboundary cooperation focus on presenting the framework for cooperation with each neighbouring country, listing the meetings that took place and providing summaries of the main issues discussed at each meeting. The methodology for designating the types and the typology of water bodies was discussed at bilateral meetings with Romania (Danube, Black Sea RBDs), Greece (East Aegean, West Aegean RBDs) and Turkey (Black Sea, East Aegean RBDs)[10].

[8] Bulgaria subsequently clarified that all national types were involved in the intercalibration exercise, which established conformity with the generic European types (TEC): 1 lake type and 5 type of rivers with the East AGS, a single type of rivers in the Mediterranean gears and 7 Black Sea area Black. All identified national types for the Danube Region (ecoregion 12) are intercalibrated, with the exception of 2 category 'river' (R9 and R15), as they do not have matching types in the GIG. The GIG (XLarge Rivers) — Danube (border water body with Romania type R6) is continuing the process of incorporation in the GIG (XLarge Rivers) and Bulgaria and Romania participate in GIG.

[9] Bulgaria subsequently clarified that to date, common types of transitional water bodies have not been identified at European level through the Black Sea ID as well as common types of rivers and lakes in the catchment area of the River Maritsa, River Struma, River Miles and Dospat (ecoregion 7).

[10] Bulgaria highlighted that A survey on the conformity of national surface water types with other neighbouring countries types was carried out between 2014 and 2016, with detailed information on a national supporting document
http:
//cdr.eionet.europa.eu/bg/eu/wfd2016/documents/national/envwcq9cw/SWB_Posible_Common_Types.doc/manage_document). The report suggests possible actions for cross-border cooperation in this regard.

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Table 2.5 Number of surface water body types at RBD level in Bulgaria for the first and second cycles

RBD	Rivers		Lakes		Transitional		Coastal	
	2010	2016	2010	2016	2010	2016	2010	2016
BG1000	22	13	6	3	0	0	0	0
BG2000	9	8	3	4	5	5	6	9
BG3000	10	10	5	4	0	0	0	0
BG4000	17	6	4	5	0	0	0	0
TOTAL	55	20 (15)	18	10 (6)	5	5	6	9

Source: WISE electronic reports. Note that the total is not the sum of the types in each RBD as some types are shared by RBDs. Values in brackets were subsequently reported by Bulgaria but do not match the data reported to WISE.

2.1.4 Establishment of reference conditions for surface water bodies

Table 2.6 shows the percentage of surface water body types in Bulgaria with reference conditions established for the first and second cycles[11]. Type specific reference conditions have been established for all relevant biological quality elements for 44 % of lakes[12], 64 % of rivers and 20 % of transitional waters[13] but only for some biological elements in coastal waters. Type specific reference conditions have not been established for hydromorphological quality elements in transitional or coastal waters. Physicochemical quality elements have been established for 78 % of elements in lakes, 56 % in rivers and 40 % transitional but none in coastal waters.

Reference conditions have been coordinated with some but not all Member States for biological quality elements, physico-chemical quality elements and hydromorphological quality elements. Reference conditions were only mentioned in the East Aegean and West Aegean RBMPs in relation to issues discussed at bilateral meetings with Greece. However, it is not specified which elements these reference conditions refer to. The other RBMPs do not mention if reference conditions were discussed at transboundary coordination meetings.

[11] Bulgaria subsequently highlighted that as the summaries in WISE are made per category, they are not the correct basis for specific analysis for Bulgaria e.g. the river category includes rivers with the performance characteristics of lakes (rivers which are dammed).

[12] Bulgaria subsequently clarified that in the case of lakes, there are no specified reference conditions for biological quality elements and macroinvertebrates, due to the absence of a legally established classification system for the assessment of the ecological condition.

[13] Bulgaria subsequently clarified that transitional waters in the Black Sea RBD are identified in estuaries and in coastal lakes rather than in marine waters. In this context biological quality elements, such as, macrophytes and not macroalgae and angiosperms are used for ecological status assessment; phytoplankton is used for lakes type and phytobenthos for rivers . Bulgaria stated that some of the biological quality elements in this category are subject to reference conditions and others have to be determined.

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Table 2.6 ***Percentage of surface water body types in Bulgaria with reference conditions established for all, some and none of the biological, hydromorphological and physicochemical quality elements***

Waterbody category	Waterbody types	Biological quality elements	Hydromorphological quality elements	Physicochemical quality elements
Rivers	All	64%	48%	56%
	Some	12%		16%
	None	24%	52%	28%
Lakes	All	44%	78%	78%
	Some	44%		
	None	17%	22%	22%
Transitional	All	20%		40%
	Some	60%		
	None	20%	100%	60%
Coastal	All			
	Some	100%		
	None		100%	100%

Source: WISE electronic reports

2.1.5 Characteristics of groundwater bodies

The geological formation of the aquifer types where there are groundwater bodies, along with details of whether groundwater bodies are layered or not, are reported. Further characterisation work has been reported since the first cycle with the inclusion of the assessment of linkages to surface water bodies and terrestrial ecosystems. The methodology used in the first RBMPs was refined and a common national methodology entitled 'Methodology for characterisation of groundwater bodies' was developed and applied in the second RBMPs.

2.1.6 Significant pressures on water bodies

In the second cycle, “no significant pressure” was reported most often (39 % of water bodies) and the most significant pressures on surface waters were reported to be anthropogenic pressure – unknown (23 %), point - urban waste water (22 %) and diffuse – agricultural (19 %) (Figure 2.2. In the first cycle, Bulgaria only reported pressures at an aggregated level making it difficult to compare reporting of the first and second cycle pressures. There has been an apparent increase in the reporting of hydromorphological pressures (Figure 2.3) and unknown anthropogenic pressures (or other pressures). Diffuse pressures appear to have decreased in the East Aegean and West Aegean RBDs.

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For groundwater bodies, diffuse – agricultural (50 %) and diffuse - discharges not connected to sewerage network (49 %) were reported to be the most significant pressures (Figure 2.2). “No significant pressure” however, was also reported for 41 % of water bodies.

For the second cycle, it was reported which significant pressures were not assessed for surface waters, which were different in each RBD. For surface water bodies the pressures and activities covered are:

- point sources: urban wastewater, industrial wastewater; animal farms and aquaculture (only in the East Aegean RBD);
- diffuse sources: urban areas without sewage systems, waste landfills, agriculture, aquaculture, erosion, land use, atmospheric and transport pollution; mining activities (only in the Danube and West Aegean RBDs); tourism, past activities (only in the West Aegean RBD);
- physical/ hydromorphological alterations: water abstraction, morphological alterations, water flow regulation;
- pressures from invasive species;
- pressures from climate change;
- pressures from fisheries, dredging and ports (only the Black Sea RBD);
- pressures from navigation (only Danubian and Black Sea RBDs).

Overall, the same types of pressures and related activities are covered in each RBMP, for groundwater bodies the pressures and activities covered are:

- point sources: urban WWTPs, industrial installations; farms and storage facilities for pesticides and fertilisers, waste landfills, mines and quarries, past activities;
- diffuse sources: agriculture, landfills, mines, past activities, urban areas without sewage systems;
- pressures from water abstraction;
- pressures from climate change.

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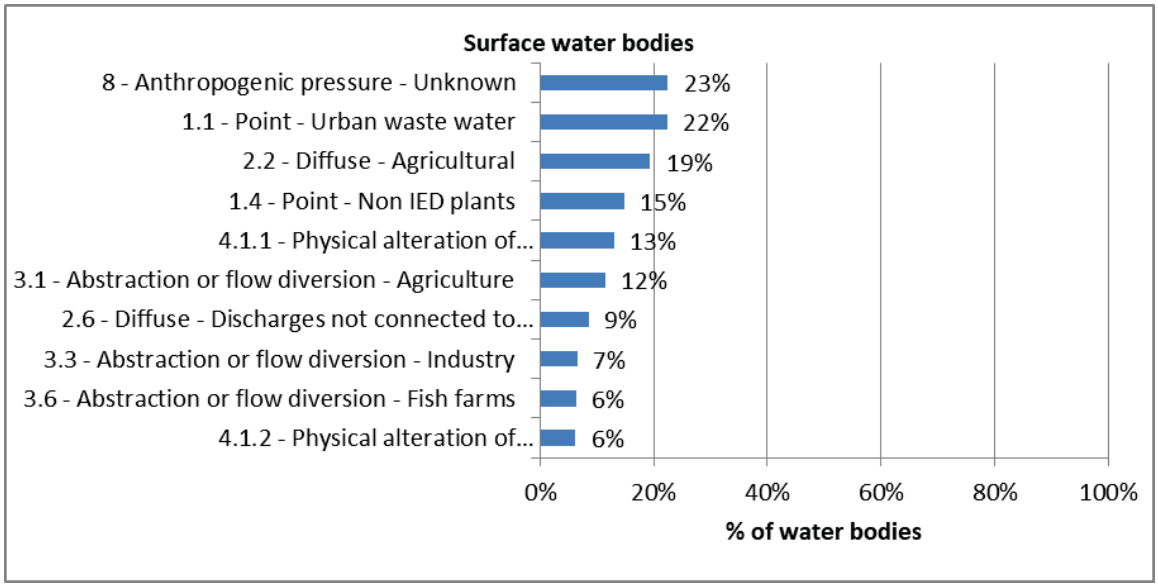
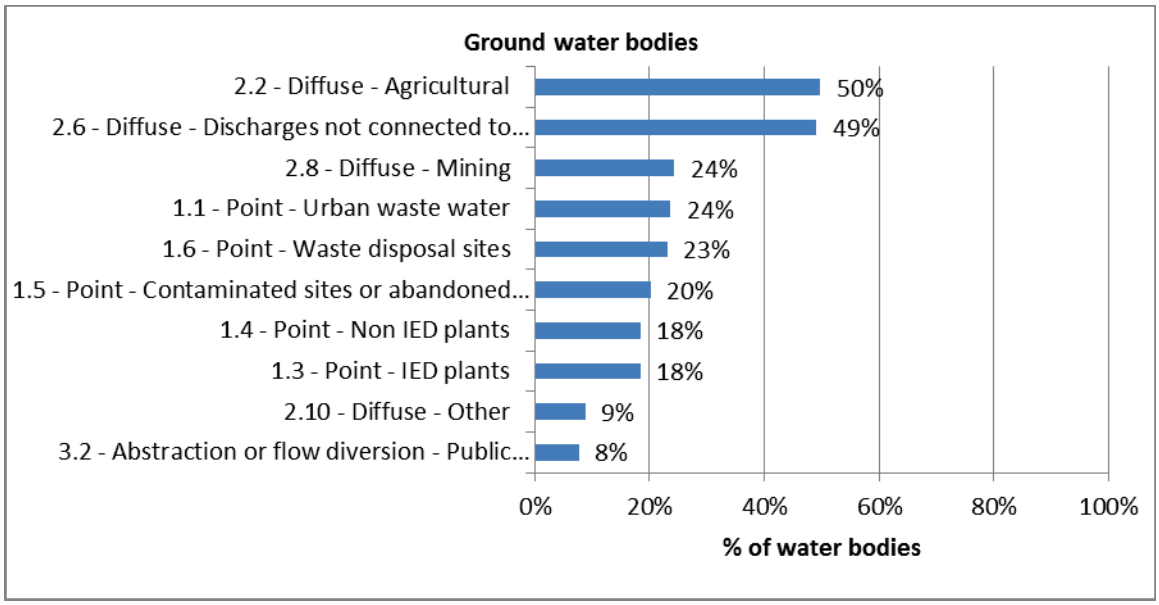
There were 14 pressures in the Danube RBD not assessed, 13 in the Black Sea RBD, five in the East Aegean RBD and 12[14] in the West Aegean RBD. The RBMPs do not provide any information as to why some pressures have been excluded from the risk assessment. The RBDs did not report any significant pressures that were not assessed for groundwater.

Figure2.2 The most significant pressures on surface water bodies and groundwater bodies in Bulgaria for the second ***cycle***





Source: WISE electronic reports.

[14] Bulgaria subsequently clarified that reporting for the West Aegean RBD had an error, under the element of "SWPressures_swPressuresNotAssessed", completed information indicated that 46 types of pressure have been assessed but in reality, 44 pressures have been assessed and 12 pressures have not been assessed.

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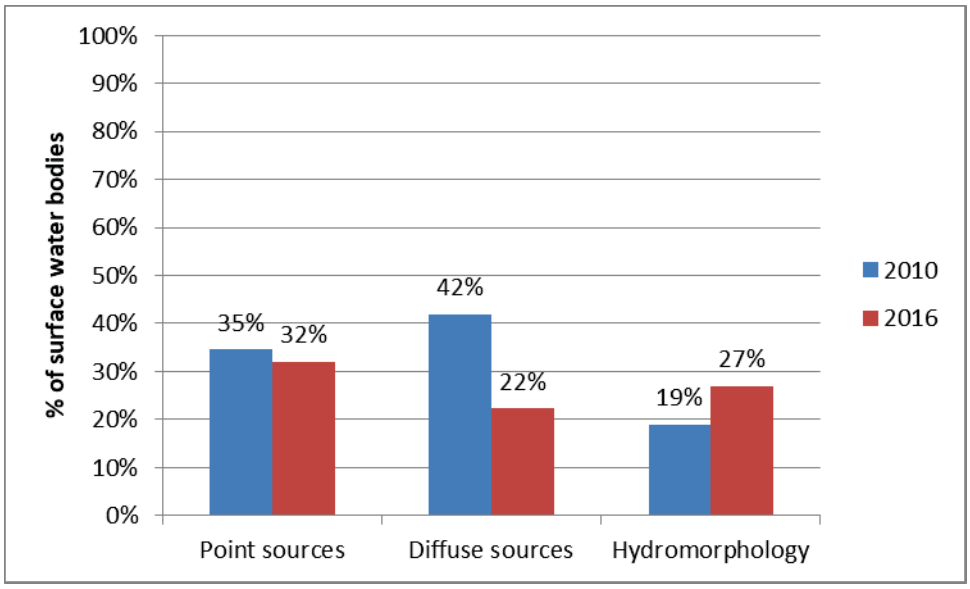
Figure 2.3 ***Comparison of pressures on surface water bodies in Bulgaria in the first and second cycles. Pressures presented at the aggregated level. Note there were 955 identified surface water bodies for the second cycle and 759 for the first cycle***



Source: WISE electronic reports.

2.1.7 Definition and assessment of significant pressures on surface and groundwater

For surface waters the tools used to define significant pressures varied depending on the pressure. A combination of both expert judgement and numerical tools were used for defining diffuse and point pressures in all RBDs[15]. For surface water bodies the significance of pressures is reported to be defined in terms of thresholds and linked to the potential failure of objectives for all RBDs except the Black Sea RBD.

For groundwaters a combination of expert judgement and numerical tools were used for defining diffuse and point source pressures and abstractions in the Danube RBD. Numerical tools were used in the Black Sea and West Aegean RBDs. For the East Aegean RBD a combination of both were used for defining diffuse and point pressures and numerical tools only for abstractions pressures[16]. For groundwater, the significance of pressures is reported to be defined in terms of thresholds and linked to the potential failure of objectives for all RBDs[17].

[15] Only expert judgement was reported to be used in the East Aegean RBD however Bulgaria subsequently clarified that this is a reporting error.

[16] Artificial recharge pressures were reported in WISE to have been assessed in the West Aegean RBD using numerical tools; however, Bulgaria subsequently clarified that this was a technical error and there is no pressure from artificial recharge of groundwater in any of their RBDs

[17] For groundwater, significance of pressures is reported not to be defined in terms of thresholds or linked to the potential failure of objectives for the Black Sea RBD. Bulgaria subsequently clarified that pressure assessments in all RBDs have been carried out according to the adopted national approaches.

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The use of common national methodologies for analysing the pressures from point and diffuse pollution sources, water abstraction and climate change was reported.

The approach used for defining pressures on surface water bodies in the first RBMPs was refined to determine the 'driving force-pressure-status-impact' relationships, expand the analysis of pressures (e.g. by considering more sources of pressures) and to implement results from models, projects and research (e.g. MONERIS, WATER, PegOpera). These changes are only explicitly summarised in the Danube RBMP.

The RBMPs do not explicitly discuss the tools or methodologies for assessment of each type of pressure; they only briefly present the general approach and then the results for each type of pressure for each type of water body. However, the RBMPs contain tables with the potential impacts of different types of pressure and the indicators for their reporting.. The main text of all RBMPs list the data sources of the information used to analyse the pressures. The website of the Ministry of Environment and Water (MOEW) suggests the following national methodologies exist:

- 'Pressures and impact on the quantitative status of groundwater bodies and Methodology for assessment of the risk that groundwater bodies do not reach good quantitative status';
- 'Methodology for assessment of the pressure and impact on surface water bodies and groundwater bodies of climate change and assessment of the availability of water for economic sectors';
- 'Methodology for analysis of the pressure and impact of anthropogenic activities related to water abstraction from surface waters'.

The Danube and East Aegean RBMPs provide brief overviews of the remaining gaps in relation to pressure analysis that could be the reasons for the different approaches reported for different RBDs. Examples of gaps mentioned in these two RBMPs are:

- no common methods or methodologies for some pressure assessments i.e. diffuse sources, and quantitative source apportionment
- insufficient monitoring data or data of insufficient quality (credibility, coverage, format) for some pressures assessments;
- no models to assess the impacts of different pressures, including their cumulative impacts.

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2.1.8 Significant impacts on water bodies

In the second cycle, the most significant impact on surface water bodies was nutrient pollution (40 %) and organic pollution (25 %), with 36 % classified as having “no significant impact”.

For groundwaters over 50 % were classified as “no significant impact”. The most significant impacts were classified as nutrient pollution (27 %) and chemical pollution (11 %). Bulgaria did not report on impacts in the first cycle.

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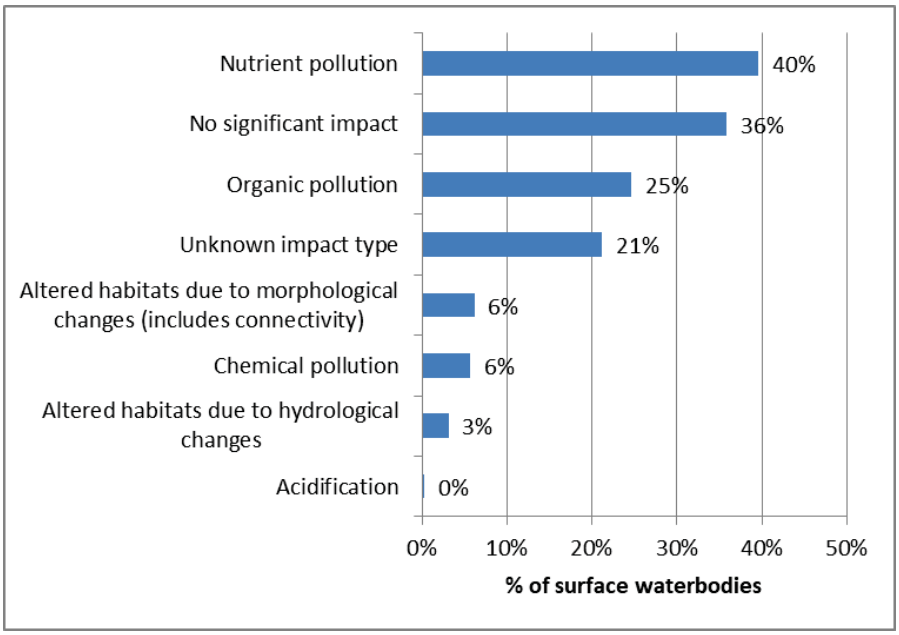
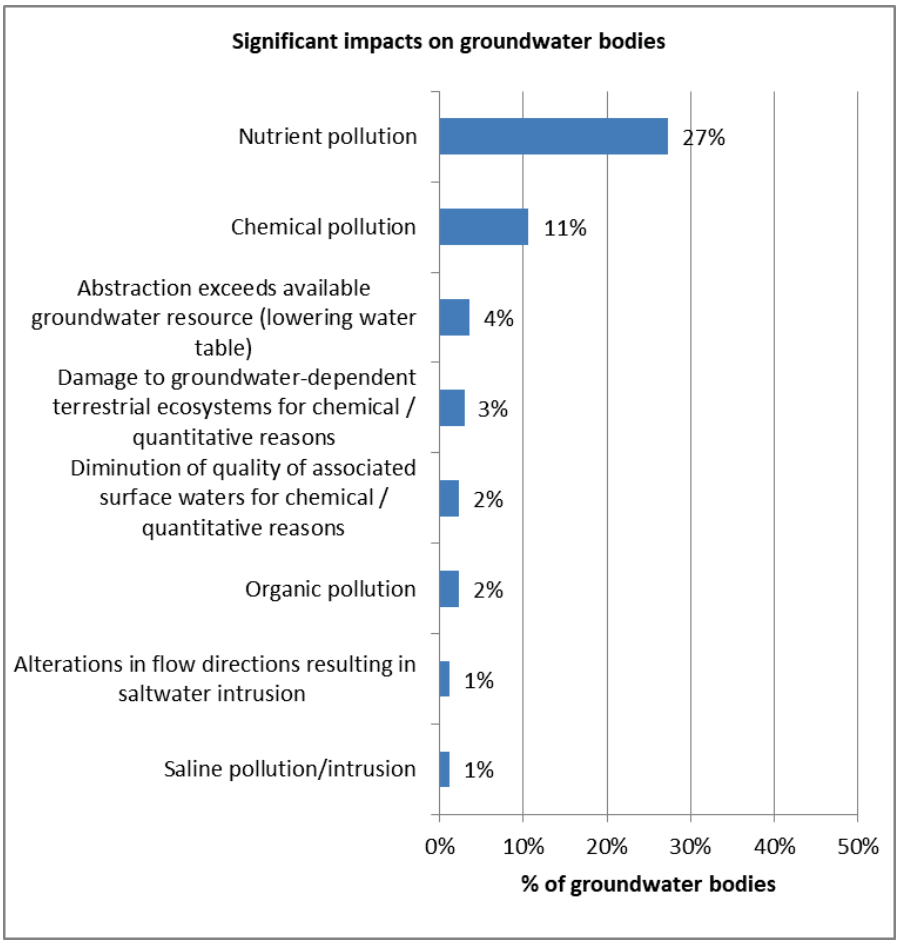
Figure 2.4 ***Significant impacts on surface water and groundwater bodies in Bulgaria for the second cycle. Percentages of numbers of water bodies***





Source: WISE electronic reports

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2.1.9 Quantification of the gap and apportionment of pressures

There are some inconsistencies in significant pressures reported at the water body level and the pressures for which measures are planned. For example, in the Danube RBD, diffuse - contaminated sites or abandoned industrial sites has been reported at the groundwater body level but this pressure has not been reported as being tackled in the Programme of Measures. Similarly, in the Black Sea RBD, abstraction or flow diversion - public water supply is reported at a surface water body level but not in the Programme of Measures[18].

Priority Substances and other substances causing the failure of good chemical status have been reported. The measures to tackle these substances to achieve good status by 2027 or the indicator gap have not been reported and were listed in Annex 0 by Bulgaria.

2.1.10 Groundwater bodies at risk of not meeting good status

In each RBD groundwater bodies were reported to be at risk of failing to meet good chemical status, ranging from 24 to 72 % of water bodies. The pollutants putting groundwater bodies at risk of failing good chemical status have been reported.

In each RBD groundwater bodies were reported to be at risk of failing to meet good quantitative status, ranging from 15 to 26 % of water bodies.

2.1.11 Inventories of emissions, discharges and losses of chemical substances

Article 5 of the Environmental Quality Standards Directive 2008/105/EC[19] (EQS Directive) requires Member States to establish an inventory of emissions, discharges and losses of all Priority Substances and the eight other pollutants listed in Part A of Annex I of the EQS Directive for each RBD, or part thereof, lying within their territory. This inventory should allow Member States to further target measures to tackle pollution from priority substances. It should also inform the review of the monitoring networks, and allow the assessment of progress made in reducing (respectively suppressing) emissions, discharges and losses for priority substances (respectively priority hazardous substances).

Bulgaria reported an inventory of emissions for each of the RBDs, however these inventories included only between four and six of the 41 Priority Substances.

[18] Bulgaria subsequently clarified that this was because only the national measures were reported in the Programme of Measures but not the actions to implement these measures.

[19] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council

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These inventories were based on Common Implementation Strategy Technical Guidance Document No. 28[20] and on additional guidance documents developed at national level such as 'Methodological guidance for determining the mass weight of pollutants in waste waters from point sources when compiling the first inventory of emissions, discharges and losses of Priority Substances and some other pollutants' and 'Instructions for implementing the first inventory of emissions, discharges and losses of Priority Substances and some other pollutants'.

The two step approach from the Common Implementation Strategy Guidance Document no 28 has been followed for the substances considered in the inventories. For these substances a combination of Tier 1 (point source information) and Tier 2 (riverine load) was implemented (the Guidance Document recommends using at least Tier 1+2 for the substances relevant at RBD level). The data quality was assessed as uncertain.

The RBMP specifies that between 2017 and 2018 an action plan for improving the implementation of inventory of Priority Substances will be carried out where the main aim will be to refine the tools and methods for the inventory.

2.2 Main changes in implementation and compliance since first cycle

Overall there was a significant change in the number of water bodies delineated between the first cycle and the second cycle. For example, for river water bodies there was a 27 % increase overall with the increase as high as 63 % in the Danube RBD and for the Black Sea RBD there was an 87 % increase in transitional water bodies and a 31 % increase in coastal water bodies. For groundwater bodies there was a slight decrease overall of 5 %. The number of surface water body types appears to have decreased overall by about 20 % between the first cycle and the second cycle.

There has been an apparent increase in the reporting of hydromorphological pressures and unknown anthropogenic pressures (or other pressures) for surface waters between the first cycle and the second cycle. Diffuse pressures appear to have decreased in the East Aegean and West Aegean RBDs. This is likely a result of changes in methodologies as discussed in the previous section.

2.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

[20] CIS Guidance N° 28 - Preparation of Priority Substances Emissions Inventoryhttp://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

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- Recommendation: *The existing pressures are not being sufficiently detected, particularly where complex pressure factors exist, e.g. combined pollution from diffuse and point sources, or combined pressures from pollution and hydromorphological alterations. Pressures should be sufficiently detected.*

  Assessment: For the second cycle, it was reported which significant pressures were not assessed for surface waters. The pressures listed were different in each RBD. There were 14 pressures not assessed in the Danube, 13 in the Black Sea, 5 in the East Aegean RBD and 12 the West Aegean RBD. However, pressures from aquaculture were addressed in all RBDs as were diffuse atmospheric deposition, with the exception of the Black Sea RBD. No explanation for why certain pressures were not assessed was found in the RBMPs. The approach used for defining pressures on surface water bodies in the first RBMPs was refined to determine the 'driving force-pressure-status-impact' relationships, expand the analysis of pressures (for example by considering more sources of pressures) and to implement results from models, projects and research. Therefore, this recommendation has partially been fulfilled.

- Recommendation: *Set out in the second RBMPs a clear assessment of the pressure agriculture is exerting on the status of water bodies.*

  Assessment: In terms of characterisation, diffuse – agricultural has been identified as a significant pressure in each RBD and accounts for 8 % of the pressures overall. The review of the RBMPs revealed that there are no common methods or methodologies for some pressure assessments i.e. diffuse sources and their source apportionment. Further progress is therefore required to meet this recommendation.

- Recommendation: *Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and in the assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

  Assessment: In terms of characterisation, the following conclusions on the progress to this recommendation are made below:

  The minimum size criterion for delineating river water bodies was reported to be a 10 km^2 catchment size for each RBD which is the same as the European Union average. When comparing the minimum reported catchment areas of rivers between the first cycle and the second cycle, it was observed that for the Danube RBD there was a decrease in minimum size from 0.55km^2 to 0.17km^2, there was no change for the Black Sea and East Aegean RBDs, and the West Aegean RBD did not report the minimum size in the second

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cycle. The two main criteria for designating small water bodies according to the national methodology was if the water body is a drinking water safeguard zone (protected area) or another type of protected area under national legislation (the Water Law) or if its designation as a water body is the most effective way for achieving the environmental objectives.

There are gaps in the development of type specific reference conditions, for example, type specific reference conditions have only been established for all relevant biological quality elements for 33 % of lakes, 57 % of rivers and 20 % of transitional waters but only for some biological elements in coastal waters.

Overall, this recommendation has been partially fulfilled.

- Recommendation: *Review the pressures and impacts analysis and status assessment in a consistent manner across all RBDs in the second RBMP and ensure that the measures are based on the updated pressures and impacts analysis and status assessment of water bodies.*

  Assessment: There have been significant changes in the delineation of water bodies between the first and second cycle. For example, for river water bodies there was a 27 % increase overall with the increase as high as 63 % in the Danube RBD. The tools used to define significant pressures varied depending on the pressure and the approaches also sometimes differed between RBDs. For groundwater either a combination of expert judgement and numerical tools or just numerical tools were used for all pressure types. Expert judgement was used for defining water flow pressures in all RBDs except the Black Sea, and expert judgement was also used for abstraction pressures in the Danube RBD. The significance of pressures from navigation appears to have been addressed only in the Black Sea RBD and Danube RBD. There appears to be some progress made in implementing this recommendation but there is still some inconsistency between RBDs. Therefore this recommendation has been partially fulfilled.

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Topic 3 Monitoring, assessment and classification of ecological status in surface water bodies

3.1. Assessment of implementation and compliance with WFD requirements in second RBMPs

3.1.1 Monitoring of ecological status/potential

Monitoring programmes

Article 8.1 of the WFD requires Member States to establish monitoring programmes for the assessment of the status of surface water and of groundwater in order to provide a coherent and comprehensive overview of water status within each RBD.

Bulgaria reported 54 different monitoring programmes for the second cycle covering groundwater, coastal waters, transitional waters, lakes and rivers. Generally the programmes are specific for each RBD, for each water category in the RBD and for surveillance and operational purposes. Bathing water and Nitrates Directive[21] programmes are reported for surface waters.

Monitoring sites

Table 3.1 compares the number of monitoring sites used for surveillance and operational purposes between the cycles, and Table 3.2 gives the number of sites used for different purposes for the second cycle.

Table 3.1 Number of sites used for surveillance and operational monitoring in Bulgaria for the second and first RBMPs. Note that for reasons of comparability with data reported in the first cycle, the second cycle data does not take into account whether sites are used for ecological and/or chemical monitoring

	Rivers		Lakes		Transitional		Coastal	
	Surv.	Op	Surv.	Op	Surv.	Op	Surv.	Op
second RBMP								
BG_1000	131 (288)	0 (58)	1 (6)	0				
BG_2000	307 (307)	20 (23)	2 (2)	0	28 (28)	15 (18)	14 (14)	6 (6)

[21] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

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BG_3000	34 (34)	147 (149)	1 (1)	0 (1)				
BG_4000	20 (32)	118 (257)	1 (5)	14 (15)				
Total by type of site	*492 (661)*	*285 (487)*	*5 (14)*	*14 (16)*	*28 (28)*	*15 (18)*	*14 (14)*	*6 (6)*
Total number of monitoring sites used for surveillance and/or operational monitoring	*756 (1107)*		*19 (30)*		*35 (35)*		*20 (20)*	
first RBMP								
BG_1000	97	59	40	0				
BG_2000	10	18	9	14			7	3
BG_3000	12	74	8	4				
BG_4000	27	67	5	4				
Total by type of site	*146*	*218*	*62*	*22*	*0*	*0*	*7*	*3*
Total number of monitoring sites used for surveillance and/or operational monitoring	*364*		*84*		*0*		*10*	

Sources: Member States electronic reports to WISE. The Bulgaria Authorities subsequently stated that there had been some errors in reporting the purpose of monitoring information at site level. The values in brackets in the Table above for the second RBMP are the values from the reported information at the monitoring programme level and their associated monitoring sites.

Table 3.2 Number of monitoring sites in relevant water categories used for different purposes in Bulgaria

Monitoring Purpose	Lakes	Rivers	Transitional	Coastal
BWD - Recreational or bathing water - WFD Annex IV.1.iii		4		90
CHE - Chemical status	7	302	26	17
DWD - Drinking water - WFD Annex IV.1.i	8	319		
ECO - Ecological status	35	1562	35	20
HAB - Protection of habitats or species depending on water - WFD Annex IV.1.v	1	112	17	10
NID - Nutrient sensitive area under the Nitrates Directive - WFD Annex IV.1.iv	10	266	5	6
OPE - Operational monitoring	14	285	15	6
REF - Reference network monitoring site	7	58	6	4
RIV - International network of a river convention (including bilateral agreements)		12		
SHE - Shellfish designated waters - WFD Annex IV.1.ii				7
SOE - EIONET State of Environment monitoring	6	171	8	
SUR - Surveillance monitoring	5	492	28	14
UWW - Nutrient sensitive area under the Urban Waste Water Treatment Directive - WFD Annex IV.1.iv	2	326	35	20

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Monitoring Purpose	Lakes	Rivers	Transitional	Coastal
Total sites irrespective of purpose	**40**	**1790**	**35**	**110**

Source: WISE electronic reports. Bulgaria subsequently stated that there has been a technical error in reporting and the number of sites reported for operational and surveillance monitoring may not be correct.

There were no monitoring sites in transitional waters for the first RBMPs, but there were sites for surveillance and operational purposes reported in the second RBMPs. There were operational sites in lakes in three RBDs reported for the first RBMPs but only in two for the second.

Because of reporting errors in WISE for the second RBMPs it is not possible to make quantitative comparisons of the numbers of monitoring sites between the two RBMPs. However, it can be concluded that there have been increases in the number of surveillance and operational sites in rivers, transitional and coastal waters, and decreases in the numbers of surveillance and operational sites in lakes from the first to the second RBMPs.

Monitored quality elements (excluding River Basin Specific Pollutants)

Table 3.3 illustrates the quality elements used for the monitoring of surface waters for the second RBMP: no differentiation is made between purposes of monitoring.

Table 3.3 Quality elements monitored for the second RBMP in Bulgaria (excluding River Basin Specific Pollutants). Note: quality element may be used for surveillance and/or operational monitoring

	Biological quality elements								
	Phytoplankton	**Macrophytes**	**Phytobenthos**	**Benthic invertebrates**	**Fish**	**Angiosperms**	**Macroalgae**	**Other aquatic flora**	**Other species**
Lakes	Yes	Yes		Yes	Yes			No	
Rivers	Yes	Yes	Yes	Yes	Yes			No	
Transitional	Yes	Yes	Yes	Yes	Yes	No	No	No	
Coastal	Yes	No	No	Yes		Yes	Yes	No	

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	Hydromorphological quality elements		
	Hydrological or tidal regime	Continuity conditions	Morphological conditions
Lakes	No		No
Rivers	Yes	Yes	Yes
Transitional	No		No
Coastal	Yes		Yes

	General physicochemical quality elements								
	Transparency conditions	Thermal conditions	Oxygenation conditions	Salinity conditions	Acidification status	Nitrogen conditions	Phosphorus Conditions	Silicate	Other determinand for nutrient conditions
Lakes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Rivers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Transitional	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Coastal	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No

Source: WISE electronic reports

There was no monitoring of transitional waters reported for the first RBMPs. All expected biological quality elements were reported to be monitored in coastal waters and rivers for the first RBMPs and in lakes all biological quality elements except phytobenthos were monitored. All expected hydromorphological and physicochemical quality elements were reported to be monitored in coastal waters, rivers and lakes for the first RBMP.

There are some significant gaps in the quality elements monitored in Bulgaria for the second RBMPs. The monitoring of macroalgae and angiosperms is missing in transitional waters, though macrophytes and phytobenthos are used, which are generally required for freshwaters[22]. Macrophytes and benthic invertebrates are not monitored in lakes in one RBD, and fish are not monitored in lakes in two RBDs[23]. The monitoring of phytobenthos in lakes is missing[24].

[22] Bulgaria subsequently indicated that transitional waters in the Black Sea RBD are identified in estuaries and in coastal lakes rather than in marine waters. They are therefore monitored for phytobenthos rather than for macroalgae and angiosperms.

[23] Bulgaria subsequently indicated that lakes in the Danube RBD have been monitored for fish and benthic invertebrates, and lakes in the West Aegean RBD for macrophytes and benthic invertebrates. In addition 1 lake in the East Aegean RBD was monitored for macrophytes and benthic invertebrates in 2011. However, these results were not reported.

[24] Bulgaria subsequently indicated that this BQE was included in lakes in the third intercalibration phase, which was not completed at the time of preparation of the second RBMPs and continued afterwards.

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Hydromorphological quality elements are not monitored in lakes and transitional waters, and only monitored in coastal waters and, in one of the four RBDs, in rivers[25].

Annex V of the WFD provides guidance on the frequency of monitoring of the different quality elements. Surveillance monitoring should be carried out for each monitoring site for a period of one year during the period covered by a RBMP i.e. six years. For phytoplankton, this should be done twice during the monitoring year and for the other biological quality elements once during the year. As a guideline, operational monitoring should take place at intervals not exceeding once every six months for phytoplankton and once every three years during the six year cycle for the other biological quality elements. Greater intervals may be justified on the basis of technical knowledge and expert judgement.

For the surveillance monitoring of phytoplankton, all sites in coastal waters were monitored at least at the minimum frequency; this was not the case in the other three water categories[26]. All sites used for the surveillance monitoring of the other biological quality elements in all water categories were monitored at least at the minimum frequency. In terms of operational monitoring, phytoplankton was monitored at least at the minimum frequency in all sites where they were monitored in coastal waters, lakes and rivers; none of the sites were in transitional waters.

Six of the 12 biological quality elements used for the operational monitoring of surface waters were monitored at all sites where they were monitored at least at the minimum sampling frequency. Two biological quality elements, fish and macrophytes, were not sampled at the minimum sampling frequency in any of the sites at which they were monitored in transitional waters.

Monitoring of River Basin Specific Pollutants

River Basin Specific Pollutants are reported to be monitored (at the generic level) in all of the water categories relevant to each RBD, except for lakes in the Black Sea RBD.

63 different River Basin Specific Pollutants (reported at the chemical substance level) are monitored in Bulgaria: one in coastal waters, 22 in lakes, 62 in rivers, none in transitional waters (even though they were reported at a generic level). All are only monitored in water. The highest number of sites were for the monitoring of iron (464 sites), followed by manganese (463 sites) and copper (315 sites).

[25] Bulgaria subsequently stated that monitoring for hydromorphological quality elements had been performed in 2012 in the Black Sea, East Aegean, and West Aegean RBD. This information was not reported to WISE.

[26] Note that this assessment is based on monitoring purpose data reported to WISE at the monitoring site level. Bulgaria has subsequently indicated that some of these data may not have been fully reported: the analysis should therefore be treated with caution.

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Annex V of the WFD provides guidance on the frequency of monitoring of the different quality elements: once every three months is recommended for "other pollutants" which are taken here to equate to river basin specific pollutants. Surveillance monitoring should be carried out for each monitoring site for a period of one year during the period covered by a river basin management plan i.e. six years. For river basin specific pollutants this should be done four times in the surveillance year, and for operational monitoring four times a year for each year of the cycle.

Of the 47 River Basin Specific Pollutants included in surveillance monitoring of surface waters in Bulgaria, seven were monitored at least at the minimum frequency at all of the sites where they were monitored, and 24 pollutants at none of the sites[27]. Of the 36 River Basin Specific Pollutants included in operational monitoring of surface waters in Bulgaria, 23 were monitored at least at the minimum frequency at all of the sites where they were monitored, and four pollutants at none of the sites.

Table 3.4 shows the number of sites used to monitor River Basin Specific Pollutants in Bulgaria in the first and second RBMPs.

Table 3.4 ***Number of sites used to monitor River Basin Specific Pollutants reported in the second RBMP and non-priority specific pollutants and/or other national pollutants reported in the first RBMP in Bulgaria. Note the data from both cycles may not be fully comparable as different definitions were used and also not all Member State reported information at the site level meaning that there were no equivalent data for the first cycle***

RBMP		Lakes	Rivers	Transitional	Coastal
first	Sites used to monitor non-priority specific pollutants and/or other national pollutants	66	283	0	10
second	Sites used to monitor River Basin Specific Pollutants	11	599	25	20

Sources: WISE electronic reports

Surveillance monitoring of surface water bodies[28]

All nine coastal water bodies included in surveillance monitoring were monitored for all required biological, hydromorphological and physicochemical quality elements.

[27] Note that this assessment is based on monitoring purpose data reported to WISE at the monitoring site level. Bulgaria subsequently indicated that some of these data may not have been fully reported; the analysis should therefore be treated with caution.

[28] Note that this assessment is based on monitoring purpose data reported to WISE at the monitoring site level. Bulgaria has subsequently indicated that some of these data may not have been fully reported; the analysis should therefore be treated with caution

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None of the lake and transitional water bodies included in surveillance monitoring was monitored for all required biological quality elements, whereas a proportion of river water bodies in surveillance monitoring in three of the four RBDs were monitored for all required biological quality elements: the minimum was 11 % in the West Aegean RBD and maximum 61 % in the Black Sea RBD.

Lakes and transitional water bodies were not monitored for any hydromorphological quality elements. Only two river water bodies included in surveillance monitoring were monitored for hydromorphological quality elements but neither was monitored for all the required ones.

Lakes in three of the four RBDs were monitored for all required physicochemical quality elements in surveillance monitoring; in the other RBD none were. Nearly all river water bodies in surveillance monitoring in three of the four RBDs were monitored for all required physicochemical quality elements; in the other RBD, 70 % were. 63 % of transitional water bodies in surveillance monitoring were monitored for all required physicochemical quality elements.

At the national level around a quarter of water bodies in each category were included in operational monitoring. There were greater differences in the proportion of water bodies included in the surveillance monitoring of each category than for operational monitoring: 86 % of transitional water bodies, 53 % of coastal water bodies, 30 % of river water bodies and 14 % of lake water bodies were included in surveillance monitoring.

It should be noted that there were significant increases in the number of delineated coastal, river and transitional water bodies for the two cycles. For example, 688 river water bodies were delineated for the first RBMP compared to 873 for the second. For lakes there was a decrease from 43 for the first to 37 for the second RBMP. Figure 3.1 shows the proportion of water bodies subject to surveillance and operational monitoring.

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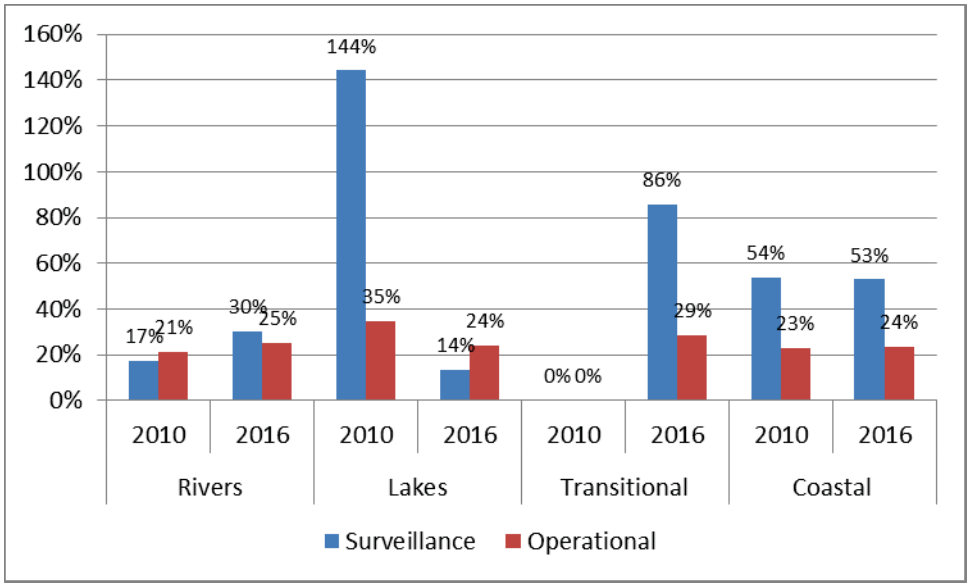
Figure 3.1 ***Percentage of water bodies included in surveillance and operational monitoring in Bulgaria for the first cycle (2010) and second cycle (2016). Note no differentiation is made between water bodies included in ecological and/or chemical monitoring***



Source: WISE electronic reports

Similar proportions of coastal water bodies were included in operational and surveillance monitoring for both cycles. A significant difference was that transitional water bodies were not operationally monitored for the first RBMPs but 29 % were for the second RBMPs. The comparison between the two cycles should be treated with caution as there are uncertainties in the data reported for Bulgaria in the first RBMPs. In particular some river and lake water body codes were reported as part of the WISE reporting on monitoring sites but were not included in the reporting of surface water bodies itself.

Figure 3.2 shows the proportion of water bodies subject to surveillance monitoring.

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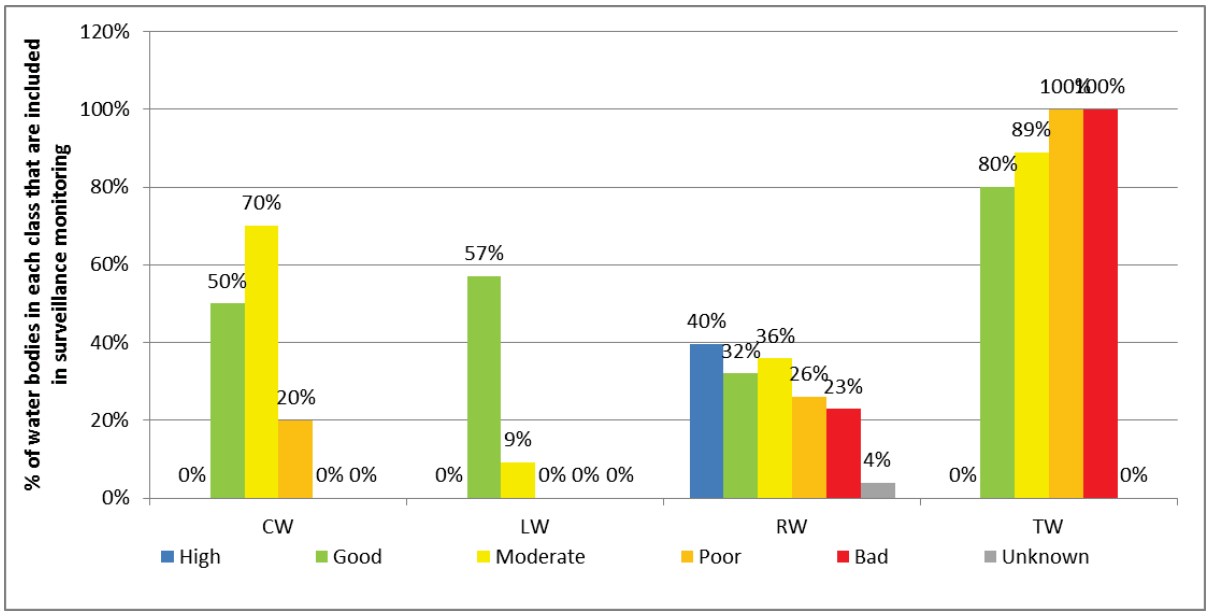
Figure 3.2 ***Proportion of water bodies in each ecological status/potential class that are included in surveillance monitoring in Bulgaria***



Source: WISE electronic reports

Operational monitoring of surface water bodies[29]

Lakes are only operationally monitored in the West Aegean RBD even though significant pressures were reported for lakes in the other RBDs. The nine lakes included in operational monitoring are all monitored for phytoplankton and benthic invertebrates, and four of them for macrophytes. Rivers in the Danube RBD are not included in operational monitoring, while those in the other three RBDs are. The most used biological quality element for rivers is benthic invertebrates (85 % of river water bodies in operational monitoring), followed by phytobenthos (33 %), macrophytes (16 %) and fish (9 %). All four coastal water bodies in operational monitoring are monitored for all of the relevant biological quality elements. Transitional water bodies in operational monitoring are monitored for four biological quality elements, though macrophytes are reported to be monitored rather than the expected angiosperms and macroalgae[30].

In the three RBDs (the Danube RBD, the Black Sea RBD and the East Aegean RBD) where lakes are not operationally monitored and one RBD (the Danube RBD) where rivers are not operationally monitored, there is a number of water bodies reported to be at less than good

[29] Note that this assessment is based on monitoring purpose data reported to WISE at the monitoring site level. Bulgaria subsequently indicated that some of these data may not have been fully reported: the analysis should therefore be treated with caution

[30] Bulgaria subsequently indicated that transitional waters in the Black Sea RBD are identified in estuaries and in coastal lakes rather than in marine waters. They are therefore monitored for phytobenthos rather than for macroalgae and angiosperms.

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ecological status/potential: it would be expected that at least some of these would be operationally monitored. Furthermore, 19 significant pressures types were reported on river water bodies in the Danube RBD and a number of significant pressures on lakes in the Danube, Black Sea and East Aegean RBDs.

Transboundary surface water body monitoring

Bulgaria reported transboundary river and groundwater bodies in three of the four RBDs. 12 river monitoring sites in the Danube RBD were reported to be part of an international network of a river convention.

Ecological Status/potential of surface water

The most recently assessed ecological status/potential of surface water bodies in Bulgaria for the second RBMP is illustrated in Map 3.1.

The proportion of surface water at good or better status/potential increased from 43 % in the first RBMPs to 46 % in the second. In terms of less than good status/potential, the proportions were 57 % for the first RBMPs and 45 % for the second. However, there was a large increase of unknown status surface water bodies from 0.1 % in the first RBMPs to 9 % in the second: this may confound any comparison between the first and second cycles in terms of classified water bodies.

Figure 3.3 compares the ecological status of surface water bodies in Bulgaria in the first RBMPs with that in the second RBMPs and that expected by 2015.

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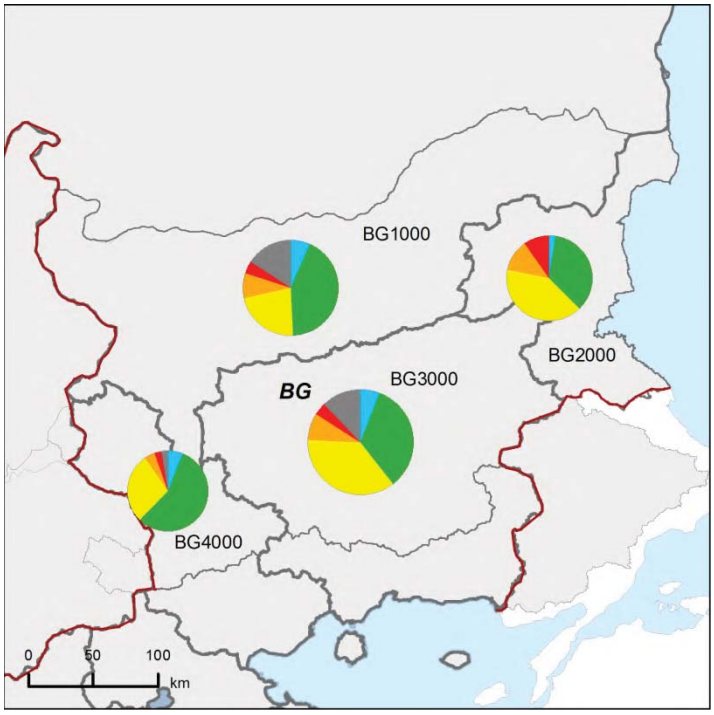
Map 3.1 ***Ecological status or potential of surface water bodies in Bulgaria based on the most recently assessed status/potential of the surface water bodies***



Note: Standard colours based on WFD Annex V, Article 1.4.2(i).
Source: WISE, Eurostat (country borders)

High
Good
Moderate
Poor
Bad
Unknown
River Basin Districts
Countries outside the European Union

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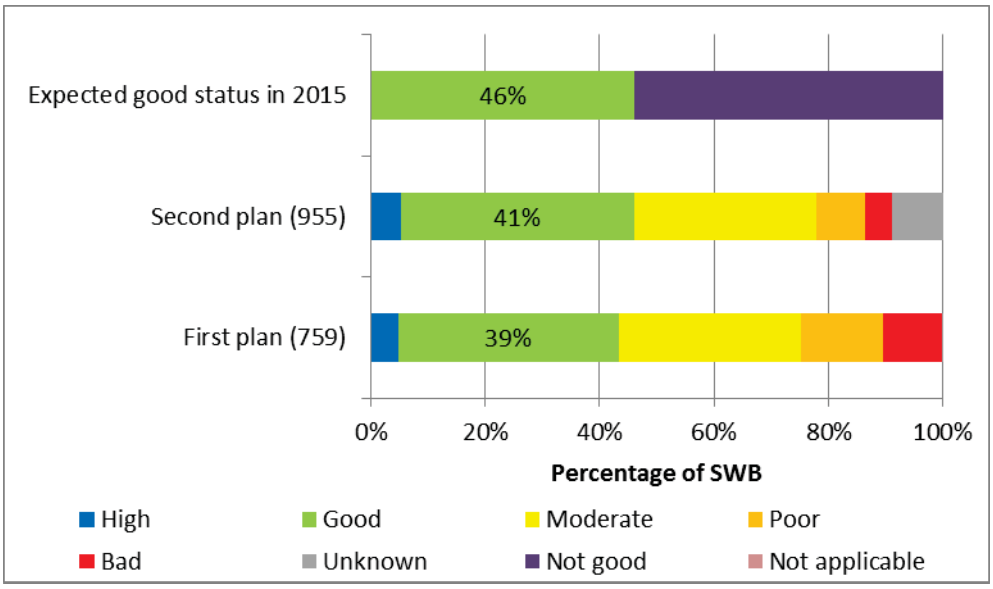
Figure 3.3 ***Ecological status or potential of surface water bodies in Bulgaria for the second RBMP, for the first RBMP and expected in 2015. The number in parenthesis is the number of surface water bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2010 to 2014. The year of the assessment of status for the first RBMP is not known***



Source: WISE electronic reports

Member States were asked to report the expected date for the achievement of good ecological status/potential. The information for Bulgaria is shown in 3.4. For coastal and transitional waters in the Black Sea RBD, good ecological status/potential is expected to be achieved by 2027. For rivers and lakes, there remain some uncertainties on when this objective will be met, with a proportion with reported dates as unknown or beyond 2027. For the several water bodies with unknown ecological status/potential (especially in the East Aegean RBD), this is perhaps understandable but needs to be resolved.

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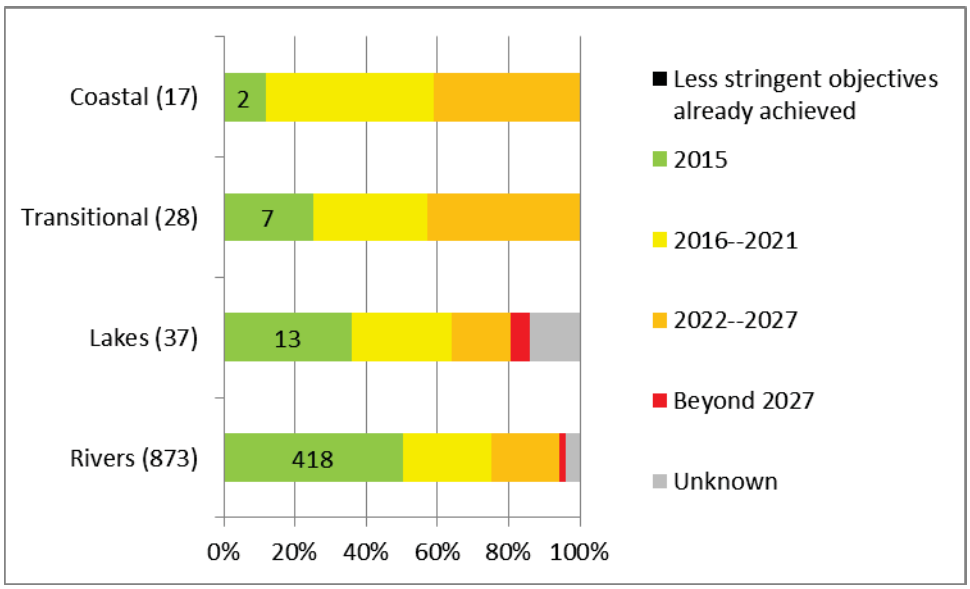
Figure 3.4 ***Expected date of achievement of good ecological status/potential of surface water bodies in Bulgaria. The number in the parenthesis is the number of water bodies in each category***



Source: WISE electronic reports

Confidence in the classification of ecological status/potential

Figure 3.5 shows the confidence in the classification of ecological status/potential.

The number of surface water bodies increased from 759 for the first RBMPs to 955 for the second. This makes comparison between the cycles difficult. However, it is clear that the confidence in the classification of ecological status/potential has improved significantly for the second cycle. In particular, no water body was classified with high confidence in the first RBMPs, while 19 % were in the second. In addition, the proportion of water bodies classified with low confidence decreased from 87 % to 16 %.

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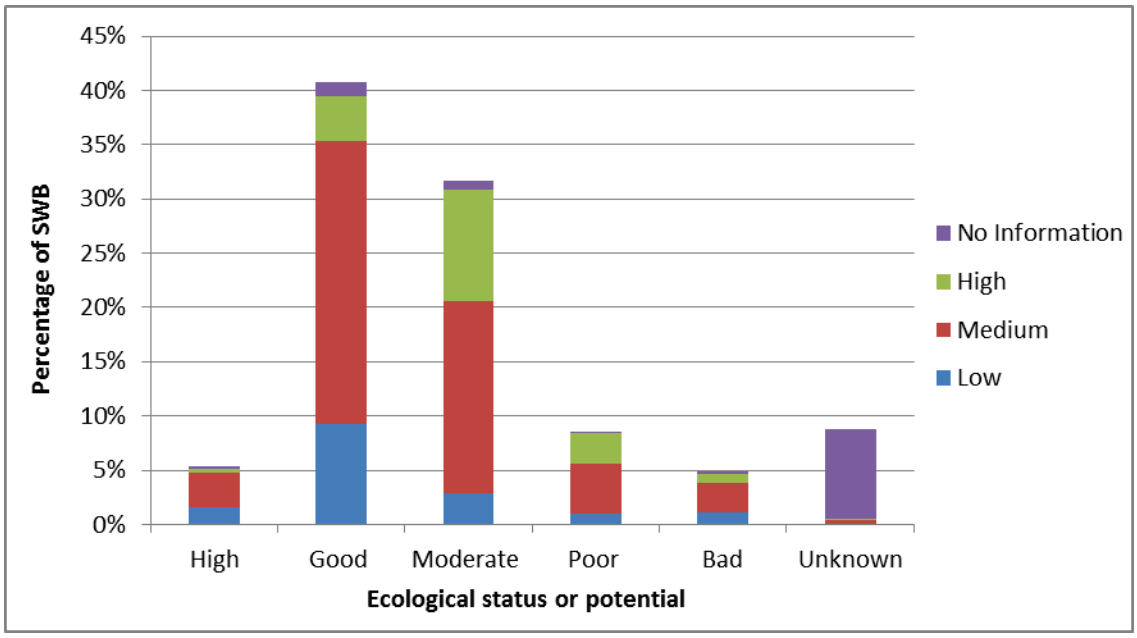
Figure 3.5 Confidence in the classification of ecological status or potential of surface water bodies in Bulgaria based on the most recently assessed status/potential



Source: WISE electronic reports

Classification of ecological status at the quality element level

Figure 3.6 shows the percentage of water bodies in terms of the biological quality elements used for classification. Benthic invertebrates are the most commonly used biological quality element in the classification of ecological status across each of the water categories, with phytoplankton also widely used. This perhaps reflects the traditional use of these elements in the assessment of ecological status. The coverage in terms of the proportion of surface water bodies covered by each biological quality element is not complete, especially in rivers and lakes, suggesting that some further progress is required in the monitoring of biological quality elements and their use in classification.

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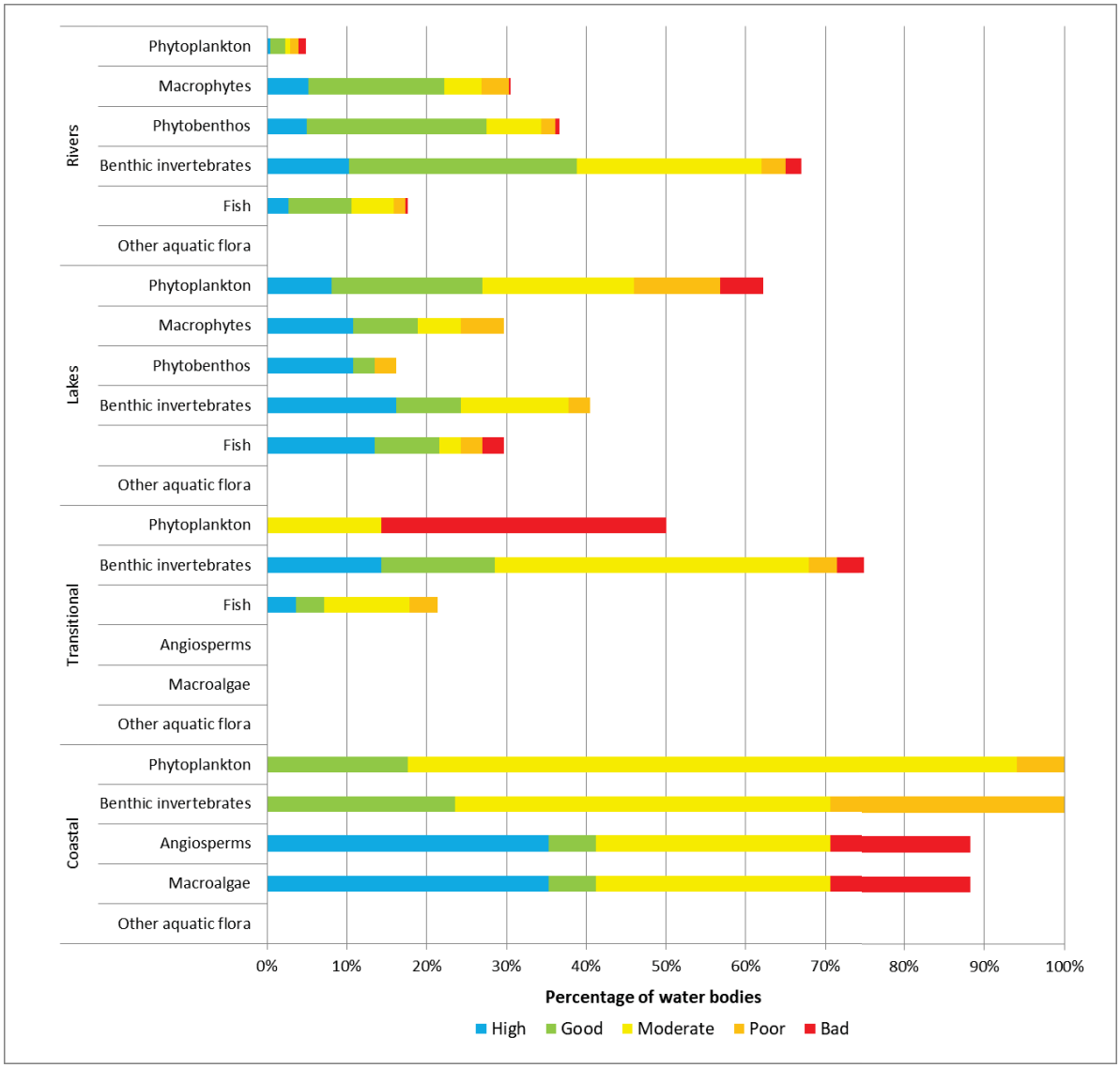
Figure 3.6 ***Ecological status/potential of the biological quality elements used in the classification of lakes and rivers in Bulgaria. Note that water bodies with unknown status/potential, and those that are monitored but not classified or reported as not applicable, are not presented***



Source: WISE electronic reports

Figure 3.7 compares the classification of biological quality elements in terms of ecological status/potential for the two cycles. It should be noted that this comparison should be treated with caution as there are differences in the numbers of surface water bodies classified for individual elements between the two cycles. Progress is demonstrated in each biological quality element with a greater number of surface water bodies monitored in the second cycle than in the first.

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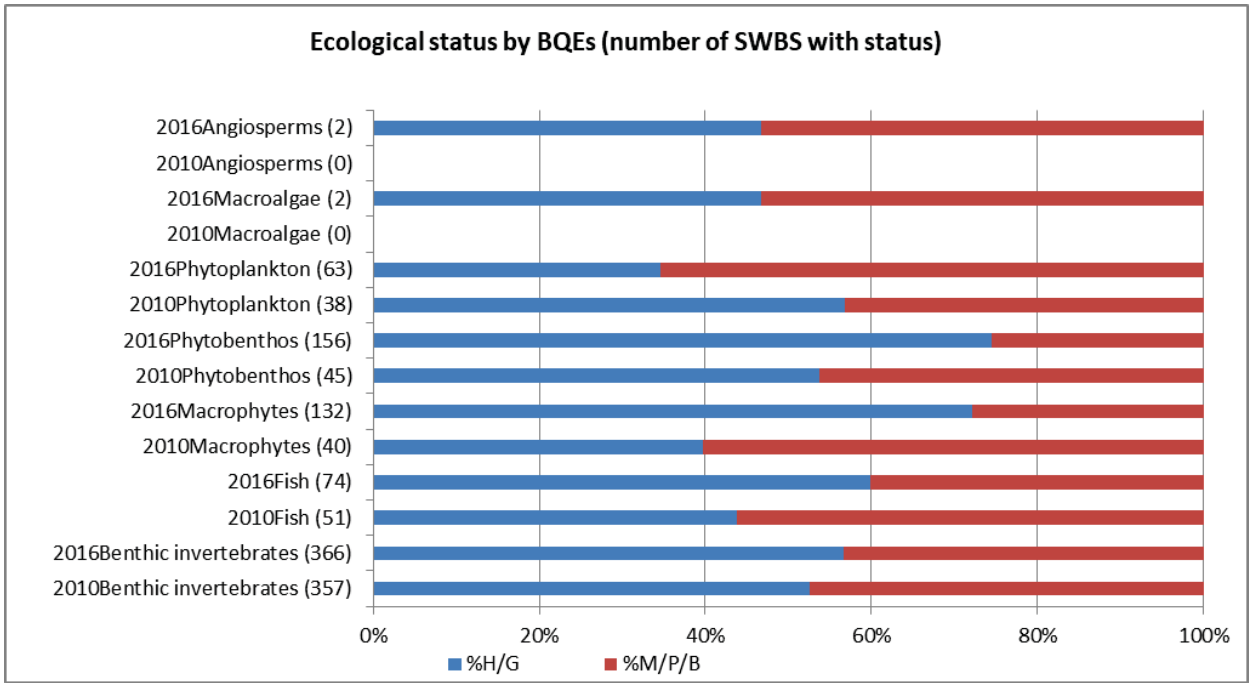
Figure 3.7 ***Comparison of ecological status/potential by number of surface water bodies in Bulgaria according to classified biological quality elements in surface water bodies between the two cycles***



Source: WISE electronic reports

Figure 3.8 illustrates the basis of the classification of ecological status/potential of surface water bodies in Bulgaria for the second RBMPs. The majority of surface water bodies are classified with up to three of the main groups of quality elements but none with all four of them. Hydromorphological quality elements are still not widely used in the classification of ecological status.

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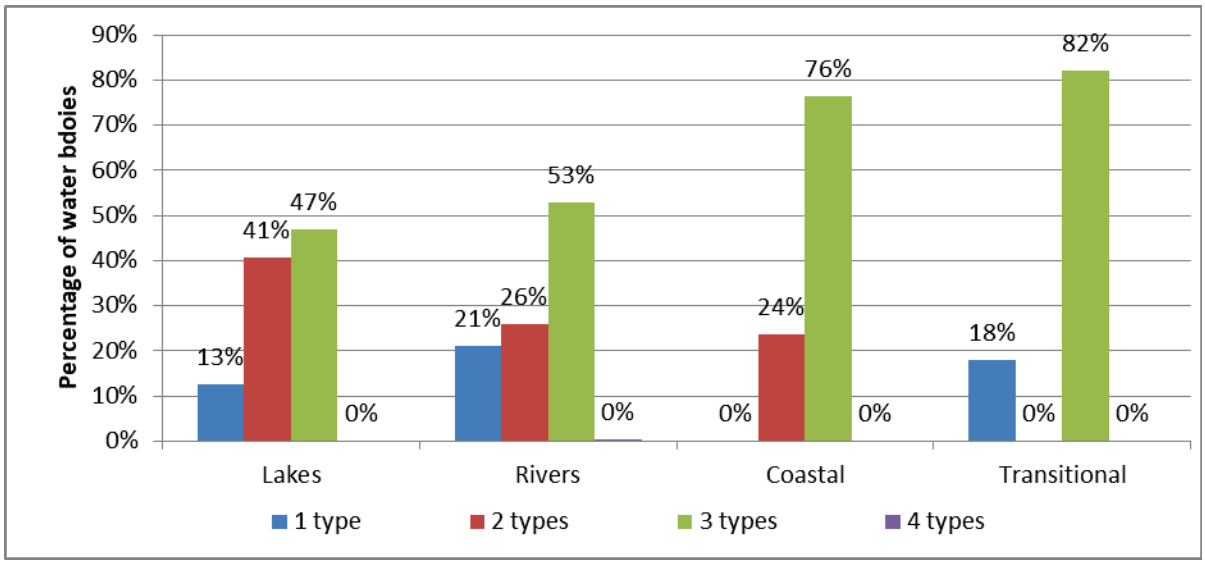
Figure 3.8 The classification of the ecological status or potential of rivers and lakes in Bulgaria using one, two, three or four types of quality element



Source: WISE electronic reports

Note: The four types are: biological; hydromorphological, general physicochemical and River Basin Specific Pollutants.

The basis of the classification of the individual quality elements is illustrated in Figure 3.9. The vast majority of quality elements are classified on the basis of monitoring with limited use of grouping (in rivers only) and expert judgement (in rivers and transitional waters).

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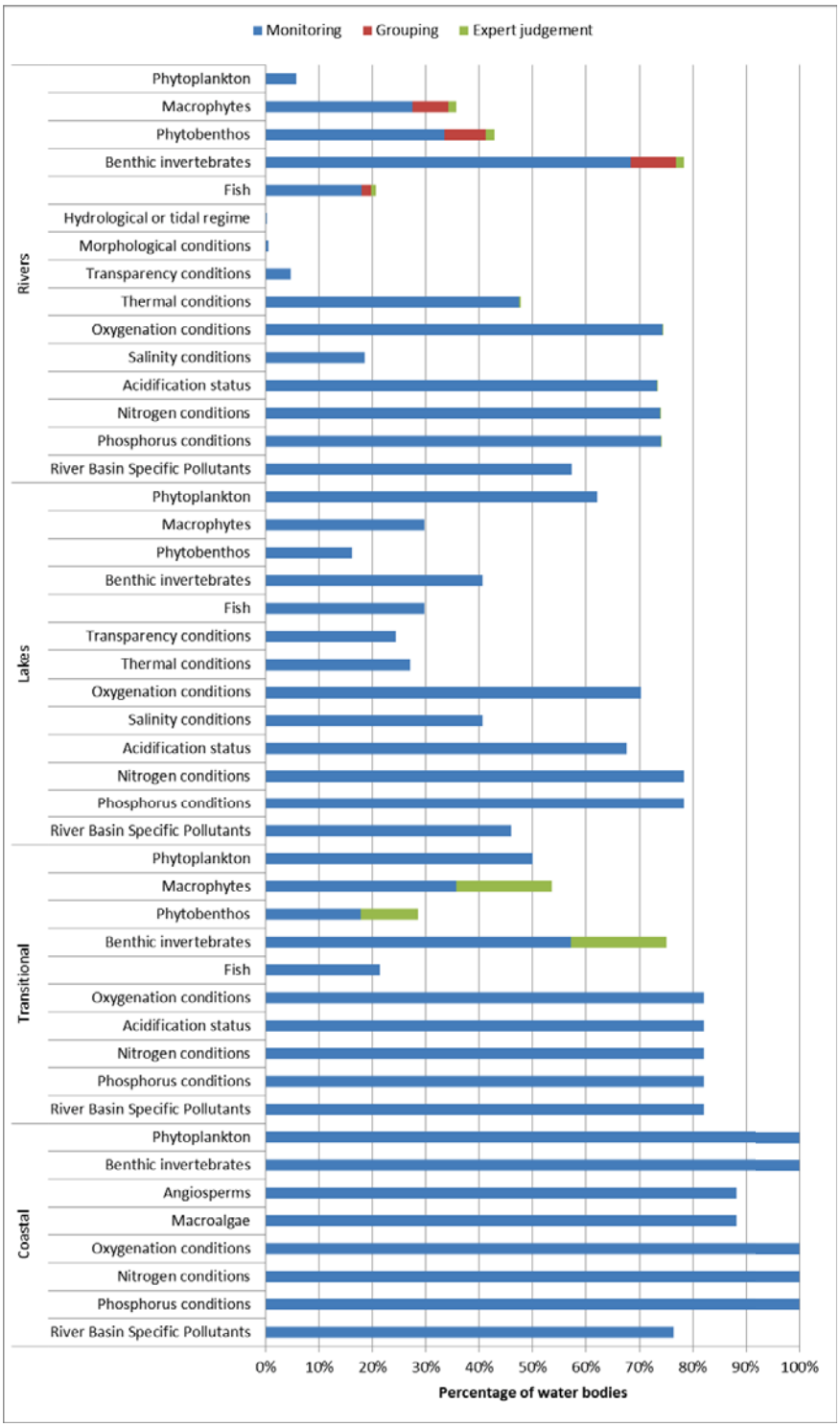
Figure 3.9 ***Basis of the classification of ecological status/potential in Bulgaria. The percentages are in terms of the number of waterbodies in each category.***



Source: WISE electronic reports

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Assessment methods for the biological quality elements

There is a lack of reference conditions, especially for river hydromorphological quality elements, but also for some physicochemical and biology quality elements.

Assessment methods were reported for all relevant biological quality elements in rivers. However there are significant gaps for the assessment methods in the other water categories:

- phytobenthos and benthic invertebrates in lakes;
- phytoplankton, angiosperms, macroalgae, benthic invertebrate and fish in transitional waters; the only method was for macrophytes;
- angiosperms and macroalgae in coastal waters.

There are biological assessment methods that are sensitive to most impacts, with the exception of saline pollution, which was not reported to be a significant impact on surface water bodies.

Intercalibration of biological assessment methods

Many national types are not linked to common intercalibration types[31].

Assessment methods for hydromorphological quality elements

The assessment of the relevant supporting hydromorphological quality elements is in terms of ecological status/potential of rivers, lakes and coastal waters. For transitional waters, only morphological conditions and river continuity were reported to be assessed in terms of ecological status/potential. However, the classification boundaries for all the hydromorphological quality elements are not related to the class boundaries for the sensitive biological quality elements. In addition, hydromorphological quality elements were only reported to be monitored in rivers and coastal waters, and were only used in the classification of rivers in terms of hydrological regime and morphological conditions.

[31] Bulgaria subsequently stated that all national river types for the Danube ecoregion are intercalibrated, with the exception of 2 river categories (R9 and R15), as they do not have matching types in the Geographic Intercalibration Group for very large rivers. Common types of transitional water bodies have not been identified at European level through the Black Sea Geographic Intercalibration Group as well as common types of rivers and lakes in the catchment area of the Rivers Maritsa, Struma, Miles and Dospat (ecoregion 7). A survey on the conformity of national surface water types with other neighbouring countries types was carried out between 2014 and 2016.

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Assessment methods for general physicochemical quality elements

The assessment of all of the relevant supporting physicochemical quality elements was done in terms of ecological status/potential of rivers, lakes, transitional waters and coastal waters. However, the classification boundaries for some of the physicochemical quality elements are reported not to be related to the class boundaries for the sensitive biological quality elements.

Standards were reported for all relevant physicochemical quality elements except thermal conditions in all water categories. All the standards for coastal and transitional waters are consistent with the good-moderate status boundary of the relevant sensitive biological quality elements. 11 of the 21 standards for rivers and 11 of the 22 standards for lakes are consistent with the good-moderate status boundary of the relevant sensitive biological quality elements, while the others are not. There are some cases where different values for the standards for the same element are defined in different RBDs. The East Aegean RBD did not provide in the WISE reporting water body type-specific values for the standards.[32]

Selection of River Basin Specific Pollutants and use of Environmental Quality Standards

No information was found in the RBMPs on how River Basin Specific Pollutants have been identified.

Environmental quality standards were reported, in water only, for 42 different substances relevant to both rivers and lakes. 36 of these substances also had standards relevant to transitional and coastal waters. As a comparison, 63 chemical substances that are not priority substances were reported to be monitored only in water; these are deemed to be equivalent to River Basin Specific Pollutants. There is some overlap between the substances reported to be monitored as River Basin Specific Pollutants and those for which an Environmental Quality Standard exists, but the two lists are not similar. Some substances are monitored but without an environmental quality standard, while some of the substances for which an environmental quality standard is reported seem not to be monitored.

All standards were reported to have been derived in accordance with the Common Implementation Strategy Technical Guidance Document No 27. The analytical methods used for 24 substances, standard types and water category met the minimum performance criteria laid down in Article 4(1) of Directive 2009/90/EC[33] for the strictest standard applied, while 24

[32] Bulgaria subsequently indicated that the lack of information for the East Aegean RBD was a reporting error

[33] Directive 2009/90/EC of 31 July 2009 laying down, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water status http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1524565750309&uri=CELEX:32009L0090

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did not. For those 24 that did not, the analytical method complies with the requirements laid down in Article 4(2) of Directive 2009/90/EC for the strictest standard applied.

Use of monitoring results for classification

In coastal waters, the classification of all quality elements was based on monitoring results and in general in all directly monitored water bodies they were subsequently used in classification. However, hydromorphological quality elements were monitored but were not used in classification, perhaps indicating inadequate assessment methods for these elements.

As for coastal waters, the classification of quality elements in lakes is solely based on monitoring results and often more water bodies are directly monitored for a quality element than are subsequently classified. Hydromorphological quality elements were neither monitored nor used in the classification. One lake in the Black Sea RBD was classified for fish based on monitoring results even though fish were not reported as being directly monitored in this RBD.

The classification of the quality elements for rivers is based on a combination of monitoring results, expert judgment and grouping. The use of expert judgment for fish, benthic invertebrates, phytobenthos and macrophytes for some river water bodies may indicate some weaknesses in the assessment methods for biological quality elements. Very few river water bodies are classified according to hydromorphological quality elements; more are monitored for these elements, including river continuity which was not used in the classification at all. This indicates potentially non-compliant methods for these elements in rivers.

The classification of quality elements in transitional waters was only based on monitoring results and for some elements more water bodies were directly monitored than subsequently classified.

Overall classification of ecological status (one-out, all-out principle)

Figure 3.10 illustrates the basis of the classification of ecological status/potential of surface water bodies in Bulgaria for the second RBMPs.

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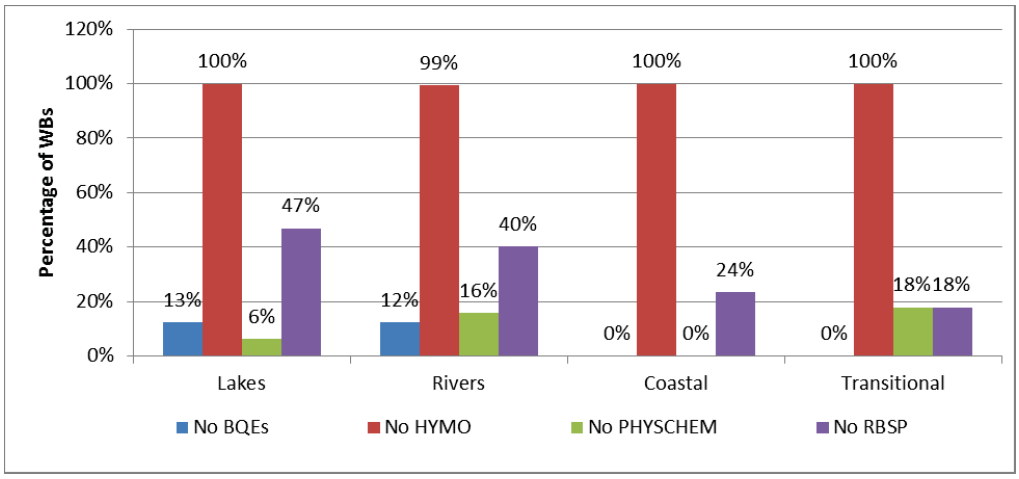
Figure 3.10 ***The percentage of river and lake water bodies in Bulgaria where no biological quality element or no hydromorphological (HYMO) or no general physicochemical (PHYSCHEM) or no River Basin Specific Pollutants (River Basin Specific Pollutant) has been used in the classification of ecological status or potential***



Source: WISE electronic reports

The 'one-out, all-out' principle was reported as having been applied in deriving the overall classification of the ecological status of a water body in all RBDs in Bulgaria.

3.2. Main changes in implementation and compliance since first cycle[34]

There were no monitoring sites in transitional waters in the first RBMPs, while there were sites for surveillance and operational purposes in the second RBMPs. Operational sites were reported for the monitoring of rivers in the Danube RBD in the first RBMP but not in the second RBMP. Similarly, there were operational sites in lakes in three RBDs in the first RBMPs but only in one in the second. Overall in Bulgaria there was over a 10 fold decrease in lake surveillance sites for the second RBMPs and a smaller decrease in the number of sites for operational monitoring. In contrast, there were significant increases in the number of rivers sites used for surveillance (146 to 492 sites) and operational (218 to 285 sites) monitoring. There was also a doubling of sites used for the surveillance and operational monitoring of coastal waters.

Phytobenthos were not monitored in lakes for both cycles. All expected hydromorphological quality elements were reported to be monitored for the first RBMPs in all three reported water categories: for the second RBMPs they were only monitored in coastal waters, and in rivers in

[34] Note that this assessment is based on the data reported to WISE. Bulgaria has subsequently indicated that some of the data may not have been fully reported: the analysis should therefore be treated with caution.

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one of the four RBDs. This represents a significant deterioration in the level of monitoring required by the WFD compared to the first cycle.

3.3. Progress with Commission recommendations

The Commission recommendations based on the first cycle RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Complete the development of methods for the status assessment of water bodies and determination of reference conditions. An adequate WFD-compliant assessment and monitoring framework is a necessary pre-requisite to design effective PoMs and ultimately to achieve the WFD objectives.*

  Assessment: There are still significant gaps in the establishment of reference conditions for all water categories and quality elements in Bulgaria. In coastal waters all types have reference conditions for some biological quality elements but for none of the hydromorphological or physicochemical quality elements. 31 % and 34 % of lake and river types, respectively, have reference conditions for all types of quality elements. In transitional waters, there are no reference conditions for any hydromorphological quality elements in any of the types. There are reference conditions for all biological and physicochemical quality elements in one of the five types. Biological assessment methods were reported for all relevant biological quality elements in rivers: however, there are significant gaps for the assessment methods in the other water categories for example for phytobenthos and benthic invertebrates in lakes. The assessment of the relevant supporting hydromorphological and physicochemical quality elements is in terms of ecological status/potential of rivers, lakes and coastal waters. However, the classification boundaries for all the hydromorphological and for some physicochemical quality elements are not related to the class boundaries for the sensitive biological quality elements. There are still some significant gaps in the quality elements monitored in Bulgaria for the second RBMPs. For example, hydromorphological quality elements are not monitored in lakes and transitional waters.

  This recommendation has been partially fulfilled.

- Recommendation: *Review in the second RBMP the environmental quality standards for the river basin specific pollutants and take the updated standards into account when designing measures for those pollutants.*

  Assessment: Environmental quality standards were reported, in water only, for 42 different substances relevant to both rivers and lakes. 36 of these substances also had

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standards relevant to transitional and coastal waters. All standards were reported to have been derived in accordance with the Common Implementation Strategy Technical Guidance Document No 27. The analytical methods used for 24 substances, standard types and water category met the minimum performance criteria laid down in Article 4(1) of Directive 2009/90/EC for the strictest standard applied: 24 did not. For those 24 that did not, the analytical method complies with the requirements laid down in Article 4(2) of Directive 2009/90/EC for the strictest standard applied.

The part of the recommendation relating to setting of Environmental Quality Standards has been fulfilled.

- Recommendation: *Develop a proper methodology for establishing ecological flow linked with good ecological status in the second RBMPs and ensure this e-flow is applied through review of permits.*

  Assessment: This recommendation is assessed in the chapter on hydromorphological measures.

- Recommendation: *Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and in the assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

  Assessment: Significant progress has been made to fill the gaps in the assessment methods in use for the first cycle; however, gaps remain in assessment methods for lakes and transitional waters. This recommendation has been partially fulfilled.

- Recommendation: *There is a significant gap in the intercalibration and the development of methodologies, the expert judgement approach is often used. There is no fully developed and formally adopted classification system for the assessment of the ecological status. These gaps should be filled.*

  Assessment: Many national types are not linked to common intercalibration types: this raises questions on how the results of the intercalibration have been transferred into the national types and on the consequences in terms of the robustness of the classification of ecological status/potential. Bulgaria subsequently stated that there has been considerable progress in the process of intercalibration, with concrete action having been undertaken on transferring intercalibration results into the classification system for national types for which a match was established. This recommendation has been partially fulfilled.

- Recommendation: *The identification of River Basin Specific Pollutants needs to be more transparent, with clear information on how pollutants were selected, how and where they were monitored, where there are exceedances and how such exceedances have been taken into account in the assessment of ecological status.*

  Assessment: No information was found in the RBMPs on how River Basin Specific Pollutants have been identified. Detailed site level information was reported on the monitoring of 63 chemical substances that are not Priority Substances, which are assumed to be River Basin Specific Pollutants. River Basin Specific Pollutants have been used in the classification of ecological status/potential in all four water categories. Nine different River Basin Specific Pollutants were reported to be causing failure of good ecological status/potential with some water bodies in each water category being affected.

  This recommendation has been partially fulfilled.

- Recommendation: *Monitoring should be strengthened as there is not enough monitoring data related to biological and chemical elements and this is also a reason for low confidence in the assessment of their status.*

  Assessment: Phytobenthos are not monitored in lakes for both cycles. All expected hydromorphological quality elements were reported to be monitored in the first RBMPs in all three reported water categories, but in the second RBMPs they were only monitored in coastal waters, and in rivers in one of the four RBDs. This represents a significant deterioration in the level of monitoring required by the WFD. On a more positive note, transitional waters are now monitored, which was not the case for the first RBMPs, and there were increases in the number of sites in rivers and coastal waters. There also has been an increase in the number of sites used for the monitoring of River Basin Specific Pollutants in rivers, transitional and coastal waters for the second RBMPs. However, there was a decrease in the sites used for monitoring River Basin Specific Pollutants in lakes and there has been a large decrease in the number of surveillance monitoring sites for lakes.

  In conclusion this recommendation has been partially fulfilled, although on some issues there was a deterioration of the previous situation.

Topic 4 Monitoring, assessment and classification of chemical status in surface water bodies

4.1. Assessment of implementation and compliance with WFD requirements in second cycle

4.1.1. Monitoring of chemical status in surface waters

Monitoring sites and monitored water bodies used for monitoring of chemical status

Member States have to implement surveillance and operational monitoring programmes in accordance with the requirements of the WFD and of the EQS Directive, for the assessment of ecological status/potential and chemical status.

Surveillance monitoring programmes should allow Member States to supplement and validate the impact assessment procedure, to efficiently and effectively review the design of their monitoring programmes, and to assess the long-term changes in natural conditions and those resulting from widespread anthropogenic activity. For operational purposes, monitoring is required to establish the status of waterbodies identified as being at risk of failing to meet their environmental objectives, and to assess any changes in the status of such waterbodies resulting from the programme of measures.

Section 3.1.1 of this report summarises the characteristics of the surveillance and operational monitoring programmes in Bulgaria for the second RBMP.

Figure 4.1 summarises the proportion of sites used for the monitoring of chemical status in surface waters for the second RBMP. In this figure, no distinction is made between sites used for surveillance and/or operational purposes. More detailed information can be found on the website of the European Environment Agency[35].

According to the WFD, chemical status should be monitored and assessed up to 12 nautical miles, however territorial waters have not been identified, monitored or assessed by Bulgaria.

In all water categories considered by Bulgaria, fewer sites are monitored for chemical status than for ecological status with the disparity greatest in surface fresh waters (rivers and lakes). Overall in Bulgaria in the second RBMP, there has been a net increase in the number of monitoring sites and water bodies since the first RBMP.

[35] https://www.eea.europa.eu/publications/state-of-water

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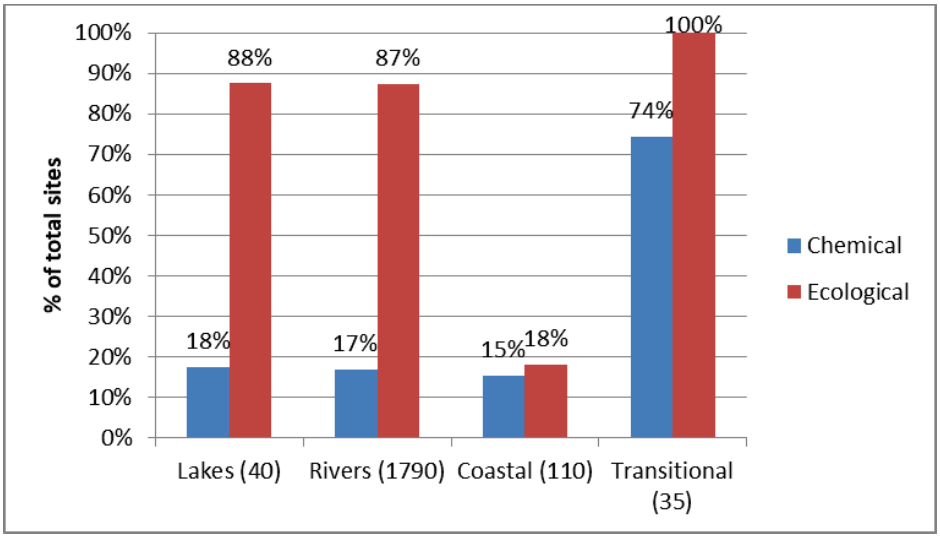
Figure 4.1 ***Proportion of sites used for monitoring of chemical status and, for comparison, ecological status, in Bulgaria. The number in parenthesis next to the category is the total number of monitoring sites irrespective of their purpose***



Source: WISE electronic reporting

Figure 4.2 summarises the proportion of water bodies monitored for chemical status in surface waters for the second RBMP. In this figure, no distinction is made between sites used for surveillance and/or operational purposes. Also given is the proportion of water bodies monitored for any purpose and, for comparative purpose, those for ecological status.

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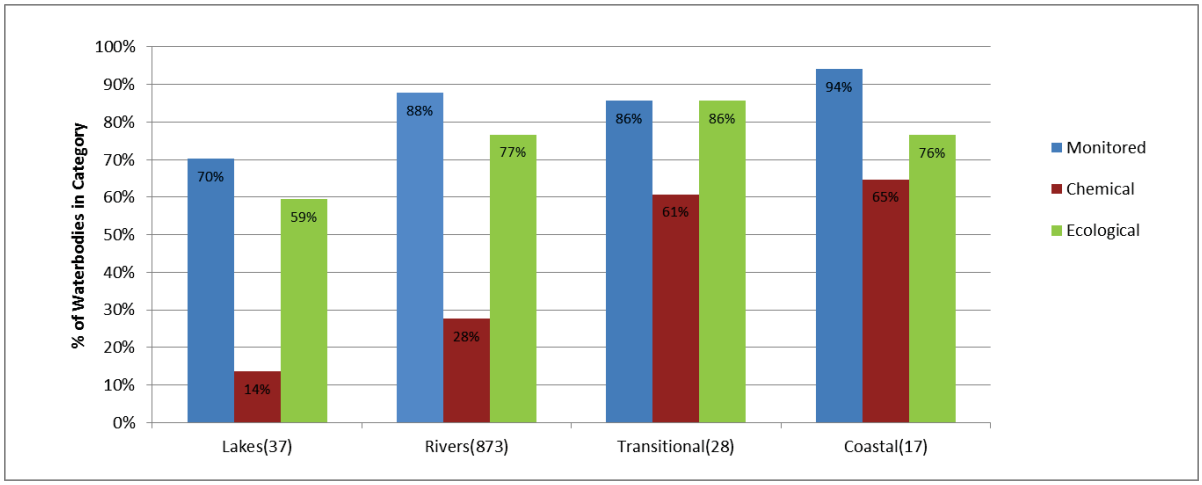
Figure 4.2 ***Proportion of total water bodies in each category monitored, monitored for chemical status and, for comparison, monitored for ecological status, in Bulgaria. The number in parenthesis next to the category is the total number of water bodies in that category***



Source: WISE electronic reporting

Between 70 and 94 % of surface water bodies in the relevant categories were reported to be monitored in the second RBMP. A larger proportion (between 59 to 86 %) was included in the monitoring of ecological status than for chemical status (14 to 65 %).

Of the surface water bodies failing to achieve good chemical status, 92 % were reported to be monitored under operational monitoring in Bulgaria as a whole.

Long-term trend monitoring and monitoring of Priority Substances in water, sediment and biota for status assessment

Monitoring for status assessment

Requirements

Article 8.1 of the WFD requires Member States to establish monitoring programmes in order to provide, *inter alia,* a coherent and comprehensive overview of water status within each RBD. The amount of monitoring undertaken in terms of priority substances, frequency and numbers of sites should be sufficient to obtain a reliable and robust assessment of status. According to the EQS Directive (version in force in 2009), mercury, hexachlorobenzene and hexachlorobutadiene have to be monitored in biota for status assessment, unless Member States derived a standard for another matrix, which is at least as protective as the biota standard.

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Spatial coverage

Monitoring of priority substances is reported in water only.

About 18 % of sites and less than a third of water bodies are monitored, with generally lower proportions of sites and water bodies monitored in lakes and rivers compared to coastal waters.

Bulgaria has subsequently provided further information stating that research was carried out for the Black Sea RBD in 2014 on mercury, hexachlorobenzene and hexachlorobutadiene concentrations in biota in transitional and river water bodies. The results indicated that only mercury exceeded the biota EQS. Water bodies, for which values were found to be above the EQS for mercury in biota were assessed as failing to achieve good chemical status. Data from pilot sampling and analysis of mercury in biota carried out as part of an applied research study entitled "Research and assessment of the chemical status of surface waters" confirmed the reported degraded chemical status.

Frequencies

The WFD indicates that, for the surveillance and operational monitoring of Priority Substances in water, the frequency of monitoring should be at least monthly for one year during the RBMP cycle and at least monthly every year, respectively. Monitoring in biota for status assessment should take place at least once every year according to the EQS Directive. In all cases greater intervals can be applied by Member States if justified on the basis of technical knowledge and expert judgement.

According to the WISE reporting, about one third of the substances monitored are sampled with an intra-annual frequency of 12 times per year at all sites where they are monitored. Other substances are monitored at or above the minimum intra-annual frequency at some sites, and below that frequency at other sites. The RBMPs and background documents provided no specific justification for the reduced monitoring frequency.

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Monitoring for long-term trend assessment

Requirements

Article 3.3 of the EQS Directive (version in force in 2009) requires Member States to monitor 14 priority substances[36] that tend to accumulate in sediment and/or biota, for the purpose of long-term trend assessment. Monitoring should take place at least once every three years, unless technical knowledge and expert judgment justify another interval.

Spatial coverage and frequencies

Bulgaria has not reported results from the monitoring of sediments and biota in the second RBMPs. Bulgaria also reports that arrangements are not in place for the long-term trend analysis of concentrations of those Priority Substances that tend to accumulate in sediment and/or biota in three RBDs in Bulgaria (Danube, East Aegean and West Aegean). No information was reported for the Black Sea RBD.

The RBMPs and background documents provided some evidence of preparatory work in terms of the development of a method for trend assessment of the concentrations of pollutants in sediment and biota and some pilot monitoring and testing. The second RBMPs indicated that monitoring would commence in the second cycle.

Monitoring of Priority Substances that are discharged in each RBD

Annex V of the WFD states, in Section 1.3.1 (Design of surveillance monitoring), that "Surveillance monitoring shall be carried out for each monitoring site for a period of one year during the period covered by a river basin management plan for [*inter alia*]: priority list pollutants which are discharged into the river basin or sub-basin." Section 1.3.2 (Design of operational monitoring) of the Directive states that "In order to assess the magnitude of the pressure to which bodies of surface water are subject Member States shall monitor for those quality elements which are indicative of the pressures to which the body or bodies are subject. In order to assess the impact of these pressures, Member States shall monitor as relevant [*inter alia*]: all priority substances discharged, and other pollutants discharged in significant quantities."

[36] Anthracene, brominated diphenylether, cadmium, C10-13 chloroalkanes, DEHP, fluoranthene, hexachlorobenzene, hexabutadiene, hexachlorocyclohexane, lead, mercury, pentachlorobenzene, PAH, Tributyltin.

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Member States are therefore required to monitor all Priority Substances which are discharged into the river basin or sub-basin.

Section 2.1.1 of this report describes the implementation of the requirement for establishing an inventory of emissions in Bulgaria. The information reported to WISE confirms that all Priority Substances listed in inventories and discharged (between four and six Priority Substances depending on the RBD) are monitored in all four RBDs in Bulgaria.

The four RBDs monitored many more substances than just those identified as discharged in the inventories. According to WISE, in the Danube RBD overall 38 individual Priority Substances[37] were monitored. In the Black Sea RBD, East Aegean and West Aegean RBDs this was the case for 30, 34 and 35 individual substances, respectively.

The RBMPs and background documents explain that all 41 Priority Substances and groups of Priority substances should be monitored (where methods exist) to meet the requirements of national legislation[38]. According to the RBMPs, the analytical methods have not been developed yet for the following substances: brominated diphenylether, C10-13 chloralkanes, di (2-ethylhexyl) phthalate (DEHP), tributyltin compounds (tributyltin-cation), diuron, isoproturon. The East Aegean RBMP mentions a project that is expected to provide such methodologies by 2018[39]. These substances are also not included in the inventories, so there is no assessment of whether they were discharged.

Performances of analytical methods used

In Bulgaria, the performances of the analytical methods used differ between RBDs. For nine Priority Substances, the analytical methods used meet the minimum performance criteria laid down in Article 4(1) of Directive 2009/90/EC[40] for the strictest standard applied in all RBDs.

For six Priority Substances in the Black Sea, East Aegean and West Aegean RBDs, the analytical methods appear not to comply with the requirements in Article 4(1) or 4(2). These substances are DEHP, diuron, isoproturon, TBT, chloroalkanes C10-13 and brominated

[37] The 41 Priority Substances and groups of Priority Substances are made of 46 « individual » substances.

[38] Ordinance on environmental quality standards for Priority Substances and some other pollutants from 1 November 2010, last updated 11 December 2015

[39] Bulgaria subsequently clarified that in the WISE reporting, some of these six substances were incorrectly reported as monitored in the Danube RBDs, and confirmed that these substances are neither monitored nor used in the assessment of status. Bulgaria also mentioned that a limited number of substances were wrongly reported as not monitored (e.g. polycyclic aromatic hydrocarbons in the West Aegean RBD).

[40] Directive 2009/90/EC of 31 July 2009 laying down, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water status http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1524565750309&uri=CELEX:32009L0090

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diphenylethers. The RBMPs and background documents clarify that there are currently no common methods for laboratory analysis for these 6 substances. Bulgaria confirmed that this is the case also in the Danube RBD.

The method for dealing with measurements of Priority Substances lower than the limit of quantification is as specified in Article 5 of Directive 2009/90/EC for three RBDs in Bulgaria but not for one RBD (East Aegean). .

4.1.2. Chemical Status of surface water bodies

Member States are required to report the year on which the assessment of chemical status is based. This may be the year that the surface water body was monitored. In case of grouping this may be the year in which monitoring took place in the surface water bodies within a group that are used to extrapolate results to non-monitored surface water bodies within the same group. For Bulgaria, the assessment of chemical status was undertaken between 2010 and 2014. The chemical status of surface water bodies in Bulgaria for the second RBMP is illustrated in Map 4.1. This is based on the most recent assessment of status.

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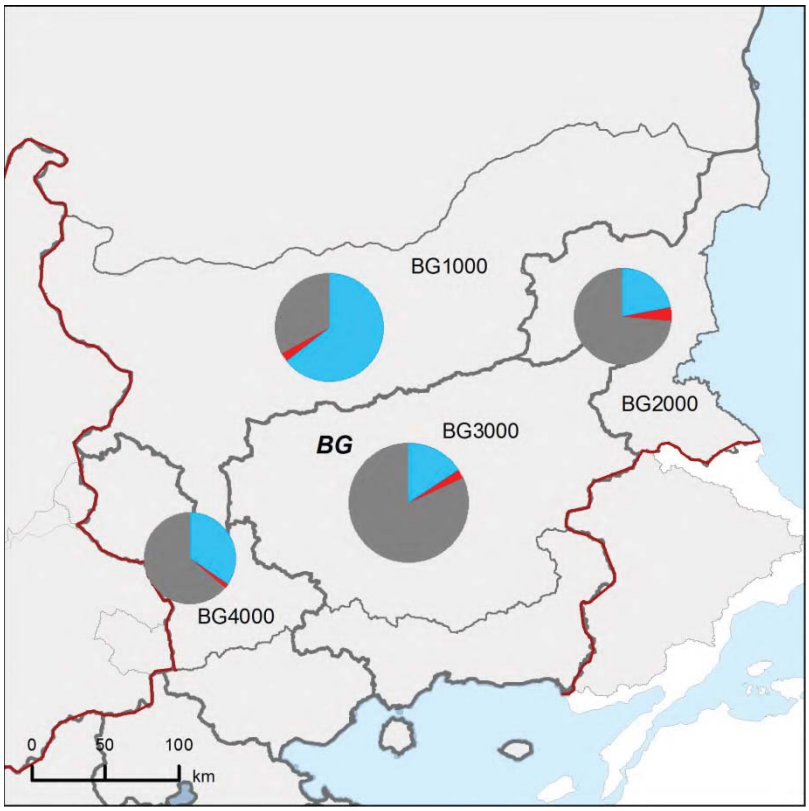
Map 4.1 Chemical status of surface water bodies in Bulgaria based on the most recently assessed status of the surface water bodies

Note: Standard colours based on WFD Annex V, Article 1.4.3.



Source: WISE, Eurostat (country borders)

- *Good*
- *Failing to achieve to good*
- *Unknown*
- *River Basin Districts*
- *Countries outside the EU*

The chemical status of lakes and rivers in Bulgaria for the first and second RBMPs is given in Table 4.1.

Overall between the two cycles, there has been a large decrease in the proportion with good status and a large increase in the proportion with unknown status across all categories between two RBMPs, despite the increase in the number of monitoring sites. (This holds true also for Natural/Heavily Modified/Artificial water body categories). This seems to reflect a change in the methodology used to classify non monitored waterbodies.

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Table 4.1 ***Chemical status of surface water bodies in Bulgaria for the second and first RBMP. Note: the number in parenthesis next to the water category is the number of water bodies. Note: Chemical status assessment is based on the standards laid down in EQS Directive 2008/105/EC (version in force on 13 January 2009). Some Member States did not implement the Directive in the first RBMPs as the transposition deadline was in July 2010, after the adoption of the first RBMPs***

Category	Good		Failing to achieve good		Unknown	
	Number	%	Number	%	Number	%
second RBMP						
Lakes (37)	10	27%			27	73%
Rivers (873)	309	35%	20	2%	544	62%
Transitional (28)			2	7%	26	93%
Coastal (17)	3	18%	3	18%	11	65%
Total (955)	322	34%	25	3%	608	64%
first RBMP						
Lakes (43)	40	93%			3	7%
Rivers (688)	545	79 %	23	3%	120	17%
Transitional (15)	11	73%			4	27%
Coastal (13)					13	100%
Total (759)	596	79%	23	3%	140	18%

More information on the chemical status in each RBD and water category can be found on the website of the European Environment Agency[41].

Figure 4.3 shows the confidence in the classification of chemical status for the second RBMP for each status class. Overall, 44 % of surface water bodies in Bulgaria were classified for chemical status with medium confidence, 33 % with low confidence and 23 % with high confidence. Bulgaria applies the methodology developed for the international Danube RBD as a common national methodology for determining the confidence level of status assessments using the following criteria:

- High: Either there is no pollution from Priority Substances/no discharges of Priority Substances, or all of the following criteria are met:

[41] https://www.eea.europa.eu/publications/state-of-water

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- the monitoring data meets the frequency requirements of the WFD (12 samples per year);
- there is high credibility in the grouping process in terms of meeting the criteria for grouping of the water bodies and they meet the requirements of the WFD.

- Medium: all of the following criteria are met:
  - there is monitoring data;
  - the frequency does not meet the requirements of the WFD (less than 12 times per year);
  - medium credibility concerning the criteria for grouping of the water bodies.
- Low: one or more of the following criteria are met:
  - there is no data;
  - expectation that good status cannot be achieved as a result of the emissions (analysis of the risk).

In the RBMPs, Bulgaria highlights that the approach to the assessment of confidence benefits from the implementation of clear criteria in the international RBD of the Danube.

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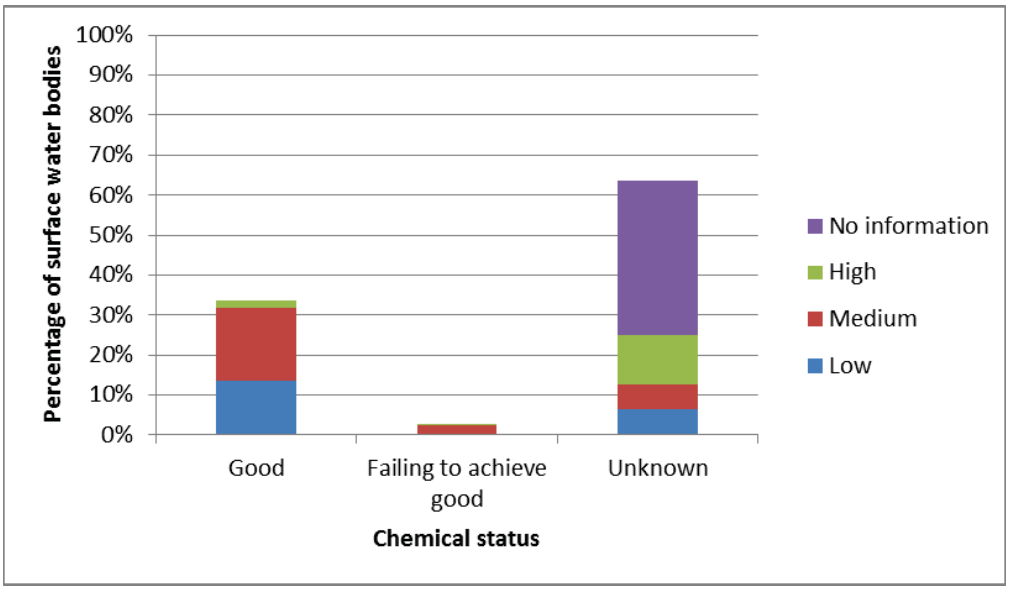
Figure 4.3 Confidence in the classification of chemical status of surface water bodies in Bulgaria based on the most recently assessed status/potential



Source: WISE electronic reporting

Figure 4.4 compares the chemical status of surface water bodies in Bulgaria for the first RBMP with that for the second RBMP (based on the most recent assessment of status) and that expected by 2015.

The assessment of chemical status for the second RBMP was expected to be based on the standards laid down in EQS Directive 2008/105/EC (version in force on 13 January 2009[42]). Some Member States did not implement the Directive in the first RBMPs as the transposition deadline was in July 2010, after the adoption of the first RBMPs.

There was a large decrease in the proportion of surface water bodies classified as good for the second RBMP compared to the first which is consistent with that expected by the end of 2015 but with a much larger proportion with unknown status. This may result at least partly from the implementation of the new guidance documents adopted at national level (see section on Main changes in implementation and compliance since first cycle.)

[42] Directive 2013/39/EU, which amended the Environmental Quality Standards Directive, introduced a less stringent annual average Environmental Quality Standards for naphthalene in transitional waters. This less stringent environmental quality standard should be taken into account for the determination of surface water chemical status by the 2015 deadline laid down in Article 4 of the WFD.

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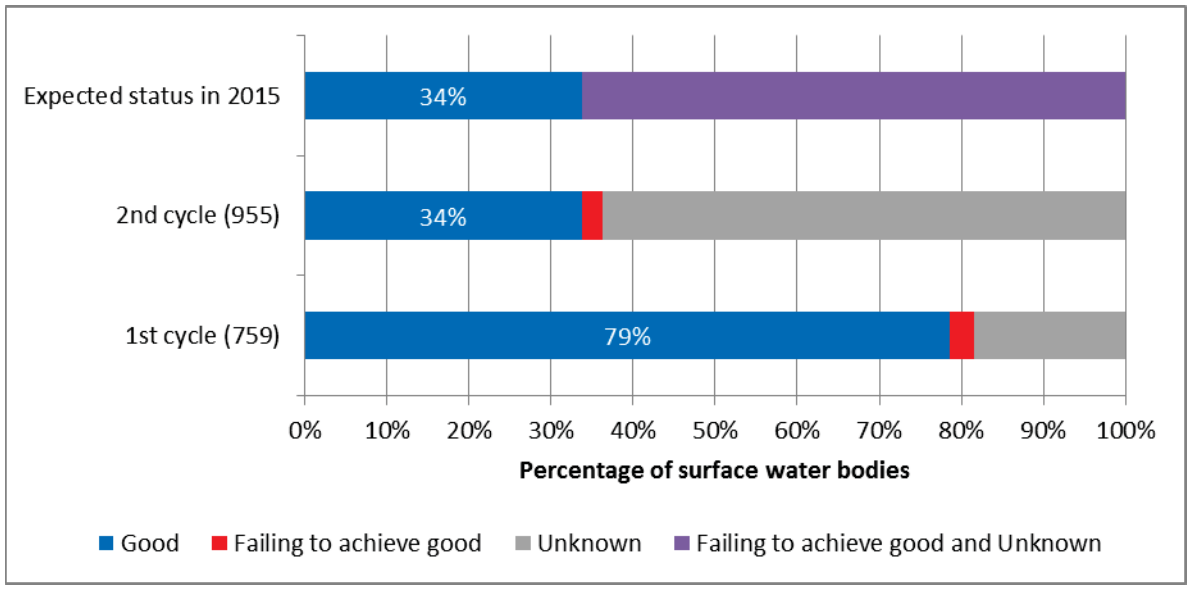
Figure 4.4 ***Chemical status of surface water bodies in Bulgaria for the second RBMP, for the first RBMP and expected in 2015. The number in the parenthesis is the number of surface water bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2010 to 2014. The year of the assessment of status for first RBMP is not known***



Source: WISE electronic reporting

The RBMPs explain that the approach to the assessment of chemical status is derived from a 'National methodology for assessment of the chemical status of surface water bodies' and the Ordinance on environmental quality standards for Priority Substances and some other pollutants from 1 November 2010[43]. According to the Ordinance all Priority Substances should be monitored. The national methodology outlines the steps for analysing the concentrations of Priority Substances, comparing these to the Environmental Quality Standards and classifying the status of the water body based on the results.

The one-out-all-out principle is not explicitly mentioned in the RBMPs, but it is corresponds to the methodology described in the plans.

The Black Sea and East Aegean RBMPs state that water bodies for which there is no monitoring data are classified with unknown chemical status. The East Aegean RBMP further states that water bodies for which not all Priority Substances planned in the monitoring programmes are monitored are also classified with unknown chemical status. Bulgaria

[43] Last updated 11 December 2015. This ordinance transposes the latest Environmental Quality Standards into the national legislation.

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subsequently clarified that in the Danube RBD, grouping has been used for the assessment of good status water bodies only. Grouping is also used in the West Aegean RBD.

Directive 2013/39/EU[44] adopted more stringent Environmental Quality Standards for seven substances[45]. Member States were required to indicate if the new standard caused the status of the surface water body to appear to deteriorate, however Bulgaria didn't apply these more stringent standards.

Good chemical status should be reached by 2021 in relation to the revised environmental quality standards, unless Member States apply exemptions under WFD article 4(4) or less stringent objectives under WFD article 4(5).

Member States were asked to report the expected date for the achievement of good chemical status. The information for Bulgaria is shown in Figure 4.5. However, the numbers reported do not sum to the total number of water bodies expected for each category. The values for rivers appear to be cumulative, and it is unclear why the values for transitional and coastal waters do not match the expected number of water bodies.

The date of achievement of good chemical status is unknown for a significant proportion of surface water bodies. Most of the remaining water bodies are expected to reach good chemical status by 2027.

The first RBMPs for the Black Sea RBD and the West Aegean RBD provided no data on the expected achievement of good status, so no comparison is possible. For the East Aegean RBD the first RBMP anticipated that the objectives would be fully met in 2027, whereas in the second RBMP only about 20 % of river water bodies are expected to be in good status at that time (the date of achievement of good status for other water bodies is unknown). This is probably at least partly linked to the increase in the proportion of water bodies in unknown status in the second RBMP.

[44] Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32013L0039

[45] Anthracene, Brominated diphenylether, Fluoranthene, Lead and its compounds, Naphthalene, Nickel and itscompounds, Polyaromatic hydrocarbons (PAH)

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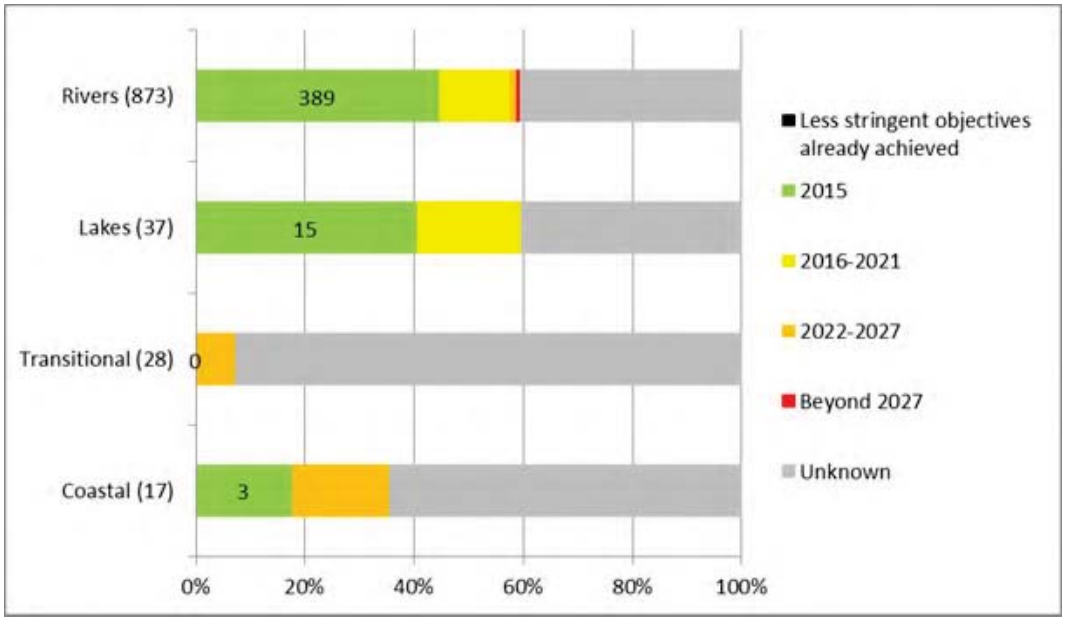
Figure 4.5 ***Expected date of achievement of good chemical of surface water bodies in Bulgaria. The number in the parenthesis is the number of water bodies in each category***



Source: WISE electronic reporting

Priority substances causing the failure of good chemical status

Bulgaria reported exceedances based on the standards from the Directive in its version in force in 2009 (the same as those used for the assessment of status presented above).

Seven Priority Substances were reported to be causing failure to achieve good chemical status in surface water bodies in Bulgaria. The proportion of water bodies failing because of each of these substances are shown in Figure 4.6.

The substances causing the greatest proportion of water bodies to fail good chemical status were cadmium (1.3 %), mercury (1 %) and nickel (0.6 %). Information on Priority Substances causing failure of good chemical status for the first RBMP was not systematically reported making comparison with the second RBMP difficult. However, examination of the first RBMPs showed that lead, nickel, cadmium and mercury were causing the greatest failure in Bulgaria (1-3 % of failing surface water bodies in the Danube and East Aegean RBDs only).

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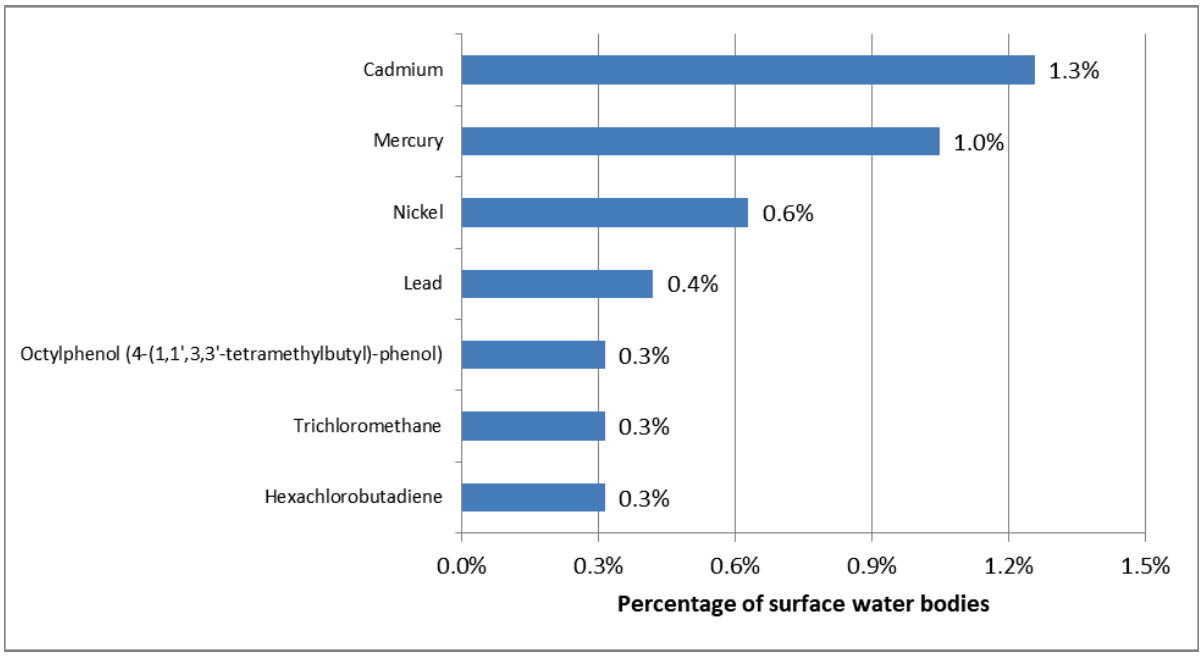
Figure 4.6 The top Priority Substances causing failure to achieve good chemical status in surface water bodies in Bulgaria



Source: WISE electronic reporting

In terms of the most commonly exceeded Environmental Quality Standards, overall for surface water bodies in Bulgaria, the largest proportion of exceedances were for the Annual Average Environmental Quality Standards for cadmium (1 % of water bodies). Exceedances of Maximum Allowable Concentration Environmental Quality Standards were most frequent for Trichloromethane (0.1 % of water bodies). In terms of exceedance of both types of standard, the largest proportion was for mercury (0.8 % of water bodies).

Overall in Bulgaria, two Priority Substances are reported have been responsible for improvements in chemical status from failing to achieve good chemical status to good chemical status since the first RBMP. These improvements occurred in the East Aegean RBD and were for lead (20 river water bodies representing 6 % of the total) and for nickel (seven river water bodies representing 2 % of the total). These improvements concur with the improvements from the first plans described above for lead and nickel (which were reported in the first RBMPs to be having a greater impact on chemical status).

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Ubiquitous persistent, bioaccumulative and toxic Priority Substances

According to article 8(a) of the EQS Directive[46], eight priority substances and groups of priority substances are behaving like ubiquitous, persistent, bioaccumulable and toxic substances[47]. These substances are generally expected to cause widespread exceedances, and their emissions can be challenging to tackle (e.g. due to long-range atmospheric transport and deposition). In order to show the progress made in tackling other priority substances, Member States have the possibility to present the information related to chemical status separately for these substances.

In the Black Sea RBD a ubiquitous persistent, bioaccumulative and toxic Priority Substance (in this case, mercury) is primarily responsible for causing failure to achieve good status across all water body types. In the Danube and West Aegean RBDs, uPBTs are assess as having little or no influence but there were a number of water bodies that failed to achieve good chemical status. This may be due in particular to the absence of monitoring of mercury in biota. Further information on ubiquitous, persistent, bioaccumulative and toxic substances is available in the 2018 State of Water report of the European Environment Agency[48].

Priority Substances used in the assessment of chemical status compared to those monitored

Not all substances are taken into account in the assessment of status. The following six substances are not taken into account in any of the RBDs: di(2-ethylhexyl)phthalate (DEHP), diuron, isoproturon, tributyltin-cation, chloroalkanes C10-13 and brominated diphenylethers. Eight additional substances and groups of priority substances are not taken into account in the East Aegean RBD, according to WISE.

According to WISE, some (groups of) Priority Substances used in the assessment of status are not monitored (this was the case for two cyclodiene pesticides in the Danube, 13 individual priority substances in the Black Sea, and 11 in the West Aegean RBD).

[46] Amended by Directive 2013/39/EU

[47] Brominated diphenylether, Mercury and its compounds, Polyaromatic hydrocarbons (PAH), Tributyltin, PFOS,dioxins, hexabromocyclodecane and heptachlor

[48] https://www.eea.europa.eu/publications/state-of-water (p40-41 of the report). Also available in a more interactive format at : https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_SWB_Chemical_Status_Maps/SWB_Failing_Good_Chemical_Status_RBD?iframeSizedToWindow=true&:embed=y&:showAppBanner=false&:display_count=no&:showVizHome=no

Bulgaria however subsequently clarified that these are reporting mistakes: substances not monitored are not taken into account in the assessment of status[49] (also see section entitled "Monitoring of Priority Substances that are discharged in each RBD").

Application of alternative environmental quality standards for water, biota and sediment

According to the EQS Directive, Member States may opt to apply environmental quality standards for another matrix than the one specified in the Directive for a given substance. If they do so, they have to ensure the environmental quality standard they set in the other matrix (or matrices) offers at least the same level of protection as the standard established in the Directive.

The Danube RBD reported that alternative and/or additional standards for particular Priority Substances had been applied for many different substances in different RBDs. Bulgaria however subsequently clarified that this is a reporting mistake and that no alternative EQS have been used in the assessment of chemical status.

Use of mixing zones

Article 4 of the EQS Directive provides Member States with the option of designating mixing zones adjacent to points of discharge in surface waters. Concentrations of priority substances may exceed the relevant environmental quality standard within such mixing zones if they do not affect the compliance of the rest of the surface water body with those standards. Member States that designate mixing zones are required to include within their RBMPs a description of the approaches and methodologies applied to define such zones, and a description of the measures taken to reduce the extent of the mixing zones in the future.

Mixing zones have not been designated under Article 4 of the EQS Directive in Bulgaria.

Background Concentrations and Bioavailability

The EQS Directive stipulates that Member States have the possibility, when assessing the monitoring results against the environmental quality standard, to take into account:

(a) natural background concentrations for metals and their compounds, if they prevent compliance with the environmental quality standard, and;

[49] Bulgaria also clarified that some of the substances reported in WISE as not monitored were actually monitored, for example benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene in the West Aegean.

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(b) hardness, pH or other water quality parameters that affect the bioavailability of metals.

Natural background concentrations for metals and their compounds are taken into consideration where such concentrations prevent compliance with the relevant Environmental Quality Standards in three RBDs of Bulgaria but not in one RBD (East Aegean).

Water quality parameters that affect the bioavailability of metals have not been taken into account in Bulgaria when assessing monitoring results against relevant Environmental Quality Standards.

4.2. Main changes in implementation and compliance since first cycle

For the first RBMP, no national methodology for the monitoring and assessment of chemical status had been adopted. The second RBMPs report progress with the development of a range of common national methodologies and guidance documents, namely:

- 'National methodology for assessment of the chemical status of surface water bodies';
- 'Method for determining background concentrations of chemical elements';
- 'Method for using the determined background concentrations when assessing the ecological and chemical status of surface water bodies';
- 'Method for trends assessment of the concentrations of pollutants in sediment and biota';
- 'Method for using results, which are under the limits for quantitative determination of the analysis method and not meeting the requirements of EQS Directive 2009/90/EC (Article 84 of Ordinance 1 from 11 April 2011 on the monitoring of waters)' - when using monitoring data that does not meet the requirements of the WFD;
- 'Methodology for determining the confidence level of the assessment of ecological and chemical status'.

The application of these methodologies has improved coherence between RBDs in the second RBMPs. Though some issues remain; notably the very large proportion of water bodies in unknown status.

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Overall in Bulgaria in the second RBMP, there has been a net increase in the number of monitoring sites and water bodies monitored for chemical status in all water categories since the first RBMP.

Small percentages of surface water bodies have been monitored for 10 or more Priority Substances in water with no reported monitoring in sediment or biota. Comparable information from the first RBMP is not readily available. However, no progress has been made with the development of analytical methods for six Priority Substances that were reported as not available in the first cycle and have yet to be developed and implemented in the second cycle.

Overall between the two RBMPs there was a large decrease in proportion of surface water bodies with good chemical status but little change in the proportion that fail to achieve good status. The proportion with unknown status has increased. The decrease in the proportion of water bodies with good chemical status and the increase of those with unknown status occurred across all RBDs. In terms of Natural/Heavily Modified/Artificial water body categorisation; there was a large decrease in the proportion with good status and a large increase in the proportion with unknown status across all categories. The reported changes in status have been attributed to improvements in the extent of monitoring and to changes in the national methodologies.

The main substances causing failures were cadmium, mercury and nickel in both RBMPs. Some improvements have been reported from the first to the second RBMP, for lead and for nickel in the East Aegean RBD.

Good chemical status of surface water bodies is not expected to be fully achieved by the end of the third planning cycle in Bulgaria or it is unknown when it will be achieved (see details in section above). The timetable for reaching the chemical status objectives appears to have deteriorated in the East Aegean RBD.

4.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and in the assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

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Assessment: This recommendation is relevant to several topics. In terms of the assessment of status, Bulgaria acknowledges that for the first RBMP, no national methodology for the monitoring and assessment of chemical status had been adopted. The second RBMPs report significant progress with the development of a range of common national methodologies and guidance documents and these are listed in Section 4.2 above. However, there has been an increase in the proportion of waterbodies in unknown status, despite the increase in the number of sites and waterbodies monitored. A significant proportion of waterbodies in good chemical status are also classified with a low confidence, and not all substances are used in the assessment of status. Progress has therefore been made in terms of developing methodologies but the part of the above recommendation related to the assessment of status has not been fulfilled yet.

- Recommendation: *Complete the development of methods for the status assessment of water bodies and determination of reference conditions. An adequate WFD-compliant assessment and monitoring framework is a necessary pre-requisite to design effective PoMs and ultimately to achieve the WFD objectives.*

  Assessment: With regard to the development of methods, as stated under the recommendation above, the second RBMPs report significant progress with the development of a range of common national methodologies and guidance documents and these are listed in section 4.2 above. In terms of the monitoring programme, the proportions of monitoring sites and water bodies monitored for chemical status for surface fresh waters in particular are limited to about one sixth of sites, and about a quarter of water bodies, although the number of sites and waterbodies monitored have increased between the two RBMPs, which represents a progress compared to the first RBMP. Monitoring frequencies are not always in line with the recommended minimum frequency, and no explanation could be found for the reduced frequencies. Progress has been made on this recommendation, but it is only partially fulfilled.

- Recommendation: *Mercury, hexachlorobenzene and hexachlorobutadiene should be monitored in biota for comparison with the biota standards in the EQS Directive, unless water Environmental Quality Standards providing an equivalent level of protection are derived. Biota Environmental Quality Standards should also be considered for other substances where analysis in water is problematic. Trend monitoring in sediment or biota is specified for several Priority Substances in Directive 2008/105/EC Article 3(3) and will need to be reflected in the next RBMP*

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Assessment: According to WISE, mercury, hexachlorobenzene and hexachlorobutadiene are not monitored in biota for status assessment. Monitoring for these substances is undertaken in water but no evidence could be found in the RBMPs assessed to indicate that an equivalent level of protection to the biota standard is provided. Bulgaria reported to WISE that no results from monitoring of sediment or biota were available for the second RBMPs. Bulgaria has provided further information stating that research was carried out for the Black Sea RBD in 2014 on mercury, hexachlorobenzene and hexachlorobutadiene concentrations in biota in transitional and river water bodies. The results indicated that only mercury exceeded the biota EQS. Water bodies for which values were found to be above the EQS for mercury in biota were assessed as failing to achieve good chemical status.

Bulgaria has not reported trend monitoring in sediment or biota. The RBMPs and background documents provided some evidence of preparatory work in terms of the development of a method for trend assessment of the concentrations of pollutants in sediment and biota and some pilot monitoring and testing. The second RBMPs indicated that monitoring would be implemented in the second cycle.

This recommendation has therefore been partially fulfilled.

- Recommendation: *Monitoring should be strengthened as there is not enough monitoring data related to biological and chemical elements and this is also a reason for low confidence in the assessment of their status.*

  Assessment: Bulgaria has reported a net increase in the number of monitoring sites and water bodies monitored for chemical status in all water categories since the first RBMP. Small percentages of surface water bodies have been monitored for 10 or more Priority Substances in water with no reported monitoring in sediment or biota in the second RBMP. Bulgaria subsequently clarified that some monitoring in biota took place in the Black Sea for status assessment.

  Comparable information from the first RBMP is not readily available. However, no progress has been made with the development of analytical methods for six Priority Substances that were reported as not available in the first RBMP and have yet to be developed and implemented. Overall between the two RBMP, there was a large increase in the proportion of water bodies in unknown status, and this occurred across all RBDs which indicates that the monitoring performed is still not sufficient to provide an overall

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assessment of the status of all water bodies (in combination with grouping if relevant), despite the above mentioned increase in the number of monitoring sites. Overall and regardless of status class, 44 % of surface water bodies in Bulgaria were classified for chemical status with medium confidence, 33 % with low confidence and 23 % with high confidence. Whilst there has been progress with some aspects of this recommendation, it is partially fulfilled.

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Topic 5 Monitoring, assessment and classification of quantitative status of groundwater bodies

5.1. Assessment of implementation and compliance with WFD requirements in second cycle

5.1.1. Monitoring of quantitative status in groundwater

The total number of groundwater bodies in Bulgaria is 169 (Table 2.3). 49 groundwater bodies are not subject to monitoring for quantitative status (Table 5.1 and Table 5.2). This means that 29 % of groundwater bodies are not monitored. The information available in the RBMPs does not indicate that grouping of groundwater bodies was applied for monitoring or assessment purposes.

The number of groundwater bodies decreased from 177 in the first RBMP to 169 in the second RBMP but the total groundwater body area increased slightly. 88 groundwater bodies remained unchanged since the first RBMP. The number of monitored groundwater bodies decreased from 135 in the first RBMP to 120 in the second RBMP. The number of monitoring sites for quantitative status is listed in Table 5.3 and shows a decrease from 366 in the first RBMP to 323 in the second RBMP.

156 of the 169 groundwater bodies, located in all RBDs, are identified as Drinking Water Protected Areas.

Table 5.1 Proportion of groundwater bodies in Bulgaria monitored for quantitative status

RBD	No of groundwater bodies with quantitative monitoring	Total No. groundwater bodies	% of total groundwater bodies monitored for quantitative status
BG1000	42	50	84.0%
BG2000	35	40	87.5%
BG3000	16	41	39.0%
BG4000	27	38	71.0%

Source: WISE electronic reports

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Table 5.2 Number of water bodies in Bulgaria directly monitored and the purpose of monitoring

RBD	Total groundwater bodies directly monitored	Monitoring Purpose									
		AGR – Ground-water abstraction site for irrigation	CHE – Chemical status	DWD - Drinking water - WFD Annex IV.1.i	IND – Ground-water abstraction site for industrial supply	NID - Nutrient sensitive area under the Nitrates Directive - WFD Annex IV.1.iv	OPE – Operational monitoring	QUA – Quantitative status	SOE - EIONET State of Environment monitoring	SUR – Surveillance monitoring	TRE – Chemical trend assessment
BG1000	50	0	0	49	0	20	21	42	35	34	50
BG2000	37	0	37	32	6	36	10	35	13	36	13
BG3000	36	3	35	30	15	33	16	16	19	32	9
BG4000	30	0	23	15	12	23	0	27	0	23	0

Source: WISE electronic reports

Table 5.3 Number of groundwater monitoring sites in Bulgaria and their purpose

RBD	Total groundwater monitoring sites	Monitoring Purpose									
		AGR – Ground-water abstraction site for irrigation	CHE – Chemical status	DWD - Drinking water - WFD Annex IV.1.i	IND – Ground-water abstraction site for industrial supply	NID - Nutrient sensitive area under the Nitrates Directive - WFD Annex IV.1.iv	OPE – Operational monitoring	QUA – Quantitative status	SOE - EIONET State of Environment monitoring	SUR – Surveillance monitoring	TRE – Chemical trend assessment
BG1000	305			83		52	40	171	42	57	96
BG2000	184		128	97	10	109	36	78	31	81	21
BG3000	179	3	113	79	21	120	45	43	39	68	18
BG4000	58		32	17	15	28		31		32	

Source: WISE electronic reports

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5.1.2. Assessment and classification of quantitative status for groundwater

Map 5.1 displays the most recently assessed quantitative status of groundwater bodies. It shows that 161 of 169 groundwater bodies (95 %) were in good quantitative status and eight (5 %) are failing good status (Figure 5.1). In terms of area this means that about 1.4 % is failing good quantitative status. About 23 % of the groundwater bodies are at risk. Figure 5.2 shows the confidence in status classifications. All groundwater bodies had and still have a known status, in the first and in the second RBMPs.

For all four RBDs, water balance was assessed by a comparison of annual average groundwater abstraction against the 'available groundwater resource' for every groundwater body.

The reasons for the failure of good quantitative status of groundwater bodies are shown in Figure 5.3. Four groundwater bodies are failing good status due to failing the water balance test which means that the long-term annual average rate of groundwater abstraction is exceeding the available groundwater resource, two groundwater bodies are failing due to damage to groundwater dependent terrestrial ecosystems and two groundwater bodies are failing due to saline intrusions. The expected date of achievement of good quantitative status in Bulgaria is shown in Figure 5.4.

In all RBDs, the criterion of 'available groundwater resource' has been fully applied in accordance with WFD Article 2(27). Only in the West Aegean RBD have all environmental objectives been considered in status assessment.

In total 39 groundwater bodies are at risk of failing good quantitative status by failing the water balance test.

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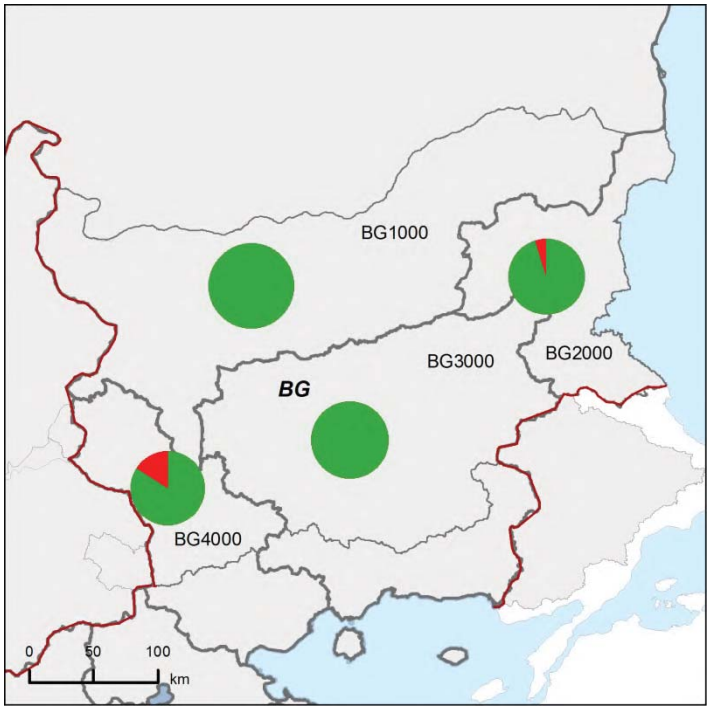
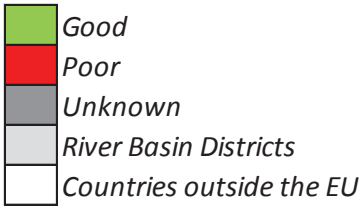
Map 5.1 Map of the most recently assessed quantitative status of groundwater bodies





Note: Standard colours based on WFD Annex V, Article 2.2.4.

Source: WISE, Eurostat (country borders)

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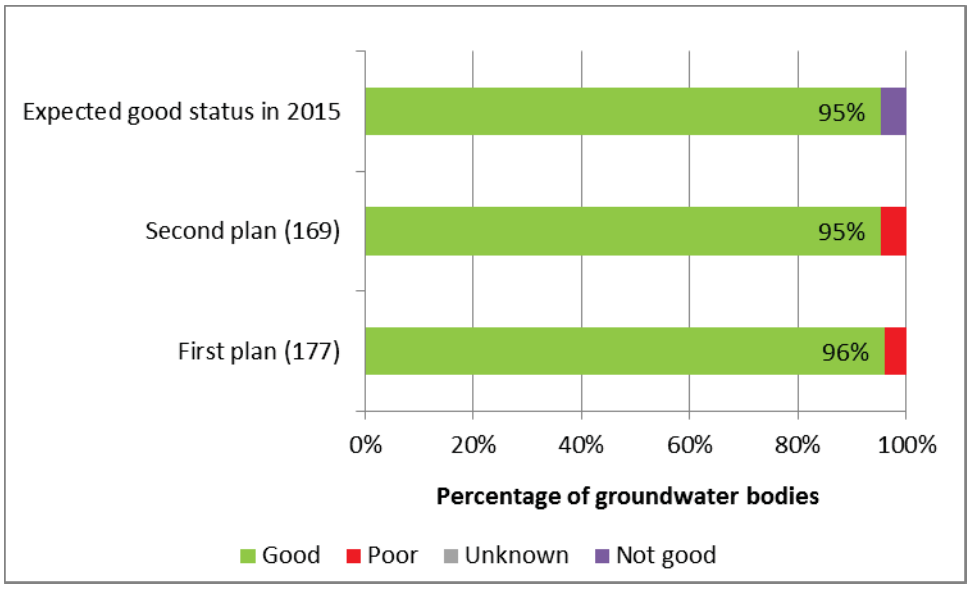
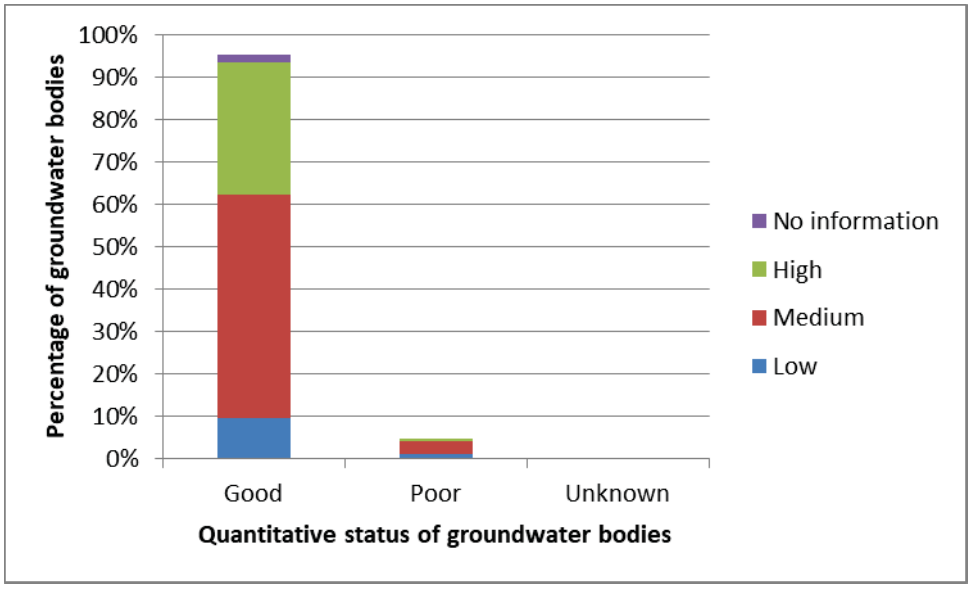
Figure 5.1 ***Quantitative status of groundwater bodies in Bulgaria for the second cycle RBMP, for the first RBMP and expected in 2015. The number in parenthesis is the number of groundwater bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2010 to 2014. The year of the assessment of status for the first RBMP is not known.***



Source: WISE electronic reports

Figure 5.2 ***Confidence in the classification of quantitative status of groundwater bodies in Bulgaria based on the most recent assessment of status***



Source: WISE electronic reports

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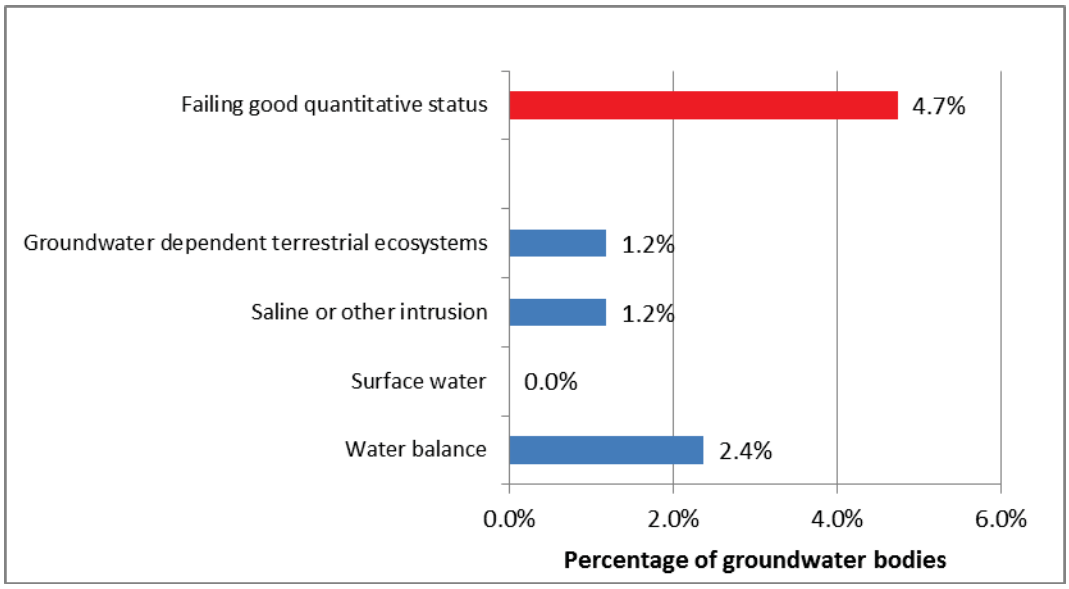
Figure 5.3 Reasons for the failure of good quantitative status of groundwater in Bulgaria based on the most recent assessment of status



Source: WISE electronic reports

Notes:

'Water balance' = long-term annual average rate of abstraction exceeds the available groundwater resource which may result in a decrease of groundwater levels.

'Surface water' = Failure to achieve Environmental Objectives (Article 4 WFD) for associated surface water bodies resulting from anthropogenic water level alteration or change in flow conditions; significant diminution of the status of surface waters resulting from anthropogenic water level alteration or change in flow conditions.

'Groundwater dependent terrestrial ecosystems' = Significant damage to groundwater dependent terrestrial ecosystems resulting from an anthropogenic water level alteration.

'Saline or other intrusion' = Regional saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.

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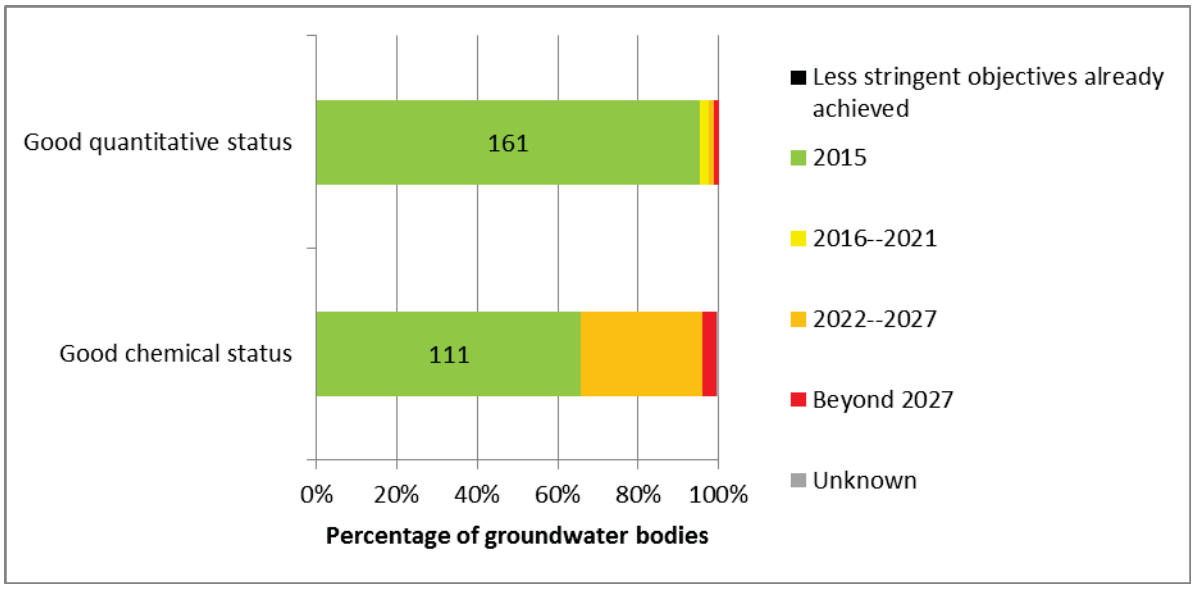
Figure 5.4 Expected date of achievement of good quantitative and good chemical status of groundwater bodies in Bulgaria. 169 groundwater bodies delineated for second RBMP



Source: WISE electronic reports

5.1.3. Consideration of groundwater associated surface waters and/or groundwater dependent ecosystems

Groundwater associated surface waters have been reported in all RBDs. They are not related to risk and they have only been considered in status assessment in the West Aegean RBD.

Groundwater bodies linked with groundwater dependent terrestrial ecosystems exist in all RBDs except the Black Sea RBD. They are not related to risk and they have been considered in status assessment in the East Aegean and West Aegean RBDs.

5.2 Main changes in implementation and compliance since first cycle

88 of 169 groundwater bodies remained unchanged since the first RBMP.

The monitoring situation shows overall drawbacks although the situation improved in certain RBDs: The number of groundwater bodies decreased from 177 in the first RBMP to 169 in the second RBMP but the total groundwater body area increased slightly. The number of monitored groundwater bodies decreased from 123 in the first RBMP to 120 in the second RBMP.

The status changes show mixed results, with some improvement and some deterioration: In the Danube RBD the seven groundwater bodies formerly in poor status are now in good status but

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there are eight groundwater bodies (two in the Black Sea RBD and six in the West Aegean RBD) which were in good status in the first RBMP and are now in poor status. The reported reasons for the changes are the re-delineation of groundwater bodies and the new methodology for status assessment. But the availability of more data compared to the first RBMP also explains changes in status classification for some groundwater bodies.

The changes in the monitoring, assessment and classification of the quantitative status of groundwater bodies are explicitly summarised only in the Danube RBMP. Although the same changes have taken place also for the other three RBDs, their RBMPs do not explicitly summarise the differences between the previous and current RBMPs.

The assessment of groundwater quantitative status improved: The preparation of the RBMPs follows nationally approved guidelines and methodologies that did not exist during the preparation of the first RBMPs. Hence, the main change since the first RBMPs is the adoption of national methodologies and guiding documents, which are relevant for the assessment of the quantitative status of groundwater bodies and have been used in all four RBMPs. These documents are:

- Pressures and impacts on the quantitative status of groundwater bodies and Method for the assessment of risk that groundwater body would not reach good quantitative status;
- Method for the assessment of the quantitative status of groundwater bodies;
- Method for the planning of networks and programmes of monitoring, characteristics of the points and programmes.

According to the summary available in the Danube RBD, another important change since the first RBMPs has been the improvement of the monitoring networks and the availability of more data for the analysis of the quantitative status of the groundwater bodies. In addition, all RBMPs report that some changes took place also with the delineation of the groundwater bodies and together with the application of the new methodologies and guidance documents this influenced the number of groundwater bodies classified in good/poor quantitative status.

5.3 Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and Programme of Measures.

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Topic 6 Monitoring, assessment and classification of chemical status of groundwater bodies

6.1 Assessment of implementation and compliance with WFD requirements in second cycle

6.1.1. Monitoring of chemical status in groundwater[50]

The total number of groundwater bodies in Bulgaria is 169 (Table 2.3). In total 44 (27 %) groundwater bodies are not subject to surveillance monitoring. 78 groundwater bodies (46 %) are at risk but only 47 groundwater bodies are subject to operational monitoring. There is no operational monitoring at all in the West Aegean RBD with nine groundwater bodies at risk. The RBMPs do not indicate that grouping of groundwater bodies was applied e.g. for monitoring or assessment purposes.

The number of groundwater bodies decreased from 177 in the first RBMP to 169 in the second RBMP but the total groundwater body area increased slightly. 88 groundwater bodies remained unchanged since the first RBMP.

The number of groundwater bodies with surveillance monitoring decreased from 141 of 177 (80 %) in the first cycle to 125 of 169 groundwater bodies (74 %) in the second RBMP. The number of monitoring sites is listed in table 14 and shows a slight decrease from 241 in the first cycle to 238 in the second RBMP. The number of operational monitoring sites is 121 and has not changed since the first RBMP.

Not all substances causing risk of deterioration in chemical status are subject to surveillance and operational monitoring.[51] The Groundwater Directive[52] Annex II substances are included in operational monitoring as well as basic parameters, substances causing risk, substances with increasing trends and further substances indicative of the pressure situation.

[50] Bulgaria subsequently clarified that there was an error in the reported data. The total number of monitoring points for chemical status of groundwater bodies increased from 477 in the 1st cycle RBMP to 1016 in the second RBMP. Surveillance monitoring is carried out in 164 groundwater bodies (157 during the 1st cycle RBMP) and operational monitoring in 92 groundwater bodies (48 in the 1st cycle RBMP). Operational monitoring includes all groundwater bodies at risk.

[51] Bulgaria subsequently clarified that certain substances that are emitted from surface sources and which have the potential to reach the groundwater body through leaching but which have not yet reached the groundwater body are not yet subject to monitoring. They are identified as being at risk to the groundwater body and they are monitored in the second RBMPs period.

[52] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0118-20140711

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No dedicated trend monitoring has been established but the results from surveillance and operational monitoring will be used for trend assessments. All WFD core parameters (nitrate, ammonium, electrical conductivity, oxygen and pH) are monitored in all RBDs.

6.1.2. Assessment and classification of chemical status in groundwater

Map 6.1 and Figure 6.1 display the chemical status of groundwater bodies for the most recently assessed status. It shows that 111 of 169 groundwater bodies (66 %) were of good chemical status, and the remaining 58 groundwater bodies (34 %) are failing good status. In terms of area, this means that about 45 % is failing good chemical status. All groundwater bodies had, and still have, a clearly defined status in both the first and second RBMPs.

The total number of groundwater bodies failing good chemical status increased since the first RBMP from 54 (31 %) to 58 (34 %) groundwater bodies (Figure 6.1) (from 42 % to 45 % of the total groundwater body area). Figure 6.2 shows the confidence in status classifications. The RBMPs report some changes to the delineation of the groundwater bodies between the two periods, the introduction and application of a common national methodology for assessment of the chemical status and the availability of more data for analysis, which may have impacted the groundwater bodies classified chemical status. The expected date of achievement of good chemical status in Bulgaria is shown in Figure 25

The reasons for the failure of good chemical status of groundwater bodies are shown in Figure 6.3. For 42 groundwater bodies, the general assessment of the chemical status for the groundwater body as a whole was that they had failed, based on the significant environmental risk from pollutants across a groundwater body and a significant impairment of the ability to support human uses. 33 groundwater bodies are failing the drinking water test which means that the requirements of Drinking Water Protected Areas have not been met. Two groundwater bodies are failing good chemical status due to saline or other intrusion. Figure 6.4 shows the top 10 pollutants causing failure of status and the pollutants causing a sustained upward trend.

The calculation of the extent of exceedance of a groundwater quality standard or a groundwater threshold value is in all RBDs based on the groundwater body area.

In all RBDs groundwater threshold values have been established for all pollutants or indicators of pollution causing a risk of failure of good chemical status and background levels have been considered in the groundwater threshold value establishment.

A trend methodology is available and assessments have been performed in all RBDs.

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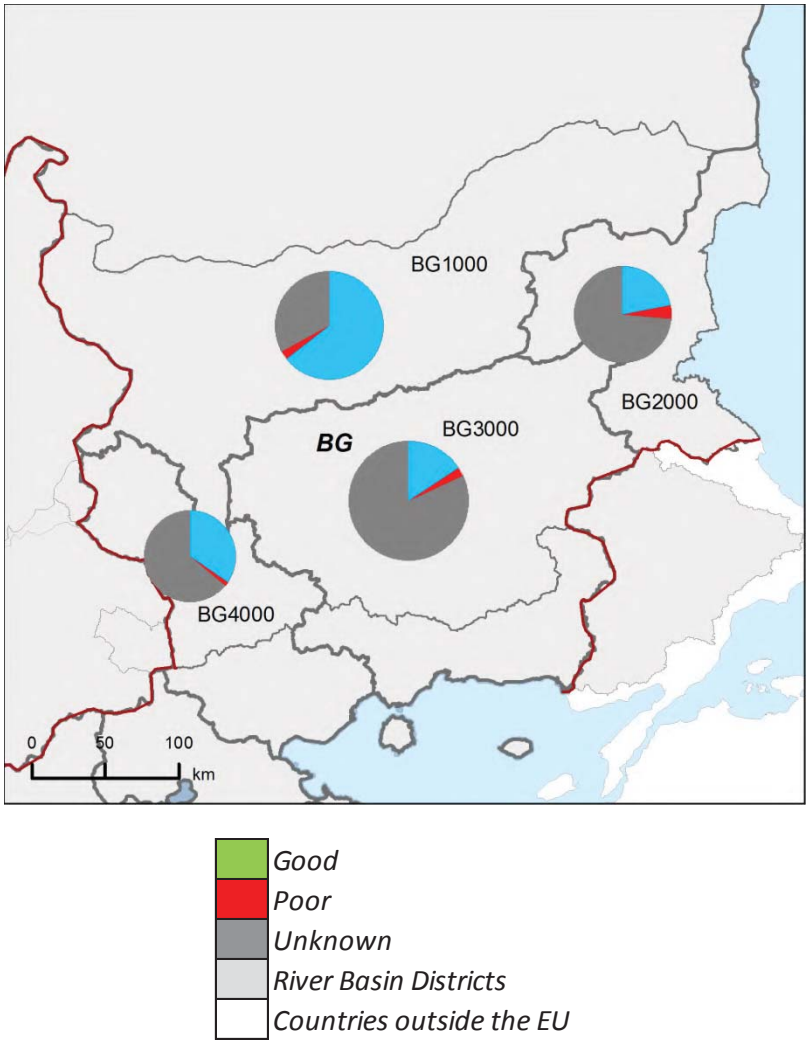
Map 6.1 ***Map of chemical status of groundwater bodies in Bulgaria based on the most recently assessed status of the groundwater water bodies***



Note: Standard colours based on WFD Annex V, Article 2.4.5.
Source: WISE, Eurostat (country borders)

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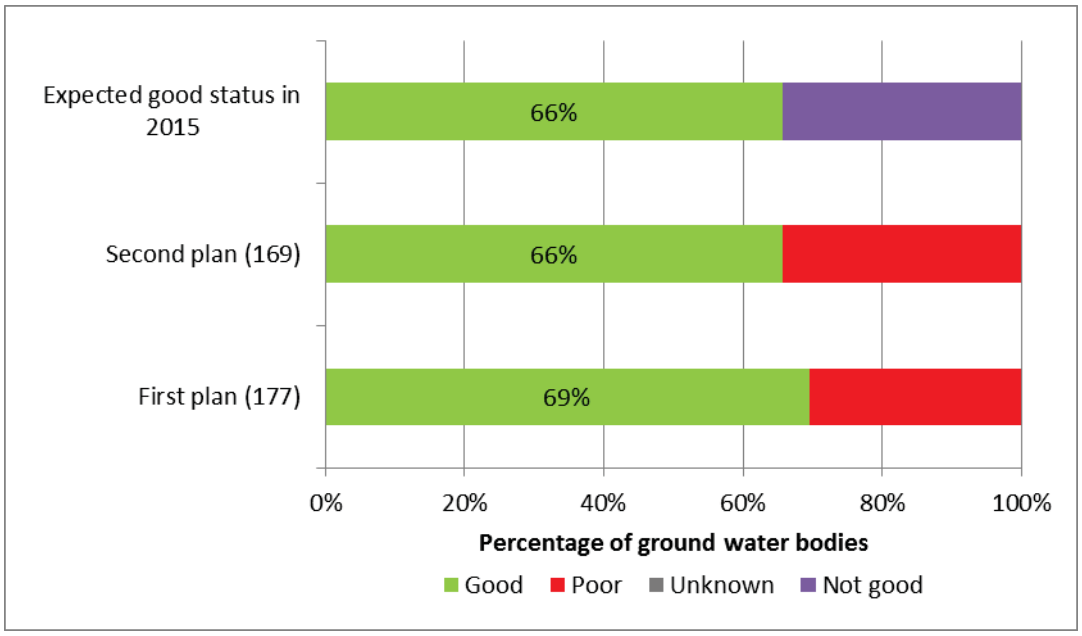
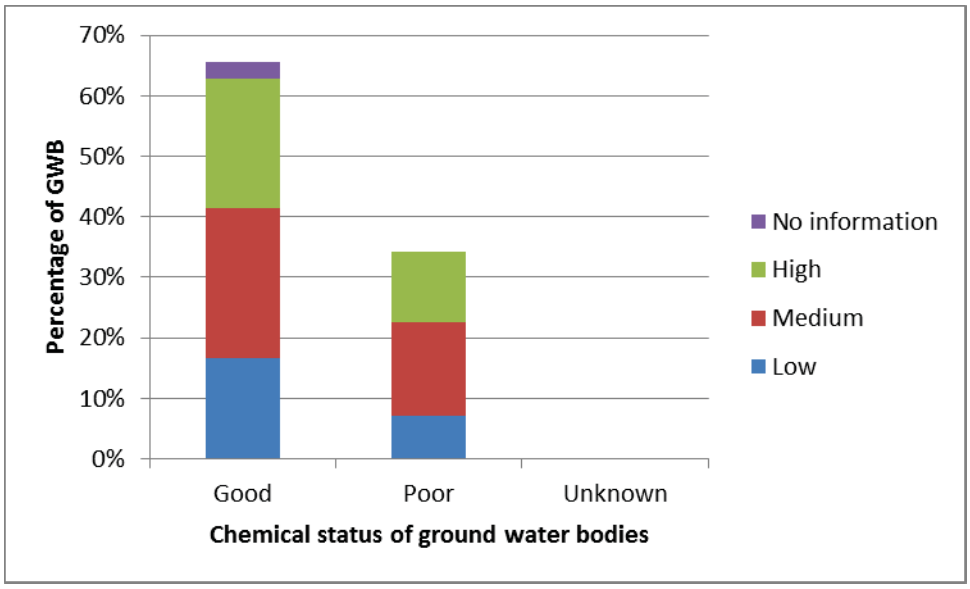
Figure 6.1 ***Chemical status of groundwater bodies in Bulgaria for the second RBMP, for the first RBMP and expected in 2015. The number in the parenthesis is the number of groundwater bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2007 to 2014. The year of the assessment of status for the first RBMP is not known.***



Source: WISE electronic reports

Figure 6.2 ***Confidence in the classification of chemical status of groundwater bodies in Bulgaria based on the most recent assessment of status***



Source: WISE electronic reports

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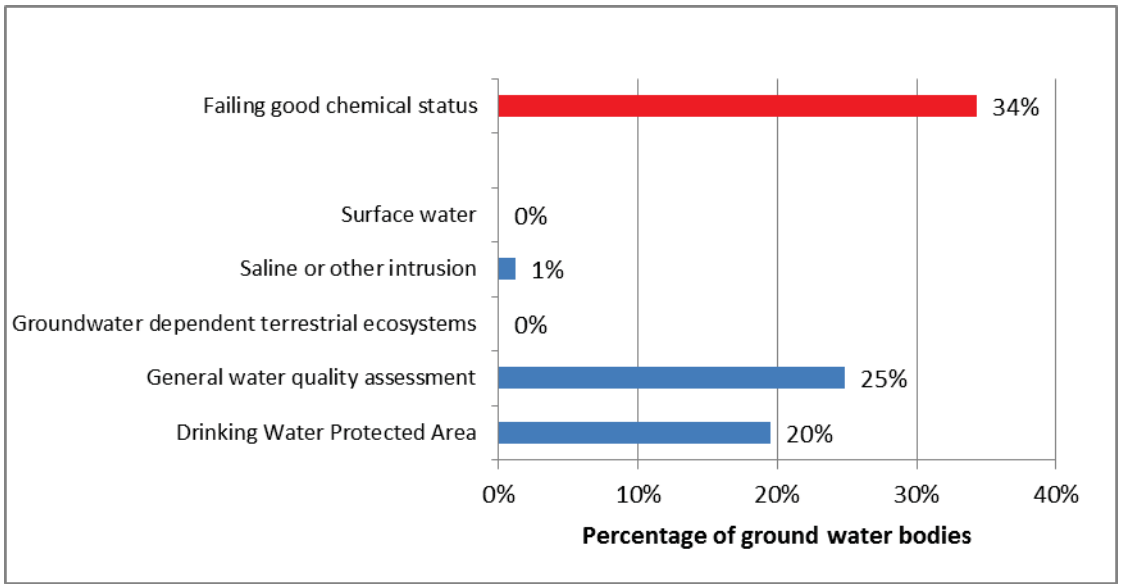
Figure 6.3 Reasons for failing good chemical status in Bulgaria for the most recent assessment of status



Source: WISE electronic reports

Notes:

'Surface water' = Failure to achieve Environmental Objectives (Article 4 WFD) in associated surface water bodies or significant diminution of the ecological or chemical status of such surface water bodies.

'Groundwater dependent terrestrial ecosystems' = Significant damage to terrestrial ecosystems which depend directly on the groundwater body.

'Saline or other intrusion' = Regional saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.

'Drinking Water Protected Area' = Deterioration in quality of waters for human consumption.

'General water quality assessment' = Significant impairment of human uses; significant environmental risk from pollutants across the groundwater body.

6.1.3. Consideration of groundwater associated surface waters and/ or groundwater dependent ecosystems[53]

In all RBDs surface water bodies are associated to groundwater bodies and in the West Aegean RBD a related risk is indicated. These aquatic ecosystems have been considered in status assessment in two of four RBDs (in the Black Sea RBD and the West Aegean RBD).

Groundwater bodies linked with groundwater dependent terrestrial ecosystems exist in all RBDs except the Black Sea RBD. They are related to risk in the West Aegean RBD and they have been considered in status assessment in all RBDs where such ecosystems exist.

[53] Bulgaria subsequently clarified that due to a reporting error groundwater dependent aquatic and terrestrial ecosystems are in fact not causing a risk of not achieving good chemical status for groundwater bodies.

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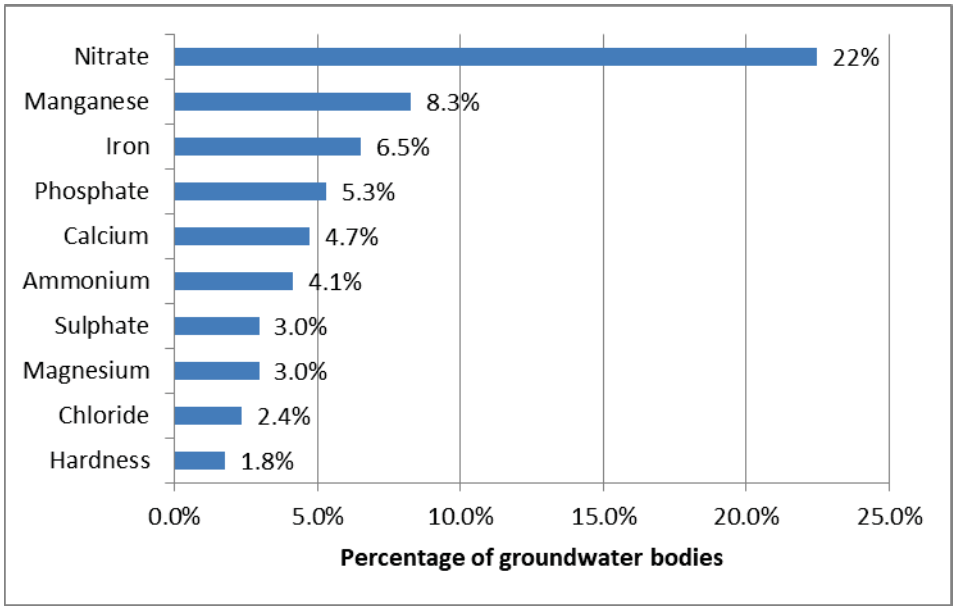
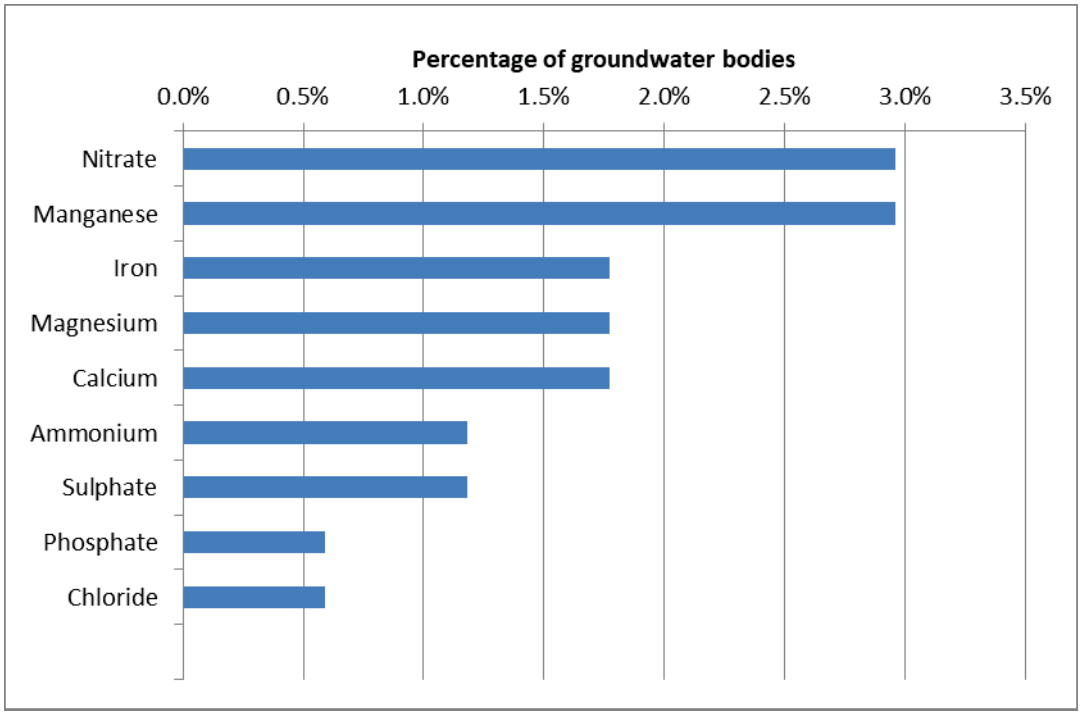
Groundwater associated aquatic ecosystems and groundwater dependent terrestrial ecosystems have not been considered in the establishment of groundwater threshold values, although they are related to risk in the West Aegean RBD in seven groundwater bodies.

Figure 6.4 Top 10 groundwater pollutants causing failure of good chemical in Bulgaria



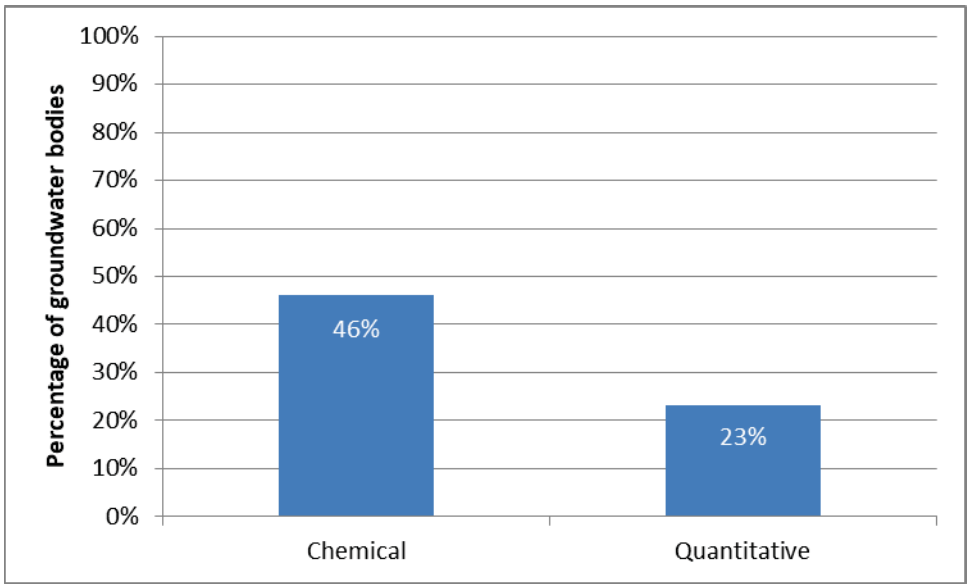
Source: WISE electronic reports

Figure 6.5 Top 10 pollutants with upward trends in groundwater bodies in Bulgaria



Source: WISE electronic reports

Figure 6.6 Percentage of groundwater bodies in Bulgaria at risk of failing good chemical status and good quantitative status for the second RBMP



Source: WISE electronic reports

6.2. Main changes in implementation and compliance since first cycle

88 of 169 groundwater bodies remained unchanged from the first RBMP.

The initial assessment showed that the monitoring situation is not fully complete and has even deteriorated: In the first RBMP surveillance monitoring covered about 80 % of the groundwater bodies and now only 74 % of the groundwater bodies are covered. The number of operational monitoring sites remained but 78 groundwater bodies are at risk and only 47 groundwater bodies are subject to operational monitoring.

However Bulgaria subsequently clarified that the total number of monitoring points for chemical status of groundwater bodies increased. Surveillance monitoring is carried out in 164 groundwater bodies (157 during the first RBMP) and operational monitoring in 92 groundwater bodies (48 in the first RBMP). Operational monitoring includes all groundwater bodies at risk.

The changes in the monitoring, assessment and classification of the quantitative status of groundwater bodies are explicitly summarised in a dedicated box only in the Danube RBMP. Although the same changes have taken place also for the other three RBDs, their RBMPs do not explicitly summarise the differences between the previous and current RBMPs.

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The chemical status situation worsened as the total groundwater area failing good chemical status increased from 42 % to 45 %. Bulgaria clarified that this was not caused by the deterioration of water quality due to increased pressures or not effective measures but because of the improvements of assessing the groundwater bodies described in the following. The preparation of the RBMPs follows nationally approved guidelines and methodologies that did not exist during the preparation of the first RBMPs. Hence, the main change since the first RBMPs is the adoption of national methodologies and guiding documents, which are relevant for the assessment of the chemical status of groundwater bodies and have been used in all four RBMPs. These documents are:

- Method for the assessment of the chemical status of groundwater bodies;
- Method for the planning of networks and programmes of monitoring, characteristics of the points and programmes.

Another important change since the previous RBMPs has been the improvement of the monitoring networks and the availability of more data for the analysis of the chemical status of the groundwater bodies. In addition, all RBMPs report that some changes took place also with the delineation of the groundwater bodies and together with the application of the new methodologies and guidance documents this influenced the number of groundwater bodies classified in good/poor chemical status.

6.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Monitoring should be strengthened as there is not enough monitoring data related to biological and chemical elements and this is also a reason for low confidence in the assessment of their status.*

  Assessment: Initial assessment showed that the recommendation is not fulfilled. In the first RBMP coverage of surveillance monitoring was 80 % but now it is 74 % of groundwater bodies. Operational monitoring is still not covering all groundwater bodies at risk because 78 groundwater bodies are at risk but only 47 groundwater bodies are subject to operational monitoring.

  However, Bulgaria clarified that the total number of monitoring points for chemical status of groundwater bodies in Bulgaria increased, with surveillance monitoring being

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carried out in 164 water bodies (157 during the first RBMP) and operational monitoring in 92 water bodies (48 in the first RBMP), while the number of total water bodies was reduced from 177 to 169. The authorities also mentioned this is also part of in the published monitoring programmes for the period 2010-2017.

Therefore, despite the WISE reported data, the additional information provided by Bulgaria indicates that for groundwater bodies this recommendation is largely fulfilled.

- Recommendation: *Groundwater trend assessments should be carried out at all RBDs.*

  Assessment: The recommendation is fulfilled as trend assessment is done in all RBDs. Groundwater associated aquatic ecosystems and groundwater dependent terrestrial ecosystems have been fully considered in chemical status assessment in those RBDs where such ecosystems exist and are related to risk.

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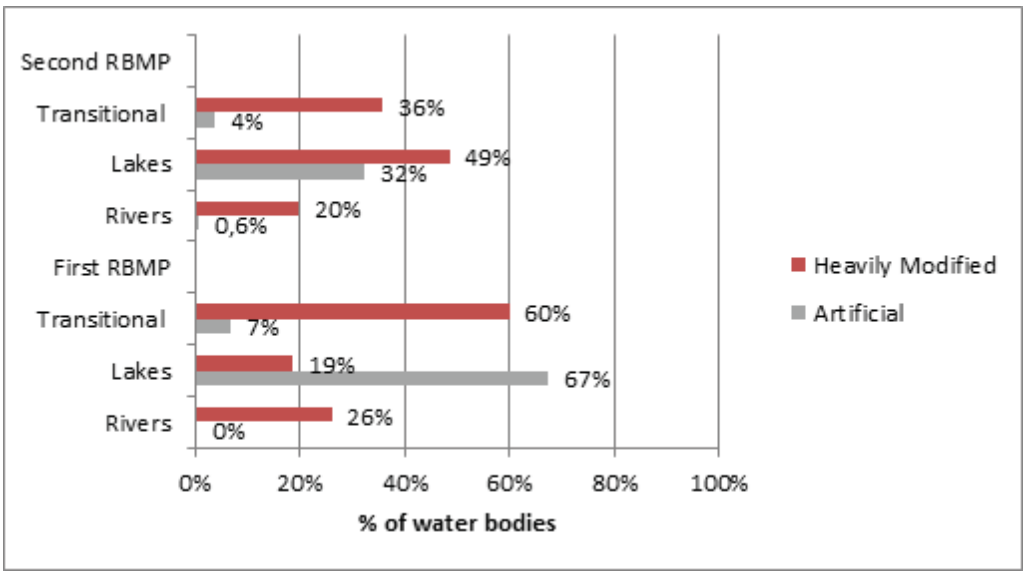
Topic 7 Designation of Heavily Modified and Artificial Water Bodies and definition of Good Ecological Potential

7.1. Assessment of implementation and compliance with WFD requirements in second cycle for designation

7.1.1. Designation of Heavily Modified and Artificial Water Bodies

The WFD requires a review of designation of heavily modified and artificial water bodies every six years. Several changes in the numbers of designated heavily modified water bodies and artificial bodies are noted since the first RBMPs (Figure 7.1). River heavily modified water bodies increased in the Danube RBD (from 42 to 51) and decreased in the East Aegean RBD (from 87 to 71). Lake heavily modified water bodies increased in the East Aegean RBD (from one to six) and in the West Aegean RBD (from 6 to 11). Transitional heavily modified water bodies increased in the Black Sea RBD from 9 to 10 (but decreased from 60 % to 35 % of total transitional water bodies). Lake artificial water bodies decreased in the Danube RBD (from 12 to 5) and in the East Aegean RBD (from 14 to 4). River artificial water bodies increased from one to five in the East Aegean RBD.

Figure 7.1 ***Proportion of total water bodies in each category in Bulgaria that has been designated as heavily modified or artificial***



Source: WISE electronic reports

Several of the designated heavily modified water bodies are reservoirs. The majority of these were originally rivers and are mainly designated as river heavily modified water bodies. Some of the reservoirs which were originally rivers are designated as lake heavily modified water

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bodies (the East Aegean RBD, the West Aegean RBD) and a few are designated as transitional heavily modified water bodies (in the Black Sea RBD). According to Common Implementation Strategy guidance[54] on this issue, though, it is recommended to designate such water bodies as river heavily modified water bodies.

The main water uses for which river water bodies are designated as heavily modified water bodies are irrigation, flood protection, storage for fisheries and hydropower. The main water uses of lake heavily modified water bodies are irrigation, storage for fisheries and urban development. The main uses of transitional heavily modified water bodies are transport and urban development. The main physical alterations of river heavily modified water bodies are channelisation/straightening/bed stabilisation/bank reinforcement and weirs/dams/reservoirs. Lake heavily modified water bodies are mainly affected by weirs/dams/reservoirs and transitional heavily modified water bodies by weirs/dams/reservoirs and dredging/channel maintenance.

The national methodology for designation of heavily modified water bodies and artificial water bodies provides a detailed step-by-step approach for designating heavily modified water bodies and artificial water bodies, including consideration of the significant adverse effects of restoration measures and achievement of the benefits by other means.

The adverse effects of the restoration measures are assessed for the environment and the following uses: navigation, tourism/recreation, water supply, energy generation, irrigation, water control, flood protection, urbanization and other uses. The national methodology outlines examples for which it can be considered that the restoration measures have adverse effects on the environment or uses. The examples include (but are not limited to) cases where the restoration measures cause:

- significant losses to the energy generation or reduced security of energy supply at regional or national level;
- increases of the flood risks and risks to the infrastructure;
- reduction of the quantity of drinking water leading to a risk of insufficient drinking water supply;
- impacts on the agricultural production;

[54] https://circabc.europa.eu/sd/a/f9b057f4-4a91-46a3-b69a-e23b4cada8ef/Guidance%20No%204%20-%20heavily%20modified%20water%20bodies%20-%20HMWB%20(WG%202.2).pdf

- impacts on other water bodies;
- negative impacts on existing habitats, Natura 2000 sites and protected areas, sites of special scientific interest or sites of cultural and natural heritage.

Concerning the beneficial effects of the modifications by other means, the national methodology specifies that as 'other means' should be considered alternatives that partly or completely replace the current uses of the modifications. Once the other means are identified, it is determined whether these other means are technically feasible. Finally, a comparison of the overall benefits to the environment and the overall costs of each technically feasible alternative is made. When the cost-benefit analysis shows disproportionately high costs the water bodies are designated as heavily modified water bodies. In other cases, measures for the achievement of good ecological status are formulated.

The step-by-step results per water body from the application of the national methodology are presented in Annexes for three of the RBMPs (Danube, East Aegean and West Aegean).

In the Danube RBD, the Danube river is designated as a heavily modified water body. The step-by-step methodology for determining heavily modified water bodies was applied and reported. The assessment based on the criteria for preliminary identification of heavily modified water bodies showed that there is no need to classify the Danube as a heavily modified water body. However, the RBMP explains that due to the transboundary nature of the river, the pressures from the Romanian side could not be adequately included in the analysis. Furthermore, the national methodology is not meant for large transboundary rivers such as the Danube and some modifications are necessary before it can be applied to such rivers. The designation of the Danube as a heavily modified water body was discussed at the regular bilateral meetings with Romania and given the results of the Romanian RBMPs, the Danube was finally designated as a heavily modified water body due to flood protection, navigation and urbanisation.

7.1.2. Definition of Good Ecological Potential for Heavily Modified and Artificial Water Bodies

Good ecological potential is reported as defined in two out of four RBDs (the Danube RBD and the Black Sea RBD). It has not been defined in the East Aegean RBD and the West Aegean RBD. The approach used for good ecological potential definition is the Common Implementation Strategy Guidance approach (approach based on biological quality elements as illustrated in Common Implementation Strategy Guidance No 4) and good ecological potential is defined at water body level.

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Good ecological potential is also reported as defined in terms of biology. The biological quality elements for which biological values have been derived to define maximum ecological potential and good ecological potential are mainly fish (in all RBDs) and in addition macrophytes, phytobenthos, benthic invertebrates, and phytoplankton in one RBD (the Black Sea RBD). The estimation of biological values of biological quality elements for maximum ecological potential and good ecological potential is based on available data and monitoring, similar to the estimation of biological values for ecological status.

The national method for determining ecological potential addresses rivers, lakes and coastal waters in Bulgaria. It provides detailed information and examples for identifying mitigation measures for the different hydromorphological pressures and impacts which the different types of heavily modified water bodies face as a result of their economic use. The examples of pressures include creation of barriers and reservoirs, fishing, water use for economic purposes, navigation and recreation. The sensitivity of five biological quality elements (phytoplankton, phytobenthos, macrophytes, macrozoobenthos and fish) and hydromorphological quality elements to these pressures and expected impacts is described. A four-level range of the impacts on biological quality elements is defined for determining the Maximum Ecological Potential and the Good Ecological Potential. The different levels of the range are described qualitatively for each type of hydromorphological pressure, surface water body (rivers, lakes or coastal waters) and each of the five biological quality elements. Furthermore, qualitative biological definitions are provided for maximum, good, moderate, bad and poor ecological potential. The method also qualitatively outlines the expected ecological impact, indicative biological quality elements, potential adverse effects on the use and examples of specific implementation actions for each of the considered mitigation measures.

The assessment of the ecological potential of heavily modified water bodies/artificial water bodies uses the classification system for biological quality elements developed in Ordinance N4 for the characterisation of surface waters (of 2012 and updated in 2014)[55]. In this classification system, ranges of threshold values are outlined for different biological quality elements and types of surface water bodies. Overall, the methods for estimating biological quality elements values are not distinguished between good ecological status and potential and the national classification system for determining ecological status and ecological potential is partly overlapping. A separate range for ecological status and ecological potential is available only for fish fauna in rivers. For the remaining biological quality elements, the ranges for

[55] This ordinance sets out the general requirements, definitions and threshold values for determining the ecological status of rivers, lakes, transitional and coastal waters and the ecological potential of rivers and lakes.

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ecological status and ecological potential are the same (for macrophytes) or are not developed (phytobenthos, phytoplankton, macrozoobenthos).

For rivers, methods for assessing fish, macrophytes, phytobenthos and benthic invertebrates are reported as sensitive to altered habitats due to both hydrological and morphological changes. Two methods for phytobenthos and invertebrates are only sensitive to morphology but not to hydrology. For lakes and transitional waters, no biological quality elements methods sensitive to hydromorphology are reported. For coastal waters, only one method for benthic invertebrates is sensitive to altered habitats due to both hydrological and morphological changes.

Mitigation measures for defining good ecological potential have been reported in two out of four RBDs (the Danube RBD and the Black Sea RBD). Ecological changes expected due to the mitigation measures are described in a qualitative way, as the method outlines the expected ecological impact, indicative biological quality elements, potential adverse effects on the use and examples of specific implementation actions for each of the considered mitigation measures. Tables detailing the mitigation measures, possible adverse effects on the use, key biological quality elements indicators, additional indicators and expected ecological effects and results are presented for each surface water category (river, lake and coastal waters) and each type of pressure.

7.2. Main changes in implementation and compliance since first cycle

As described above, there have been modifications in the extent of designation of water bodies as heavily modified or artificial in several RBDs since the first RBMPs.

The reason for the differences in the designation of heavily modified water bodies and artificial water bodies is the application of new national methodology and guidance for their designation. This methodology (and accompanying guidance) was developed after the first RBMPs and has been applied for the second RBMPs. Two of the second RBMPs (Black Sea and West Aegean) state that the designation of heavily modified water bodies and artificial water bodies in the first cycle was prepared primarily based on expert judgement and a list of activities considered to lead to significant modifications, while in the second cycle the national methodology was applied; this explains the difference in the number of heavily modified water bodies and artificial water bodies between the two reporting cycles. The other two RBMPs (Danube and East Aegean) only state that the national methodology for the designation of heavily modified water bodies and artificial water bodies was applied in this cycle, without providing comparisons with the methods for the designation in the first RBMPs.

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The national supporting documents on the method for designation of heavily modified water bodies do not provide explanations on whether and how these methods differ between the two reporting cycles.

Concerning the definition of good ecological potential, a national method for determining the ecological potential of rivers, lakes and coastal waters has been developed since the first reporting cycle. None of the RBMPs explicitly report what are the differences in the assessment of the ecological potential of heavily modified water bodies compared to the first cycle; however the national methodology for designating heavily modified water bodies and determining their good ecological potential was developed after the first reporting cycle and first applied for the second RBMPs, indicating a key improvement.

7.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *The designation of heavily modified water bodies should comply with all the requirements of Article 4(3). The assessment of significant adverse effects on their use or the environment and the lack of significantly better environmental options should be specifically mentioned in the RBMPs. This is needed to ensure transparency of the designation process.*

  Assessment: Heavily modified water bodies are designated due to various uses, including irrigation, flood protection, storage for fisheries, hydropower, urban development and transport. The national methodology for designation of heavily modified water bodies and artificial water bodies in the second RBMPs provides a detailed step-by-step approach for designating heavily modified water bodies and artificial water bodies, including consideration of the significant adverse effects of restoration measures and achievement of the benefits by other means. The step-by-step results per water body from the application of the national methodology are presented in Annexes for three of the RBMPs (Danube, East Aegean and West Aegean).

  Therefore, this recommendation has been fulfilled.

- Recommendation: (report 2015) *Develop in the second RBMPs an appropriate methodology to establish good ecological potential including the necessary mitigation measures linked to water uses and quality level.*

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For the second RBMPs, a national method for determining the ecological potential of rivers, lakes and coastal waters has been developed and applied for the heavily modified water bodies and artificial water bodies of the RBMPs. However, good ecological potential has been defined and mitigation measures for good ecological potential reported only in two out of four RBDs (the Danube RBD and the Black Sea RBD). Good ecological potential has not been defined in the East Aegean RBD and the West Aegean RBD.

Therefore, this recommendation has been partially fulfilled.

Topic 8 Environmental objectives and exemptions

8.1. Assessment of implementation and compliance with WFD requirements in second cycle

8.1.1. Environmental objectives

The environmental objectives are defined in Article 4 of the WFD. The aim is long-term sustainable water management based on a high level of protection of the aquatic environment. Article 4(1) defines the WFD general objective to be achieved in all surface and groundwater bodies, i.e. good status by 2015. Within that general objective, specific environmental objectives are defined for heavily modified water bodies (good ecological potential and good chemical status by 2015[56]), groundwaters (good chemical and quantitative status by 2015) and for Protected Areas (achievement of the objectives of the associated Directive by 2015 unless otherwise specified).

Environmental objectives for ecological and chemical status in surface waters and quantitative and chemical status in groundwaters have been reported in all RBDs. They have been set for 2021, 2027 and beyond 2027.

Member States are also required to specify additional environmental objectives and standards in Protected Areas where these are required to ensure the requirements of the associated Directive are met. An assessment of such additional objectives for Bulgaria is provided in Chapter 15 of this report.

Assessments of the current status of surface and groundwater bodies in Bulgaria are provided elsewhere in this report: for ecological status/potential of surface waters (Chapter 3); chemical status of surface waters (Chapter 4); quantitative status of groundwater bodies (Chapter 5); chemical status of groundwater bodies (Chapter 6); status of surface and groundwater bodies associated with Protected Areas (Chapter 15).

For the second RBMPs, Member States are required to report the date when they expect each surface and groundwater body to meet its environmental objective. This information is summarised for Bulgaria elsewhere in this report: for ecological status/potential of surface waters (Chapter 3); chemical status of surface waters (Chapter 4); quantitative status of groundwater bodies (Chapter 5); chemical status of groundwater bodies (Chapter 6).

[56] For priority substances newly introduced by Directive 2013/39/EU, good status should be reached by 2027, and for the 2008 priority substances, for which the Environmental Quality Standards were revised by Directive 2013/39/EU, good status should be reached in 2021.

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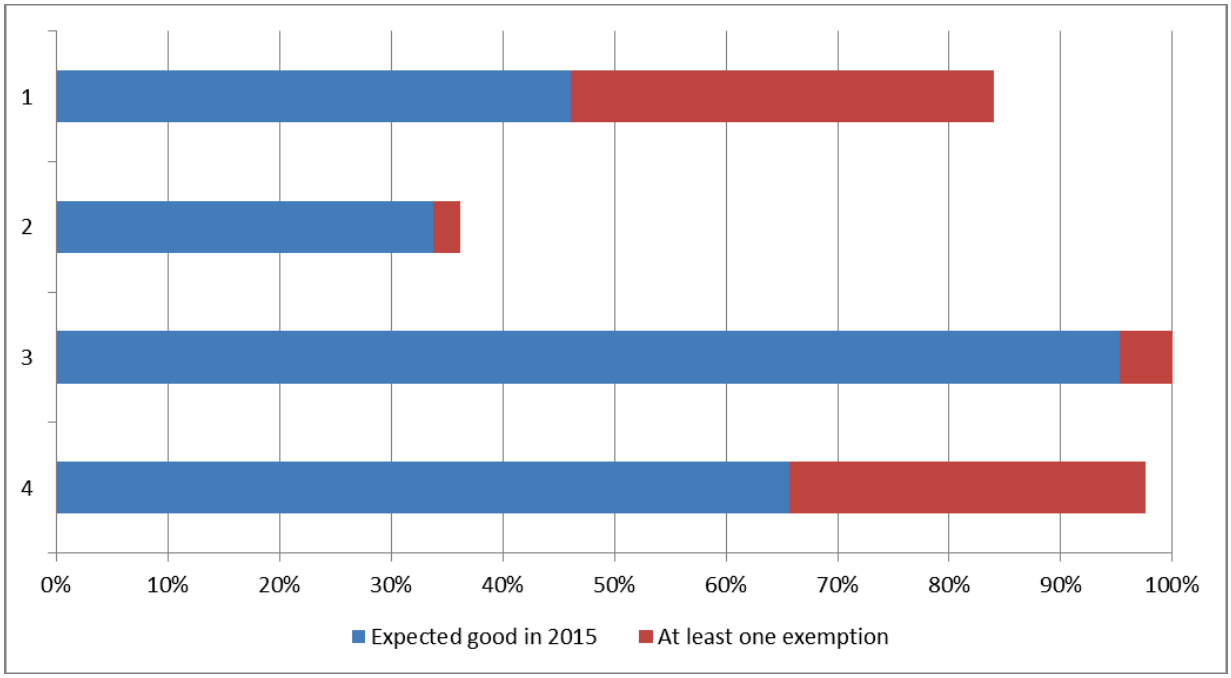
8.1.2. Exemptions

Where environmental objectives are not yet achieved exemptions can be applied in case the respective conditions are met and the required justifications are explained in the RBMP. Figure 8.1 summarises the percentage of water bodies expected to be at least in good status in 2015 and the use of at least one exemption in Bulgaria for the 4 main sets of environmental objectives.

Figure 8.1 ***Water bodies in Bulgaria expected to be in at least good status in 2015 and use of exemptions. 1 = Surface water body ecological status/potential; 2 = Surface water body chemical status; 3 = Groundwater body quantitative status; 4 = Groundwater body chemical status***



Source: WISE electronic report. For some water bodies the date for achievement of good status is unknown.

Article 4 of the WFD allows under certain conditions for different exemptions to the objectives: an extension of deadlines beyond 2015, less stringent objectives, a temporary deterioration, or deterioration / non-achievement of good status / potential due to new modifications, provided a set of conditions is fulfilled. The exemptions under WFD Article 4 include the provisions in Article 4(4) - extension of deadline, Article 4(5) - lower objectives, Article 4(6) - temporary deterioration, and Article 4(7) - new modifications / new sustainable human development activities. Article 4(4) exemptions may be justified by: disproportionate cost, technical feasibility or natural conditions, and Article 4(5) by disproportionate cost or technical feasibility.

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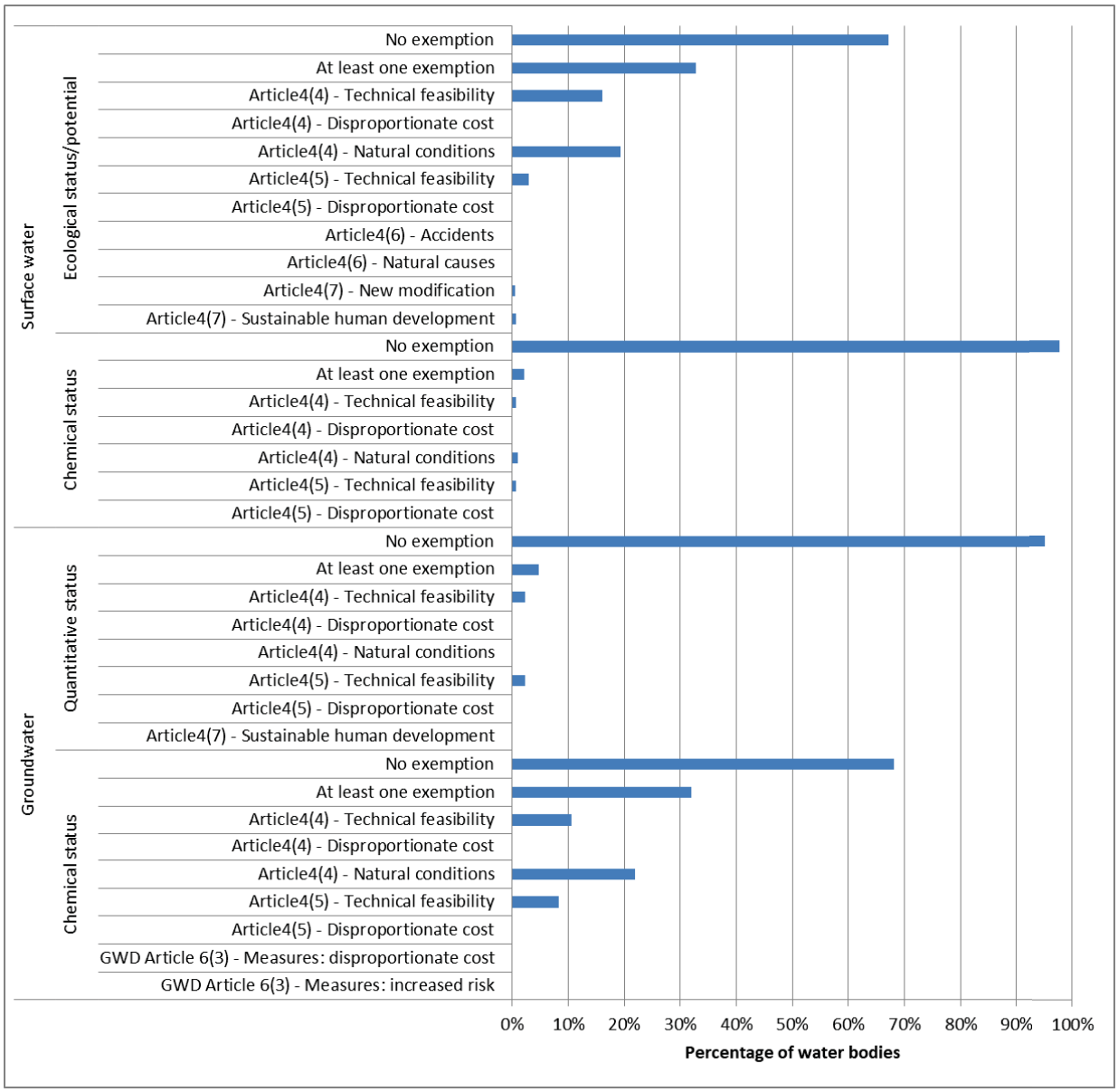
Figure 8.2 summarises the percentage of water bodies subject to each type of exemption (and reason) in relation to the four types of environmental objectives in Bulgaria.

Figure 8.2 ***Type of exemptions reported to be applied to surface water and groundwater bodies for the second RBMP in Bulgaria. Note: Ecological status and groundwater quantitative status exemptions are reported at the water body level. Chemical exemptions for groundwater are reported at the level of each pollutant causing failure of good chemical status, and for surface waters for each Priority Substances that is causing failure of good chemical status***



Source: WISE electronic reports

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Application of Article 4(4)

Article 4(4) was applied in the first cycle in surface waters and groundwaters and is again applied in the second cycle. In the first cycle, the justification for surface waters in relation Article 4(4) referred to technical feasibility and natural conditions. This has not changed and again disproportionate costs have not been used as a justification for any exemption.

The main parts of the RBMPs provide only some general information about the exemptions applied in the respective RBDs summarising changes in the number of exemptions compared to the previous period. However, annexes to the RBMPs list the exemptions on water body level together with justifications for the exemptions by water body. The format and information provided differs. In the case of the East Aegean RBMP the main text presents the justifications for the exemptions by water body.

The RBMPs list only generic reasons or types of reasons as defined in the national methodology (e.g. the Danube and Black Sea RBMPs list generic reasons; the West Aegean RBMP quotes the reasons from the national methodology that apply for the RBD). Nevertheless, all RBMPs refer to the national methodology for applying exemptions ("Methodology for application of the exemptions according to Articles 156(b) to 156(e) of the Water Law"[57]) as the basis on which exemptions were defined and a focussed review of the methodology suggests that technical reasons for applying Article 4(4) and Article 4(5) can be used in the following situations:

- time needed for implementation of the measures - when the improvements/measures can be accomplished over a longer period due to technical reasons such as the time for preparation of construction works and their implementation;
- lack of sufficient technical capacity for the completion of larger and multiple investments (including the time needed to organise and conduct public procurement procedures);
- lack of existing technical solution - when, to date, there is no suitable and practically applicable technical solution/technology that can be used to address the specific problem and when there is information about a certain technology (e.g. for treatment) but it is not clear if it will be effective in practice;

[57] http://www.moew.government.bg/bg/vodi/planove-za-upravlenie/planove-za-upravlenie-na-rechnite-basejni-purb/

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- no known reason for the observed impacts - when the impacts/sources of impacts for not achieving good status are not determined and therefore, an appropriate solution/measure cannot be defined;

- Impossibility to take measures - cases where measures cannot be taken as the reason for no achieving good status (source of the impact) is outside the jurisdiction of Bulgaria and there are no transboundary mechanisms for joint actions defined.

According to the national methodology for using exemptions, natural conditions can be used as reasons for applying Article 4(4) and Article 4(5) in the following circumstances:

- time for ecological recovery - when the necessary measures are being implemented but a longer period is necessary to achieve their effects on the water body and to achieve good status (e.g. restoration of meanders will have an impact on the biological quality elements and the development of the biocenosis after a certain time, the application of good agricultural practices will impact the concentration of nitrates after a certain time);

- natural conditions - e.g. when the reason for not achieving environmental quality standards for a certain quality element is not human activity but is natural, the natural background levels are such that the concertation of this element in the water body cannot be significantly decreased as to achieve the necessary improvement i.e. to achieve the environmental quality standards of this quality element.

- time for recovery of groundwater - in cases where the climatic and geological conditions determine longer time for recovery the status of the groundwater e.g. time for recovering the level of groundwater after adopting measures concerning abstraction/use.

The justification of natural conditions might be an issue of insufficient and/or non-compliant implementation of WFD requirements, as relevant information is lacking in the RBMPs and reported background documents. It is mentioned that "natural conditions - e.g. when the reason for not achieving Environmental Quality Standards for a certain quality element is not human activity but is natural, the natural background levels are such that the concentration of this element in the water bodies cannot be significantly decreased so as to achieve the necessary improvement i.e. to achieve the Environmental Quality Standards of this quality element. A correction/adaptation of the reference conditions seems to be more appropriate instead of applying an exemption in case there is evidence that the concentrations are indeed natural.

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The main pressures to surface waters in the Danube RBD come from a broad range of activities including urbanisation, industry, agriculture, mining, aquaculture, atmospheric deposition and activities causing changes in hydromorphology. For the Black Sea RBD, the main pressures to surface waters are resulting from urbanisation, industry, aquaculture, agriculture, abstraction, activities causing changes in hydromorphology but also the introduction of species and diseases, litter and exploration of animals or plants. In the East Aegean RBD, the main pressures to surface waters are resulting from abstraction and activities causing changes in hydromorphology, point source pollution from industry, mining and settlements. Diffuse pollution is also an issue. The main pressures to surface waters in the West Aegean RBD are urbanisation, industry, agriculture, aquaculture and activities causing changes in hydromorphology. Most of these pressures are also responsible for Priority Substances failing to achieve good chemical status (Table 8.1).

For groundwater, the main driver causing chemical pressures is agriculture in all RBDs (Table 8.2). The Danube, Black Sea and East Aegean RBDs also report industry as a pressure on groundwater with the East Aegean RBD reporting in addition mining and discharges not connected to the sewerage network. The latter is also a pressure to groundwater in the Black Sea RBD.

The impacts causing exemptions under Article 4(4) are chemical pollution, altered habitats, nutrient and organic pollution in all RBDs. In addition, for groundwater, diminution of quality of associated surface waters for chemical and quantitative reasons and saline pollution/intrusion are reported in the Black Sea RBD together with unknown impacts.

Table 8.1 Pressure responsible for Priority Substances in Bulgaria failing to achieve good chemical status and for which exemptions have been applied

Significant pressure on surface water bodies	Failing Priority Substances	Article 4(4) - Technical feasibility exemptions	Article 4(5) - Technical feasibility exemptions
	Number	Number	Number
1.1 - Point - Urban waste water	3	2	2
1.3 - Point - IED plants	1	1	1
1.4 - Point - Non IED plants	3	4	4
1.5 - Point - Contaminated sites or abandoned industrial sites	2	3	0
1.7 - Point - Mine waters	4	2	7
2.2 - Diffuse - Agricultural	2	2	0
2.8 - Diffuse - Mining	2	2	2
8 - Anthropogenic pressure - Unknown	3	3	0

Source: WISE electronic reports

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Table 8.2 ***Pressure responsible for pollutants in Bulgaria failing to achieve good chemical status in groundwater and for which exemptions have been applied***

Significant pressure on groundwater	Number of failing pollutants	Number of exemptions		
		Article 4(4) - Natural conditions	Article 4(4) - Technical feasibility	Article 4(5) - Technical feasibility
1.1 - Point - Urban waste water	1		1	2
1.3 - Point - IED plants	2	2		
1.5 - Point - Contaminated sites or abandoned industrial sites	6	6		
2.10 - Diffuse - Other	4	3	2	4
2.2 - Diffuse - Agricultural	7	35	10	17
2.5 - Diffuse - Contaminated sites or abandoned industrial sites	3	1	1	2
2.6 - Diffuse - Discharges not connected to sewerage network	3			6
2.8 - Diffuse - Mining	1	1	1	
3.2 - Abstraction or flow diversion - Public water supply	1			1
8 - Anthropogenic pressure - Unknown	7	7	14	4

Source: WISE electronic reports

No information on the drivers and impacts of the Article 4(4) exemptions are provided in WISE. The main parts of the RBMPs do not mention specific drivers or impacts causing the exemptions.

Application of Article 4(5)

Article 4(5) was only applied in the Danube RBD for surface waters in the first RBMP but in the second cycle it is applied in all RBDs. For groundwaters, Article 4(5) was only applied in the Danube and Black Sea RBDs in the first cycle. In the second cycle it is applied in the Black Sea, East Aegean and West Aegean RBDs. The potential justifications for Article 4(5) are set out in the national methodology for applying exemptions (see above). The application and justification of Article 4(5) might be an issue of insufficient and/or non-compliant implementation of WFD requirements as natural conditions can potentially be used as a justification. However, in the second RBMP in all cases, the reason quoted is technical feasibility.

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No information on the drivers and impacts of the Article 4(5) exemptions are provided in WISE.

Application of Article 4(6)

While in the first cycle Article 4(6) was applied in the Black Sea RBD, in the second cycle Article 4(6) was not applied in any RBD.

Application of Article 4(7)

Article 4(7) was only applied in the West Aegean RBD in the first cycle but in the second cycle it is also applied in the Danube and East Aegean RBDs. The types of modifications leading to the application of exemptions under Article 4(7) are only reported for the West Aegean RBD ("other" type of modifications), but not for the Danube and East Aegean RBDs. According the RBMPs, the impact of new modifications or relevant flood risk management measures from the Flood Risk Management Plans that can have an impact on the water status have been assessed. Even though the reasons for applying Article 4(7) exemptions are not discussed at length in the main parts of the RBMPs, all relevant RBMPs contain annexes that provide further details about the exemptions. The annexes to the Danube and East Aegean RBMPs contain information about the Article 4(7) exemptions per water body and their justifications. The annexes to the West Aegean RBMP only list the exemptions per water body without specific justification. In addition, the Danube and West Aegean RBMPs contain annexes with 'potential' Article 4(7) exemptions resulting from e.g. infrastructure projects in the territory of the RBDs.

The methods for assessing the need for Article 4(7) exemptions are not discussed in the RBMPs but as indicated previously all RBMPs refer to the national methodology for using exemptions. According to this national methodology, the assessment of new modification has also to assess cumulative effects. However, further details are not available; the methodology only provides examples where the cumulative effects are considered.

The RBMPs do not explicitly discuss if any steps have been taken to mitigate the adverse impacts on the status of the affected water bodies. However, the national methodology for using exemptions requires that exemptions are defined only when 'all practical steps' to mitigate the adverse impacts on the affected water bodies are taken. As regard to public interest or the fact that the benefits of the project outweigh the benefits of achieving the WFD environmental objectives, the annexes of the RBMP provide only the conclusions from the assessments and do not provide details about the methodologies used. Nevertheless, they all include a section that sums up why the project is of overriding public interest and the public

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benefits cannot be achieved in another way. As all new modifications refer to flood protection, the main argument is that these measures aim to protect citizens' health and safety. Furthermore, the national methodology for using exemptions requires that the public benefits of projects or their overriding public interest is analysed any time a potential exemption is sought. Even if there is little information in the RBMPs in relation to better environmental options taken into account when applying Article 4(7), in all cases alternative options are mentioned and a reference to the national methodology is made.

Application of Article 6(3) of the Groundwater Directive

No exemptions according to Article 6(3) of the Groundwater Directive[58] have been applied.

8.2. Main changes in implementation and compliance since first cycle

Article 4(7) was only applied in the West Aegean RBD in the first RBMP but in the second RBMP it has also been applied in the Danube and East Aegean RBDs. Article 4(4) was applied in the first cycle in surface waters and groundwaters and has also been applied in the second cycle. Article 4(5) was only applied in the Danube RBD for surface waters in the first cycle but has been applied in all RBDs in the second cycle. For groundwaters, Article 4(5) was only applied in the first cycle in the Danube and Black Sea RBDs. Now it has been applied in the Black Sea, East Aegean and West Aegean RBDs. Article 4(6) was applied in the first cycle in the Black Sea RBD; however, in the second cycle it has not been applied in any RBD.

Changes in the methodology to define environmental objectives and exemptions are not explicitly discussed in the RBMPs. However, all RBMPs explain that a national methodology concerning the use of exemptions has been developed. This methodology refers to Article 4(3) to Article 4(7) of the WFD and was adopted in 2016. It was used for the preparation of the Plans. Only the West Aegean RBMP explicitly lists different relevant normative and methodological changes that took place in the period 2010-2015. These include:

- changes in the delineation of the water bodies;
- designation of protected areas for drinking water;
- a common national methodology for characterisation and status classification of surface water bodies has been introduced;

[58] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0118-20140711

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- common national methods for monitoring and analysis of biological quality elements and new criteria for Environmental Quality Standards have been introduced.

8.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *The ecological objectives defined are of a very general nature, there are no quantitative dimensions and easily measurable and verifiable criteria for monitoring their achievement. Ecological objectives should be better specified.*

  Assessment: Environmental objectives for ecological and chemical status in surface waters and qualitative and quantitative status in groundwaters have been reported in all RBDs. Expected dates of achieving these objectives have been reported for the majority of water bodies (Ecological status - Figure 9; Chemical status – Figure 20; groundwater quantitative and chemical status – Figure 25) though there are some gaps with respect to ecological status and for a greater number with respect to the chemical status of surface water bodies where dates are unknown or beyond 2027. Where objectives are not going to be met, exemptions have been applied. This recommendation has been partially fulfilled.

- Recommendation: *The identification of exemptions is incomplete and should be completed in the next RBMP cycle. While the WFD does provide for exemptions, there are specific criteria that must be fulfilled for their use to be justified. The application of exemptions needs to be more transparent and the reasons for the exemptions should be clearly justified in the plans.*

  Assessment: This recommendation has been partly implemented as a national approach for exemptions has been developed. However, the justifications in the RBMPs are on water body level but generic. The extent to which a harmonisation between RBDs has taken place was not possible to assess. In relation to Article 4(7), a national methodology has been developed, but it is unclear if it is applied in accordance with water bodies and project specific circumstances.

- Recommendation: *It is unclear whether there are new physical modifications planned in RBMPs. If this is the case, the use of exemptions under Article 4(7) should be based on a thorough assessment of all the steps as requested by the WFD, in particular an*

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assessment of whether the project is of overriding public interest and whether the benefits to society outweigh the environmental degradation, and regarding the absence of alternatives that would be a better environmental option. Furthermore, these projects may only be carried out when all possible measures are taken to mitigate the adverse impact on the status of the water. All conditions for the application of Article 4(7) in individual projects must be included and justified in the RBMPs as early in the project planning as possible.

Assessment: Article 4(7) is applied in three basins, but the types of modifications leading to the application of this exemptions are only reported for the West Aegean RBD. Even though the reasons for applying Article 4(7) exemptions are not discussed at length in the main parts of the RBMPs, all relevant RBMPs contain annexes that provide further details about the exemptions. Therefore, this recommendation has been partly fulfilled.

- Recommendation: *Ensure that the RBMPs clearly identify the gap to good status, and that the Progammes of Measures are designed and implemented to close that gap. Exemptions should be adequately justified at water body level.*

  Assessment: Environmental objectives for ecological and chemical status of surface water bodies were reported in all RBDs as well as for chemical and quantitative status of groundwater bodies. Information is also provided on when it is expected that the objectives will be achieved. Exemptions are justified at water body level, but in generic terms. Therefore, this recommendation has been partly fulfilled.

Topic 9 Programme of measures

The aim of this chapter is to provide an overview of the Programme of Measures reported by Member States; more specific information on measures relating to specific pressures (for example arising from agriculture) is provided in subsequent chapters.

The Key Types of Measure (KTM) referred to in this section are groups of measures identified by Member States in the Programme of Measures, which target the same pressure or purpose. The individual measures included in the Programme of Measure (being part of the RBMP) are grouped into Key Types of Measure for the purpose of reporting. The same individual measure can be part of more than one Key Types of Measure because it may be multi-purpose, but also because the Key Types of Measure are not completely independent silos. Key Types of Measure have been introduced to simplify the reporting of measures and to reduce the very large number of Supplementary Measures reported by some Member States (WFD Reporting Guidance 2016).

A Key Type of Measure may be one national measure but it would typically comprise more than one national measure. The 25 predefined Key Types of Measure are listed in the WFD Reporting Guidance 2016.

The Key Types of Measure should be fully implemented and made operational within the RBMP planning period to address specific pressures or chemical substances and achieve the environmental objectives.

9.1 Assessment of implementation and compliance with WFD requirements in second cycle

9.1.1. General issues

An indication as to whether or not measures have been fully implemented and made operational is when they have been reported as being planned to tackle significant pressures (at the Key Types of Measure level). Significant pressures are also reported at the water body level. It would therefore be expected that there would be measures planned in the RBMP to tackle all significant pressures. A large number of pressure types causing failure of objectives in groundwater and surface waters in all RBDs were reported by Bulgaria. For surface waters, KTMs were reported for all significant pressure types causing failure of objectives in all RBDs

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except the Black Sea RBD, where several are missing, including point and diffuse sources from contaminated/abandoned sites, other diffuse sources, some abstractions/flow diversions, dams, hydrological alterations and exploitation of animals/plants. For groundwater, all significant pressure types causing failure of objectives, were covered by KTMs in all RBDs, except KTM2.5 – "diffuse from contaminated/abandoned sites" in the Danube RBD, although this pressure was covered by a KTM for surface water.

Bulgaria has mapped 105 national basic measures and 82 national supplementary measures against all the pre-defined KTMs except KTM25 – "Measures to counteract acidification". 12 % of the national basic measures and 22 % of the national supplementary measures were mapped against KTM14 – "Research, improvement of knowledge base reducing uncertainty", a further 11 % of national basic measures were mapped against KTM8 – "Water efficiency, technical measures for irrigation, industry, energy and households". Basic measures are in place to address all the requirements of Article 11(3) (see Table 9.2).

Links to documents on Article 11(3)(c-k) basic measures were provided. An inventory of national basic measures was also provided.

For all RBDs, the KTMs reported to be tackling significant pressures are covered by KTMs mapped against national measures. For the Black Sea RBD, one additional KTM has had national measures mapped against it. For the Danube and West Aegean RBDs, several additional KTMs have had national measures mapped against them, compared with those reported to be tackling significant pressures; therefore it is not clear if these are relevant / will be made operational.

The percentage of water bodies not expected to achieve good status/ potential by 2027 has been indicated as zero or 0-10 in most cases in surface water and groundwater in all RBDs (20-50 % for diffuse agricultural pollution in the East Aegean RBD).

No data has been provided for any of the RBDs on the number of surface water bodies failing to achieve objectives due to River Basin Specific Pollutants. Information has been provided for all 4 RBDs for groundwater bodies, although the range of substances reported is limited to nutrients (only nitrate is reported in the West Aegean RBD), inorganic contaminants (e.g. iron, magnesium, chloride, sulphate) and other physicochemical parameters (e.g. conductivity). The KTMs in place to address the failure of objectives caused by the substances in groundwater identified have been reported in three RBDs - no information has been provided for the East Aegean RBD. Information on KTMs to address failures of objectives caused by River Basin

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Specific Pollutants in surface waters is also provided for the Danube, Black Sea and West Aegean RBDs – the substances addressed are all inorganic contaminants.

The number of surface water bodies where Priority Substances are causing a failure of objectives has been reported in all four RBDs. Four substances have been found to be causing failures in the East Aegean RBD, with the other RBDs each reporting three substances causing failure. No information on the KTMs used to address these failures has been reported for the East Aegean RBD. For the other RBDs, KTMs are reported for all substances causing failure in the Danube RBD, in the Black Sea RBD KTMs are reported for hexachlorbutadiene and mercury, but not for octylphenol, and in the West Aegean RBD KTMs are reported for lead and cadmium, but not for nickel.

Indicators of the gap to good status, and the progress expected from the implementation of measures have been reported for most significant pressure types in groundwater and surface water in all RBDs. However, these have not been quantified for any pressures in any RBD. In the Annex 0 document, Bulgaria reports that for the indicators for the gap to good status "due to the significant number of water bodies assessed in 'unknown' ecological and/or chemical status, it is not possible to assess the level of significance of the different pressure types and to evaluate the extent of the pressure or chemical substance that is to be reduced to achieve the Environmental Objectives; respectively, it is not possible to estimate and report a quantitative indicator." The indicators of progress of measures is also covered in the Annex 0 where Bulgaria report "due to the significant number of water bodies assessed in 'unknown' ecological and/or chemical status, it is not possible to assess the gap to the achievement of 100% compliance with the Environmental Objective. It is not possible to quantify the pressures that are to be reduced; it is not possible to assess the scale of measures still needed for achievement of 100% compliance and to report the expected value of the KTM- indicator."

Cost-effectiveness analysis is an appraisal technique that provides a ranking of alternative measures on the basis of their costs and effectiveness, where the most cost-effective has the highest ranking. Cost-effectiveness analysis was not used in the selection of measures for the first Programme of Measures – no information was provided on this topic for the second Programme of Measures. Further information on the methods used for the prioritisation of measures could not be found in the RBMPs or background documents.

A critical factor in the success of the implementation of the Programme of Measures is the availability of funding to support the investments required. For the first cycle (covering years 2010-15) investment costs have been reported separately for Article 11(3)(a) requirements (measures required to implement Community legislation for the protection of water) and

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Article 11(3)(b-l), Article 11(4) and Article 11(5) (all other measures) for the Danube and East Aegean RBDs, and as a total of all measures for the Black Sea and West Aegean RBDs. The total cost of the first Programme of Measures for Bulgaria was reported to be €1311 m.

For the second cycle investment costs are presented for the years 2017-21 (2016-21 for the East Aegean RBD) separately for Article 11(3)(a) requirements (measures required to implement Community legislation for the protection of water) and Article 11(3)(b-l), Article 11(4) and Article 11(5) (all other measures) for all RBDs, depreciation has not been included in any calculations. The capital investment required for Article 11(3)(a) measures ranges from €192.6 m in the West Aegean RBD to €1018 m in the East Aegean RBD. The total capital investment required is €2462 million. The capital investment required for measures required by Article 11(3)(b-l), Article 11(4) and Article 11(5) ranges from €1.9 million in the West Aegean RBD to €108 million in the Black Sea RBD. The total capital investment required is €186 million. The annual operation and maintenance costs have not been reported. In the Annex 0 Bulgaria reports that "it is difficult to quantify these costs due to the different type of measures and the diversity of operators." European Union investment funding figures are presented for the first cycle only (2009-15) for all four RBDs – the total investment reported was €49020. No information was reported for the second cycle, in the Annex 0 document Bulgaria report "the information about expected European Union financing for the second management plan is not reported. It is difficult to estimate the expenditure, which will be financed by different European Union funds."

A clear financial commitment has been reported as having been secured for the implementation of the Programme of Measures in all RBDs. On a sectoral basis, commitments have been secured where considered relevant, i.e. for Agriculture, Industry, Urban and Flood Protection in all RBDs; Transport (not applicable in the West Aegean RBD); Hydropower and Aquaculture (not applicable in the Black Sea RBD); Energy (not applicable in the Danube and Black Sea RBDs); Recreation (only applicable in the East Aegean RBD).

Co-ordination of the preparation of all RBMPs and Programmes of Measures with the Marine Strategy Framework Directive[59] is reported for the Black Sea RBD only (the other RBDs are landlocked). The preparation of the RBMPs and marine strategy were co-ordinated and joint consultation on the RBMPs and the Marine Strategy was carried out, but the need for additional or more stringent measures beyond those required by the WFD in order to contribute to the achievement of the relevant Marine Strategy Framework Directive objectives in coastal

[59] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

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and marine environments was not considered. However, KTMs that are relevant to the Marine Strategy Framework Directive are reported for the Black Sea RBD, with an indication of the type and number of basic measures, but not indicating the pressures they are addressing.

The RBMPs and Floods Directive[60] Flood Risk Management Plans have not been integrated in any of the four RBDs; but in all RBDs (i) joint consultation of RBMPs and Flood Risk Management Plans was carried out, (ii) the objectives and requirements of the Floods Directive were considered in the second RBMPs and Programme of Measures, (iii) drought management and use of Natural Water Retention Measures have been included in the Programme of Measures, (iv) the design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, has been adapted to take account of WFD Environmental Objectives, and financial commitments have been made. WFD Article 9(4) has been applied to impoundment for flood protection in the East Aegean RBD only.

9.1.2 Measures related to other significant pressures

Other significant pressures have been reported for groundwater and surface water for the Danube, Black Sea, and East Aegean RBDs (no information was reported for the West Aegean RBD). These relate mainly to "Anthropogenic pressures – unknown and historical" in all 3 RBDs, plus introduced species/diseases in surface water in the Black Sea and East Aegean, and fly tipping in the Black Sea. Whilst KTMs are listed for all pressures, together with gap indicators and measure indicators, no gap values are provided (see also section 9.1.1).

9.1.3 Mapping of national measures to KTMs

It was expected that Member States would be able to report their Programme of Measures by associating their national measures with predefined KTMs. KTMs are expected to deliver the bulk of the improvements through reduction in pressures required to achieve WFD Environmental Objectives. A KTM may be one national measure but it would typically comprise more than one national measure. Member States are required to report on the national measures associated with the KTM, and whether the national measures are basic (Article 11(3)(a) or Article 11(3)(b-l)) or supplementary (Article 11(4)).

Table 9.1 summarises the number of national measures that have been mapped to the relevant KTM in Bulgaria. Also shown is the number of RBDs for which the KTM has been reported. Table 9.2 then summarises the type of basic measures associated with the national measures mapped against the KTM.

[60] Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

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Table 9.1 Mapping of the types of national measures to Key Types of Measure in Bulgaria

Key Type of Measure	National basic measures	National supplementary measures	Number of RBDs where reported
KTM1 - Construction or upgrades of wastewater treatment plants	3	2	4
KTM10 - Water pricing policy measures for the implementation of the recovery of cost of water services from industry	2		4
KTM11 - Water pricing policy measures for the implementation of the recovery of cost of water services from agriculture	2		4
KTM12 - Advisory services for agriculture	1	1	3
KTM13 - Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)	7	5	4
KTM14 - Research, improvement of knowledge base reducing uncertainty	13	18	4
KTM15 - Measures for the phasing-out of emissions, discharges and losses of Priority Hazardous Substances or for the reduction of emissions, discharges and losses of Priority Substances	7	4	3
KTM16 - Upgrades or improvements of industrial wastewater treatment plants (including farms).	7	3	4
KTM17 - Measures to reduce sediment from soil erosion and surface run-off	1	1	3
KTM18 - Measures to prevent or control the adverse impacts of invasive alien species and introduced diseases	1	2	3
KTM19 - Measures to prevent or control the adverse impacts of recreation including angling	2	2	4
KTM2 - Reduce nutrient pollution from agriculture	9	5	4
KTM20 - Measures to prevent or control the adverse impacts of fishing and other exploitation/removal of animal and plants	2	3	4
KTM21 - Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	9	7	4
KTM22 - Measures to prevent or control the input of pollution from forestry	1		1
KTM23 - Natural water retention measures		2	3
KTM24 - Adaptation to climate change	6	3	4
KTM3 - Reduce pesticides pollution from agriculture.	4	3	4
KTM4 - Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)	1	1	3

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Key Type of Measure	National basic measures	National supplementary measures	Number of RBDs where reported
KTM5 - Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)	3	2	4
KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity	2	6	4
KTM7 - Improvements in flow regime and/or establishment of ecological flows	8	8	4
KTM8 - Water efficiency, technical measures for irrigation, industry, energy and households	12	4	4
KTM9 - Water pricing policy measures for the implementation of the recovery of cost of water services from households	2		4
Total number of Mapped Measures	**105**	**82**	**4**

Source: Member States reports to WISE

Table 9.2 Type of basic measure mapped to Key Type of Measures in Bulgaria

	Basic Measure Type															
Key Type of Measure	Accidental pollution	Controls water abstraction	Cost recovery water services	Efficient water use	Habitats or Birds	Hydromorphology	IPPC IED	Nitrates	Other	Point source discharges	Pollutants diffuse	Pollutants direct groundwater	Protection water abstraction	Recharge augmentation groundwaters	Surface Priority Substances	Urban Waste Water
KTM1 - Construction or upgrades of wastewater treatment plants										2						1
KTM10 - Water pricing policy measures for the implementation of the recovery of cost of water services from industry			2													
KTM11 - Water pricing policy measures for the implementation of the recovery of cost of water services from agriculture			2													
KTM12 - Advisory services for agriculture								1								
KTM13 - Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)		2		1	1	1							6			
KTM14 - Research, improvement of knowledge base reducing uncertainty		3		7	4	3			5	1	4	1	1	1	1	

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KTM15 - Measures for the phasing-out of emissions, discharges and losses of Priority Hazardous Substances or for the reduction of emissions, discharges and losses of Priority Substances		1		2								2		1	4	
KTM16 - Upgrades or improvements of industrial wastewater treatment plants (including farms).							1			4	2				1	
KTM17 - Measures to reduce sediment from soil erosion and surface run-off						1										
KTM18 - Measures to prevent or control the adverse impacts of invasive alien species and introduced diseases		1		1	1	1			1	1	1		1	1	1	
KTM19 - Measures to prevent or control the adverse impacts of recreation including angling		2		1	2	2			1	1	1		1	1	1	
KTM2 - Reduce nutrient pollution from agriculture		1		1	1	1		3		2	5	1	2	1	1	
KTM20 - Measures to prevent or control the adverse impacts of fishing and other exploitation/removal of animal and plants		2		1	2	2			1	1	1	1	1	1	1	
KTM21 - Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	1	1		3	1	1	1			4	6	2	1	1	1	
KTM22 - Measures to prevent or control the input of pollution from forestry		1		1	1	1				1	1		1	1	1	
KTM24 - Adaptation to climate change		2		3							1					
KTM3 - Reduce pesticides pollution from agriculture.		1		1	1	1		1		2	2	1	1	1	1	
KTM4 - Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)											1					
KTM5 - Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)		1		1	1	3										
KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity					1	2										
KTM7 - Improvements in flow regime and/or establishment of ecological flows		8		2	3	5										
KTM8 - Water efficiency, technical measures for irrigation, industry, energy		9		6	1	1							2	1		

and households																
KTM9 - Water pricing policy measures for the implementation of the recovery of cost of water services from households			2													

Source: Member States reports to WISE

Key

'Urban Waste Water' = Urban Waste Water Treatment Directive (91/271/EEC) .
'Nitrates' = Nitrates Directive (91/676/EEC) .
'IPPC IED' = Integrated Pollution Prevention Control Directive (96/61/EC) and the Industrial Emissions Directive (2010/75/EU) .
'Habitats or Birds' = Habitats Directive (92/43/EEC) or Birds Directive (2009/147/EC)
'Cost recovery water services' = Article 11(3)(b): Measures for the recovery of cost of water services (Article 9).
'Efficient water use' = Article 11(3)(c): Measures to promote efficient and sustainable water use.
'Protection water abstraction' = Article 11(3)(d): Measures for the protection of water abstracted for drinking water (Article 7) including those to reduce the level of purification required for the production of drinking water.
'Controls water abstraction' = Article 11(3)(e): Controls over the abstraction of fresh surface water and groundwater and impoundment of fresh surface waters including a register or registers of water abstractions and a requirement for prior authorisation of abstraction and impoundment.
'Recharge augmentation groundwaters' = Article 11(3)(f): Controls, including a requirement for prior authorisation of artificial recharge or augmentation of groundwater bodies.
'Point source discharges' = Article 11(3)(g): Requirement for prior regulation of point source discharges liable to cause pollution.
'Pollutants diffuse' = Article 11(3)(h): Measures to prevent or control the input of pollutants from diffuse sources liable to cause pollution.
'Hydromorphology' = Article 11(3)(i): Measures to control any other significant adverse impact on the status of water, and in particular hydromorphological impacts.
'Pollutants direct groundwater' = Article 11(3)(j): Prohibition of direct discharge of pollutants into groundwater.
'Surface Priority Substances' = Article 11(3)(k): Measures to eliminate pollution of surface waters by Priority Substances and to reduce pollution from other substances that would otherwise prevent the achievement of the objectives laid down in Article 4.
'Accidental pollution' = Article 11(3)(l): Any measures required to prevent significant losses of pollutants from technical installations and to prevent and/or reduce the impact of accidental pollution incidents.
'Other' = Other Directives mentioned in Part A of Annex VI of the WFD.

9.1.4 Pressures for which gaps to be filled to achieve WFD objectives have been reported and the Key Types of Measure planned to achieve objectives

Member States are required to report the gaps that need to be filled to achieve WFD Environmental Objectives in terms of all significant pressures on surface waters and groundwaters, in terms of Priority Substances causing failure of good chemical status and in terms of River Basin Specific Pollutants causing failure of good ecological status/potential. Member States were asked to report predefined indicators of the gaps to be filled or other indicators where relevant. Values for the gap indicators were required for 2015 and 2021, and were optional for 2027.

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The information reported in WISE on the gaps to fulfil to achieve good ecological status include detailed data on the significant pressures on surface and groundwaters that may cause failure on the environmental objectives. For chemical status, the Member States reported the specific chemical substances causing failure.

This information is reported at the sub-unit level. Sub-units are smaller geographic areas within particular RBDs identified by Member States. Not all Member States have defined and reported sub-units.

Member States were required to report which KTMs are to be made operational to reduce the gaps to levels compatible with the achievement of WFD environmental objectives. A number of indicators were predefined for each KTM. Values of the indicators for the second and subsequent planning cycles were also to be reported to give an indication of the expected progress and achievements: the values for 2027 could be optionally reported. This means that the value of the indicator will be reduced with time as measures are implemented. A value of zero is comparable with 100 % good ecological status or potential or good chemical status.

This information was reported at sub-unit level, or at RBDs level if sub-units have not been reported by the Member State.

9.2 Main changes in implementation and compliance since first cycle

The level of implementation of the first cycle of Programme of Measures in all 4 RBDs was reported as “some measures completed”. The obstacles to implementation reported in all RBDs are delays, lack of finance and changes in surface water body delineation in all RBDs, and a lack of mechanism in all RBDs with the exception of the Danube. A large number of significant pressures have been identified and many (but not all) are being addressed with measures. New legislation or regulations to implement the Programme of Measures in the first cycle was reported necessary and already adopted in all RBDs. No further information was provided in the RBMPs.

9.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

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- Recommendation: *Review the pressures and impacts analysis and status assessment in a consistent manner across all RBDs in the second RBMP and ensure that the measures are based on the updated pressures and impacts analysis and status assessment of water bodies.*

  Assessment: A large number of significant pressures have been reported and many (but not all) seem to be addressed with measures. In the programme of measures, for each KTM there are linked national measures, which, for their part, contain one or more specific actions for the application of the measure. Further examination of RBMPs found that only the Black Sea RBD seems to have addressed this recommendation fully. The East Aegean RBD has not identified the expected results of the measures, and the West Aegean RBD has not identified water body specific objectives. No information could be found for the Danube RBD. It should be noted that this was not explicitly presented in the RBMP, but information was found in the Annexes. This recommendation has been partially fulfilled.

- Recommendation: *Ensure that the RBMPs clearly identify the gap to good status, and that the Programme of Measures is designed and implemented to close that gap. Exemptions should be adequately justified at water body level.*

  Assessment: No gap analyses have been completed for any RBD and Bulgaria has reported in the Annex 0 that "due to the significant number of water bodies assessed in "unknown" ecological and/or chemical status, it is not possible to assess the level of significance of the different pressure types and to evaluate the extent of the pressure or chemical substance that is to be reduced to achieve the Environmental Objectives; and It is not possible to estimate and report the expected value of the indicator"[61]. This recommendation has not been fulfilled.

[61] Bulgaria subsequently noted the additional difficulties that arose as a result of the significant re-delineation of water bodies.

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Topic 10 Measures related to abstractions and water scarcity

10.1. Assessment of implementation and compliance with WFD requirements in second cycle

10.1.1. Water exploitation and trends

Water abstraction pressures are reported as not relevant for Bulgaria; however, all RBDs face water quantity-related problems. The Black Sea and West Aegean RBDs do not achieve good quantitative status for 5 % and 15 % of ground water bodies, and water abstraction pressures significantly affect 23, 23 and 29 % of surface waters in the Danube, Black Sea and East Aegean RBDs respectively. The self-assessment does not appear consistent with these water body-related data. The Water Exploitation Index + has not been reported[62]; but water quantity data have been reported to support the European State of the Environment Report. Water scarcity is not considered an issue at the international level. The RBMPs include no water resource allocation and management plan.

10.1.2. Main uses for water consumption

No data have been reported[63] for the uses of water consumption, because water quantity pressures are not reported as significant. However, significant water abstraction pressures are registered in all RBDs.

10.1.3. Measures related to abstractions and water scarcity

Regarding basic measures (Article 11(3)(e)), there is a concession, authorisation and/or permitting regime to control water impoundment and a register of impoundments; and small abstractions are exempted from these controls; there is also an authorisation regime to control water abstractions in all RBDs. Measures promoting efficient and sustainable water use (Basic Measure Article 11(3)(c)) were implemented in the previous cycle in all RBDs except the West Aegean RBD[64], and new measures and/or significant changes are planned for the second cycle, except the East Aegean RBD. Given the high figures of water abstraction pressures, further assessment may be required on the expected impact of the new basic measures.

[62] Bulgaria subsequently clarified that on the basis of the calculated WEI +, the pressure from water abstraction is not considered significant. Important pressures from water abstraction have been assessed in individual water bodies or parts of water bodies. Relevant information can be found in section 6 of the RBMPs. In addition, an operational water abstraction index is calculated for groundwater bodies.

[63] Bulgaria clarified that data on water consumptions can be found on sections 2, 4 and 6 of the RBMPs.

[64] Bulgaria clarified that KTM 8 on water efficiency was reported in the previous cycle for West Aegean.

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Measures for the prior authorisation of artificial recharge or augmentation of groundwater bodies (Article 11(3)(f)) have been implemented in the previous cycle in all RBDs except the West Aegean RBD, and new measures and/or significant changes are planned for the second cycle, except the East Aegean RBD[65].

Complementary measures under KTMs are reported for addressing abstraction pressures, with a varied approach for the different RBDs, which might be due to lack of coordination: KTM9 – "Water pricing policy measures for the implementation of the recovery of cost of water services from households" and KTM10 – "Water pricing policy measures for the implementation of the recovery of cost of water services from industry" for the Black Sea and East Aegean RBDs, and KTM11 – "Water pricing policy measures for the implementation of the recovery of cost of water services from agriculture" for the Danube, Black Sea and East Aegean RBDs. KTM12 – "Advisory services for agriculture" is planned for the Danube RBD, KTM13 – "Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.)" for the East Aegean RBD, KTM21 – "Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure, for groundwater related pressures" in the Black Sea RBD, and KTM24 – "Adaptation to climate change" for the East Aegean RBD. No information is reported regarding when the existing gaps will be closed. Bulgaria reports that it is not possible to quantify the pressures that are to be reduced and the scale of measures still needed for achievement of 100 % compliance.

Water reuse was reported as a measure in all RBDs except the East Aegean RBD[66].

10.2.Main changes in implementation and compliance since first cycle

Regarding basic measures (Article 11(3)(e)), there is a concession, authorisation and/or permitting regime to control water impoundment and a register of impoundments; and small abstractions are exempted from these controls. Measures on this topic have been implemented in the previous cycle in all RBDs, and new measures and/or significant changes are planned for the 2016-2021 period, except the East Aegean RBD.

10.3.Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and Programme of Measures.

[65] Bulgaria subsequently clarified that prior authorisation of artificial recharge is mandatory under the Water Act, regardless of whether it is intended as a measure in the RBMPs. Since there are no water shortages, there is no provision for such measure.

[66] Bulgaria clarified however, that this was a reporting error.

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Topic11 Measures related to pollution from agriculture

11.1. Assessment of implementation and compliance with WFD requirements in second cycle

Pressures related to agriculture are clearly identified, both for surface and groundwater. For water quality, the reported pressures are organic pollution, nitrogen and phosphorus from diffuse sources and pesticides from diffuse sources. In relation to water quantity over-abstraction from surface water bodies is reported. Significant impact of engineering activities (bank reinforcement, dams, flow regulation, weirs, drainage systems) and significant soil erosion represent hydromorphological pressures.

Overall it seems that these pressures have not changed significantly in the Danube, Black Sea and East Aegean RBDs since the first RBMPs. In the first cycle the West Aegean RBD was not listed to be affected significantly by agriculture but this is the case in the second cycle.

The Programme of Measures identifies a broad range of measures to address pressures arising from agriculture but the measures applied vary significantly across RBDs. Basic measures as defined in Article 11(3)(h) for the control of diffuse pollution from agriculture at source are applied only in Nitrate Vulnerable Zones except in the West Aegean RBD where the same rules apply across the whole RBD. General binding rules to control diffuse pollution are applied for nitrates, organic pollution and phosphorus in all RBDs. In the East Aegean and West Aegean RBDs, this applies also for pesticides. No information is provided on the area of agricultural land to be covered by measures to achieve the environmental objectives.

Information has been reported on whether the measures are basic (the minimum requirement to be complied with) or supplementary. KTM2 – Reduce nutrient pollution from agriculture is planned in all four RBMPs and refers to organic methods for limiting eutrophication and reducing nitrates pollution. Other measures include ecological practices for discharge in groundwater bodies (Black Sea RBD), rules for the reuse of sewage sludge (Danube and Black Sea RBDs) and reducing pollution from mining activities (East Aegean RBD). These include both basic and supplementary measures. For supplementary measures information on whether the measures are mandatory or voluntary is not available either in WISE or in the RBMPs.

The same KTM3 – “Reduce pesticides pollution from agriculture” measures have been planned in all four RBMPs. It refers to the protection of waters against pesticide pollution. KTM3 has both basic and supplementary measures in all RBDs, except the West Aegean RBD where they are only basic.

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The same KTM12 – Advisory services for agriculture measures, also relevant for KTMs 2 and 3, have been planned in three RBDs. KTM12 is not planned in the West Aegean RBD. KTM12 refers to raising the awareness of agriculture stakeholders concerning the Good Ecological Status of waters. KTM12 measures are only basic in the Black Sea RBD, only supplementary in the East Aegean RBD, and both basic and supplementary in the Danube RBD.

The main KTM13 – Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.), planned in all four RBMPs, refer to the sanitary safeguard zones (bans or limitations of the activities that can be carried out in these zones or buffer zones) and protection of the surface water bodies that are used for drinking water. They are both basic and supplementary. Other measures include: update of the normative base concerning water management (Danube and Black Sea RBDs); limiting all other use that can pose risks to the drinking water supply (Danube, Black Sea and East Aegean RBDs); control and prevention of chemical, biological and other pollution or activities that can pose risks to the quantity or quality of the waters (Danube, East Aegean and West Aegean RBDs); studies and development of infrastructure for improvement of the drinking water supply (Danube, Black Sea and East Aegean RBDs).

According to the RBMPs, safeguard zones have been established in all 4 RBDs and include safeguard zones for: i) waters used for abstraction of drinking water, ii) waters used for bathing, iii) waters sensitive to biogen elements (primarily nitrogen and phosphorus vulnerable zones in accordance with Directives 91/676/EEC and sensitive areas in accordance with 91/271/EEC), iv) economically valuable fish species and v) protected areas related to the nature protection policies. In the process of updating the RBMPs the safeguard zones were also updated and in some RBDs this led to the designation of new safeguard zones. All 4 RBMPs include KTMs specifically targeting the protection of safeguard zones for waters used for abstraction of drinking water. These measures include establishment of sanitary safeguard zones around sources and facilities for drinking water, control of the sanitary safeguard zones and safeguard zones for drinking water, bans or limitations on investments in the catchment areas of water bodies used for drinking water, banning of economic activities in dams used for drinking water, a ban of tree cutting in the catchment areas of water bodies for drinking water, control and prevention of pollution from chemical, biological and other substances.

Farmers and Farmers' Unions have been consulted under the Public Consultation process in all RBDs. The information available concerning the public consultation of the draft RBMPs suggests that consultation took place with the Ministry of Agriculture, the National Agriculture Fund, the regional directorates ‘Agriculture’, the public irrigation systems and the association of grain producers.

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Financing of agricultural measures is secured in all RBDs. While in the first RBMPs very limited information on the funding resources and the costs associated with part of the measures was provided, these have been included in the second RBMPs. The RBMPs provide estimations for the potential financial contributions of different sectors (domestic, agriculture, industry and services) in the second cycle for the financing of the Programme of Measures. They also describe the sources of public funding for financing the Programme of Measures: state budgets, private investments and European Structural and Investment Funds. In the annexes to the RBMPs the complete Programme of Measures per RBD provide information about the funding source of each specific measure.

11.2.Main changes in implementation and compliance since first cycle

Overall it seems that the situation as regards the pressures has not changed significantly in the Danube, Black Sea or the East Aegean RBDs. In the first RBMP, the West Aegean RBD was not listed to be affected significantly by agriculture but this is the case in the second cycle. While in the first cycle very limited information on the funding resources and the costs associated with part of the measures have been given, this is available in the second RBMPs.

11.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: Ensure coordination between water and agriculture departments to make sure that developments supported by these investments do not undermine the achievement of WFD objectives. (Bulgaria is considering significant investment in irrigation and drainage under the *Rural Development Programme* 2014-2021).

  Assessment: Based on the East Aegean RBMP, it appears that Good Agricultural and Environmental Conditions have been defined with an ordinance of the Minister of Agriculture and to support their implementation 'Guidance for practical application of the conditions for maintaining the land in good agricultural and ecological condition' was issued in 2010. The Rural Development Programmes and the application of Article 4(4) are not mentioned in relation to the measures, the Rural Development Programmes are mentioned only as funding sources.

  Concerning irrigation, the RBMPs mention only that relevant KTM8 - "Water efficiency, technical measures for irrigation, industry, energy and households" measures are planned. Review of the Programme of Measures annexes indicates that the following

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national measures are classified as KTM8 and are relevant for agriculture (other KTM8 measures are more aimed at industry or urban areas): i) Improving the awareness of stakeholders in the agriculture sector concerning the effective use of water (Danube and East Aegean RBDs); ii) Adoption/update of legislative or other regulatory documents in the sphere of protection, use and management of waters (Danube and West Aegean RBDs); iii) Ensuring the quantity of surface and groundwaters used is measured (Danube RBD); iv) Application of the permitting regime in accordance with the Water Law concerning water abstraction from surface or groundwaters including construction of necessary facilities (Danube RBD). The main text of the Black Sea RBMP mentions that KTM8 measures 'construction of new hydromeliorative infrastructure' and 'reconstruction of hydromeliorative infrastructure' will address pressures from agriculture, but those measures were not found in the Programme of Measures annex. Therefore, this recommendation has partially been fulfilled.

- Recommendation: *Agriculture is indicated as exerting a significant pressure on the water resources in Bulgaria. This should be translated into a clear strategy that defines the basic/mandatory measures that all farmers should adhere to and the additional supplementary measures that can be financed. This should be developed with the farming community to ensure technical feasibility and acceptance. There needs to be a very clear baseline so that any farmer knows the rules this can be adequately advised and enforced and so that the authorities in charge of the Common Agricultural Policy funds can adequately set up Rural Development programmes and cross compliance water requirements.*

  Assessment: The measures are listed in annexes of the RBMPs with their codes and relevant water bodies. However, the actions taken to address this recommendation are not discussed. Plans and strategies are just described and their impacts do not seem to be analysed in detail. Measures to address pollution from agriculture have been planned in all RBMPs. Article 11(3)(a), Article 11(3)(b-l) and supplementary measures (Article 11(4)) have been applied but no gap assessment was carried out. Both basic and supplementary measures have been planned for compliance with the Urban Waste Water Treatment Directive[67] and for addressing pressures on water bodies from agriculture. The chapters of the RBMPs which covers the Programme of Measures focus on presenting the approach used for planning the measures in the second RBMPs (e.g. with information about responsible authorities, funding sources, analysis of climate change, economic

[67] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991L0271

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analysis, etc.) rather than on discussing specific measures. However, information on the effectiveness and what will be achieved to close the gaps is not provided. Only the East Aegean RBMP presents some more details of the measures planned for specific pressures (all other RBMPs either mention generic measures or list the KTMs).

Therefore, this recommendation has partially been fulfilled.

- Recommendation: *Review the degree to which the existing measures to implement the Nitrates Directive*[68] *are sufficient to address agricultural pressures and concentrate efforts on ensuring farmers understand their obligations in this regard and can finance the necessary investments. Additionally, Bulgaria should ensure basic measures as per Article 11(3)(h) of the WFD are put in place to control other diffuse pollutants – e.g. phosphate, pesticides, particulate matter. These measures should be specific, have a clear legal basis, and include appropriate advice, monitoring and inspection regimes to ensure their effective implementation. In addition to the basic measures, it should be set out clearly what supplementary measures will be needed to bridge the gap to good status and which of these measures will be included in the second Programme of Measures and what funding sources will be used to deliver these. Clear references to expectations for the Rural Development Programs in this regard (and to other funding sources) are expected.*

  Assessment: Basic measures as defined in Article 11(3)(h) for the control of diffuse pollution from agriculture at source are applied only in Nitrate Vulnerable Zones, except in the West Aegean RBD where the same rules apply across the whole RBD. General binding rules to control diffuse pollution are applied for nitrates, organic pollution and phosphorus in all basins. In the East Aegean and West Aegean RBDs this also applies for pesticides[69]. No information is provided on the area of agricultural land to be covered by measures to achieve the environmental objectives.

  Therefore, this recommendation has partially been fulfilled.

[68] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

[69] Bulgaria subsequently clarified that this is also the case for the Danube Basin.

Topic 12 Measures related to pollution from sectors other than agriculture

12.1. Assessment of implementation and compliance with WFD requirements in second cycle

In the context of this topic, pollution is considered in terms of nutrients, organic matter, sediment, saline discharges and chemicals (Priority Substances, River Basin Specific Pollutants, groundwater pollutants and other physico-chemical parameters) arising from all sectors and sources apart from agriculture. Key types of measure (KTM) are groups of measures identified by Member States in their Programmes of Measures which target the same pressure or purpose. A KTM could be limited to one national measure but would typically comprise more than one national measure. The same individual measure can also be part of more than one KTM because it may be multipurpose, but also because the KTMs are not completely independent of one another.

KTMs relevant to non-agricultural sources of pressures causing failure of WFD objectives have been reported for all RBDs in Bulgaria. These KTMs include:

KTM1- "Construction or upgrades of wastewater treatment plants"

KTM4 - "Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)"

KTM7 - "Improvements in flow regime and/or establishment of ecological flows"

KTM10 - "Water pricing policy measures for the implementation of the recovery of cost of water services from industry"

KTM12 - "Advisory services for agriculture"

KTM13 -" Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.)"

KTM14 - "Research, improvement of knowledge base reducing uncertainty"

KTM15 – “Measures for the phasing-out of emissions, discharges and losses of Priority Hazardous Substances or for the reduction of emissions, discharges and losses of Priority Substances”

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KTM16 – “Upgrades or improvements of industrial wastewater treatment plants (including farms)”

KTM17 – "Measures to reduce sediment from soil erosion and surface run-off"

KTM 21 - "Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure" and

KTM22 -" Measures to prevent or control the input of pollution from forestry".

The Programme of Measures indicates that KTM15 measures are planned only in the Danube and Black Sea RBDs. They include both basic and supplementary measures, and measures relevant to preventing pollution of both surface water bodies and groundwater bodies. The Programme of Measures does not indicate which sectors or sources will be affected, the geographic coverage of the measures or whether they are voluntary or mandatory.

KTM16 measures are reported in all four Bulgarian RBMPs, and in all cases they are both basic and supplementary. The KTM16 measures reported are as follows:

- ensuring proper treatment of industrial waste waters (Danube, Black Sea, East Aegean RBDs);
- implementation of the procedure for review of issued permits for discharges of waste waters (Danube and Black Sea RBDs);
- reduction of the pollution from mining activities (Danube and East Aegean RBDs);
- reduction of the diffuse pollution from industrial activities (Danube RBD);
- application of a permitting regime for discharges of waste waters in surface water bodies according to the Water Act (Danube RBD);
- change or cancellation of permits for discharges of waste waters based on their review (West Aegean RBD).

Most of these measures are relevant only for surface water bodies; however the Danube and Black Sea RBMPs indicate that some of the KTM16 measures are relevant also for groundwater bodies. The Programme of Measures does not indicate which sectors or sources

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will be affected, the geographic coverage of the measures or whether they are voluntary or mandatory.

The WFD specifies that the Programme of Measures shall include, as a minimum, "basic measures" and, where necessary to achieve objectives, "supplementary measures" when basic measures are not enough to address specific significant pressures (see the chapter 9 in this report).

Quantitative information on basic and supplementary measures used to tackle pollution from non-agricultural sources (number of measures per KTM) has been provided for all Bulgarian RBDs. This includes information on basic measures in 10 KTM categories. All four Bulgarian RBMPs contain basic measures for addressing point source pollution such as change or cancellation of permits for discharges of waste waters based on their review; and ensuring appropriate treatment of industrial waste waters.

Bulgaria provided more targeted information on basic measures required under Article 11(3)(c to k). The use of an authorisation and/or permitting regime to control waste water point source discharges (Basic measures Article 11(3)(g)) was reported for three out of the four Bulgarian RBDs for surface and groundwater. For the West Aegean RBD the use of an authorisation and/or permitting regime to control waste water point source discharges was reported for surface water only. A register of waste water discharges (Basic measures Article 11(3)(g)) is available in three out of the four Bulgarian RBDs for surface and groundwater. For the West Aegean RBD a register of waste water discharges is available for surface water only.

As regards thresholds below which waste water discharges do not require permits and are not subject to registration (Basic measure Article 11(3)(g)), small discharges are exempted in three out of the four Bulgarian RBDs, i.e. in all but the West Aegean RBD. Some direct discharges to groundwater are authorised in accordance with Article 11(3)(j) in three out of the four Bulgarian RBDs. There is prohibition of all direct discharges in the West Aegean RBD.

Bulgaria reported that there are measures in place to eliminate or reduce pollution from Priority Substances and other substances in all RBDs.

12.2. Main changes in implementation and compliance since first cycle

In the first RBMPs, the measures provided to reduce or phase out the emissions of Priority Substances and River Basin Specific Pollutants were formulated in a very general way and did not refer to any individual pollutants except nitrogen and phosphorus.

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At present, according to information reported to WISE, there are measures in place to eliminate or reduce pollution from Priority Substances and other substances (Basic measures Article 11(3)(k)) in all RBDs. Bulgaria reported to WISE that KTMs have been made operational based on pressures from Priority Substances and River Basin Specific Pollutants causing non-compliance, including KTM15 measures in two out of four RBDs.

Concerning measures for Priority Substances causing failure, according to information reported to WISE the Black Sea and East Aegean RBDs reported that mercury and its compounds cause failures of good status. However, all four RBDs reported Priority Substances that cause failure of good status, e.g. trichloromethane (Danube RBD), nickel (Danube RBD), cadmium (Danube, East Aegean and West Aegean RBDs), hexachlorobutadiene (the Black Sea RBD), octyphenol (the Black Sea RBD), mercury (the Black Sea and East Aegean RBDs) and lead (East Aegean and West Aegean RBDs). According to the information reported to WISE all four RBMPs include basic measures to target pollution from Priority Substances, even though only two include KTM15 measures. The descriptions of most measures provided in the annexes with the Programme of Measures do not refer to individual Priority Substances but only to tackling such pollution in general.

As far as measures for River Basin Specific Pollutants causing failure are concerned, according to information reported to WISE, three RBDs reported specific pollutants that are causing failure of good status and in all these RBDs relevant KTM measures are reported (e.g. KTM1, KTM 14, KTM 21). However, the descriptions of most measures (except for nitrates and phosphates from agriculture) provided in the annexes with Programme of Measures do not refer to individual substances/pollutants but only to tackling such pollution in general.

12.3. Progress with Commission recommendations

The Commission made five recommendations based on the first RBMPs and Programme of Measures:

- Recommendation: "*Identify in the second RBMP a solution to address the significant pressure from landfills, and commit to accelerating the implementation of measures to comply with the Urban Waste Water Treatment Directive.*"

  Assessment: According to the information reported to WISE, KTM4 measures are in place in three out of the four RBDs in Bulgaria. The following national measures have been classified as KTM4: (i) Reducing the pollution from past activities (Danube and West Aegean RBDs) and (ii) Reducing the pollution from mining activities (Danube and

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East Aegean RBDs). The actions mentioned for those measures are: (i) Development and implementation of programmes for limiting the pollution from past activities (including landfills) (Danube and West Aegean RBDs); (ii) Re-cultivation of areas polluted by mining activities (Danube and East Aegean RBDs); (iii) Re-cultivation of areas impacted/disturbed by mining activities (Danube RBD).

It therefore appears that the recommendation has been acted upon in relation to landfills for two of the four RBDs.

As regards the Urban Waste Water Treatment Directive, KTM1 measures are particularly relevant and are listed for all four of the RBDs, with reference in all cases to point sources and in two RBDs also to diffuse sources as pressures.

This recommendation is considered as partially fulfilled.

- Recommendation: "*Ensure that significant point and diffuse sources of chemical pollution are proactively identified and measures put in place to control them.*"

  Assessment: According to the information reported to WISE, Bulgaria has put in place a number of KTM measures tackling point and diffuse sources of chemical pollution. In addition to KTM4 and KTM1 mentioned above, KTM15, KTM16, KTM21, KTM22, and KTM25, and two other KTMs (other basic and supplementary prevention measures and improvement of governance/management) are planned in Bulgarian RBMPs.

  As noted above, however, there is no substance-specific detail, therefore it is not possible to consider the recommendation as completely fulfilled.

- Recommendation: "*Prioritize the agglomerations with more than 2000 population equivalent (p.e.) in terms of the WFD principles and of financing in the second RBMPs but also assess the pressures due to waste water from small agglomerations (less than 2000 p.e.) in the second RBMP cycle.*"

  Assessment: Measures to tackle urban point sources are reported in all 4 RBDs.

  The following national measures are classified as KTM1: Ensuring collection, conveyance and treatment of industrial waste waters, released in water bodies (Danube and East Aegean RBDs); and use of natural methods for treatment of waste waters (Danube RBD). The Programme of Measures mentions a large variety of actions for those measures, such as:

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- implementation of projects for construction, reconstruction or modernisation of sewage systems for agglomerations of less than 2000 *population equivalent* including finishing the construction of sewage systems when there is a wastewater treatment plant or ensuring proper treatment (through construction of wastewater treatment plants or transportation of waste to another wastewater treatment plants) when there is an existing sewage system (all RBMPs);

- ensuring conveyance and proper treatment of waste waters from urban areas with less than 2000 *population equivalent* including construction of proper sewage systems, wastewater treatment plants, connection to larger wastewater treatment plants; and development of a wet zone for treatment of waste waters in agglomerations of less than 2000 *population equivalent*. (Danube, Black Sea and West Aegean RBDs);

- implementation of projects for construction, reconstruction or modernisation of sewage systems including city wastewater treatment plants defined for specific agglomerations over 2000 *population equivalent* according to the national catalogue of measures (Danube, Black Sea and West Aegean RBDs);

- construction, reconstruction or modernisation of sewage systems for agglomerations of over 2000 *population equivalent* (Danube, Black Sea and East Aegean RBDs).

Each of the RBMPs provides an economic analysis of the Programme of Measures that provides estimates of the total costs of the Programme of Measures together with the possible sources of financing and expected amounts of financing from each source. Based on this analysis each RBMP provides an 'indicative financial plan of projected financing' for each year of the second cycle and per funding source. The financing of all measures is expected to come from a combination of public and private sources (e.g. national budget, Operation Programme Environment, water users). The Programme of Measures annexes list the sources of financing for each specific measure. For KTM1, the financing sources are state budget, municipal budget, Operation Programme Environment, the public water supply and sewage company, the Bulgarian Enterprise for Management of Environmental Protection Activities, and private investors). However, it is not explicitly mentioned in RBMPs if the funding is already 'secured' for each of the coming years.

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Overall, the recommendation appears to have been acted upon in the planning of significant actions, but prioritisation of agglomerations is not mentioned in the RBMPs, and it is not clear whether funding has been secured. Thus, the recommendation is considered partially fulfilled.

- Recommendation: "*Ensure compliance with Article 5 of the Urban Waste Water Treatment Directive for more stringent treatment, especially in big cities*."

  Assessment: Measures to tackle urban point sources are reported in all 4 Bulgarian RBDs. Another example of an action relevant to the national measures classified as KTM 1 is the introduction of a third stage of wastewater treatment for the removal of nitrogen and phosphorus (Danube and East Aegean RBDs). RBMPs do not indicate whether the planned measures will be sufficient to comply with Article 5 of the Urban Waste Water Treatment Directive.

  Therefore, the recommendation has been partly fulfilled.

- Recommendation: "*[The identification of river basin specific pollutants needs to be more transparent, with clear information on how pollutants were selected, how and where they were monitored, where there are exceedances and how such exceedances have been taken into account in the assessment of ecological status.] It is important that to take an ambitious approach to combatting chemical pollution and that adequate measures are put in place."*

  While Bulgaria has identified several KTMs as relevant to addressing the pressures from chemical pollutants, substance specific information is lacking. Therefore, the extent to which the measures will be successful is difficult to judge. Furthermore, it is not clear why KTM15 measures are not mentioned in the RBMPs for the East and West Aegean RBDs. The recommendation is considered partially fulfilled.

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Topic 13 Measures related to hydromorphology

13.1. Assessment of implementation and compliance with WFD requirements in second cycle

Significant hydromorphological pressures and operational KTMs to deal with these are reported in all RBDs. The significant hydromorphological pressures are assigned to specific sectors. Hydrological alterations are mainly related to hydropower. Dams, barriers and locks are mainly related to hydropower, irrigation and flood protection. Physical alterations are mainly related to agriculture and flood protection.

To tackle continuity barriers, mainly KTM5 – "Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)" and KTM6 – "Improving hydromorphological conditions of water bodies other than longitudinal continuity" are made operational; in 1 RBD (Black Sea), also KTM10 – "Water pricing policy measures for the implementation of the recovery of cost of water services from industry" and KTM24 – "Adaptation to climate change" are applied. To tackle significant physical alterations, KTM6, 23 and 24 are applied, while for significant hydrological alterations, KTM6 – "Improving hydromorphological conditions of water bodies other than longitudinal continuity", KTM7 – "Improvements in flow regime and/or establishment of ecological flows" and KTM14 – "Research, improvement of knowledge base reducing uncertainty" are applied. For hydrological alterations from aquaculture, also KTM19 – "Measures to prevent or control the adverse impacts of recreation including angling" and KTM20 – "Measures to prevent or control the adverse impacts of fishing and other exploitation/removal of animal and plants" are made operational.

The measures listed in the Programme of Measures (annexes to the RBMPs) are rather broad. The national measures identified for addressing pressures include ensuring the continuity of water flows and fish movement, reconstruction and protection of river banks and river beds against erosion, ensuring ecological flow, improving the hydromorphological conditions of rivers, improving the assessment of hydromorphological elements for quality and hydromorphological status, reducing the erosion of the catchment area, restoration of areas impacted by 'extraction of aggregate materials' (dredging), restoration of the natural condition of the bottom of lakes. Measures also include actions such as ban of 'extraction of aggregate materials' (dredging) of less than 50m from the river banks and ban of prolongation of the validity and/or change of existing permits for water abstraction from surface waters and/or use of water bodies with the purpose of energy production from hydropower plants which do not have a construction permit in accordance with the Law for Spatial Planning as of the date of

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adoption of the RBMP. In addition, the Programme of Measures lists the more concrete actions that fall in the scope of each measure.

In terms of the basic measures planned to tackle hydromorphological pressures, there is an authorisation and/or permitting regime in place to control physical modifications in all RBDs, which covers changes to the riparian area of water bodies according to WFD Article 11(3)(i). There is also a register of physical modifications of water bodies.

Overall management objectives in terms of restoring river continuity have been set in two out of four RBDs (Danube and West Aegean RBDs); in the Danube RBMP, these objectives are also quantitative. No such objectives are set for the other RBDs.

Win-win measures in terms of achieving the objectives of the WFD and Floods Directive[70], drought management and use of Natural Water Retention Measures are included in the Programme of Measures of all RBDs. In addition, KTM23 – "Natural Water Retention Measures" has been made operational to tackle significant hydromorphological pressures in three out of four RBDs (Danube, Black Sea and East Aegean RBDs). The national measures classified as KTM23 include improving the natural retention of water and measures on drainage of wetlands/ wet zones. In general, Natural Water Retention Measures are not further discussed in any of the RBMPs. The RBMPs for the Danube and the East Aegean RBDs mention the planned Natural Water Retention Measures and their actions only in relation to flood risk management and synergies with the Flood Risk Management Plans but no further details are provided.

In addition, the design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, is reported to have been adapted to take into account WFD objectives in all RBDs.

Ecological flows have been derived and implemented partly, i.e. for some relevant water bodies, and only in one out of four RBDs (Danube) but the work is still on-going. In the other three RBDs (Black Sea, East Aegean and West Aegean), no ecological flows have been derived but there are plans to do it during the second cycle. The Programmes of Measures for the Black Sea, East Aegean and West Aegean RBDs indicate that relevant measures will start in 2017-2018.

[70] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

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The measure 'ensuring ecological flow' has been planned in all RBMPs and the Programmes of Measures outline specific actions that this measure encompasses, such as ensuring the minimum allowed flow in rivers after facilities for water abstraction or flow control, optimising the water management of dams for ensuring water quantities of the ecological flow and achieving good ecological status/potential, ban of water abstraction in cases of low water (in accordance with the methodology for ecological flow).

Concerning the level of ambition for tackling significant hydromorphological pressures, it is not possible to draw specific conclusions as indicators on the gap to be filled for significant hydromorphological pressures and KTM value indicators are not reported. Due to the significant number of water bodies assessed in unknown ecological and/or chemical status, it is not possible for Bulgaria to quantify the pressure that is to be reduced or to assess the scale of measures still needed for achievement of 100 % compliance and to report the expected value of the KTM value indicators in 2015.

13.2. Main changes in implementation and compliance since first cycle

The information on the links between the water use, the hydromorphological pressure and the measures has improved due to the improved WISE reporting linking KTM with pressures and specific sectors. These links were not considered and analysed in the first RBMPs.

However, no change is noted on other aspects, for example on the assessment of progress expected by the hydromorphological measures in terms of closing the gap in hydromorphological pressures and achieving the environmental objectives. In the first cycle RBMPs, no assessment of the expected effects was carried out and in the second cycle, no information is reported on the extent to which the gap will be closed in terms of tackling significant pressures.

The second RBMPs do not provide information about differences between the planned hydromorphological measures compared to the first RBMPs. However, all RBMPs provide a brief summary of the implementation of the Programme of Measures from the first cycle. Although these summaries are rather general and less focused on specific measures, there are some examples of progress concerning hydromorphological measures, such as on the number of constructed or reconstructed fish passes and number of negative decisions concerning permits or investment proposals.

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13.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Develop a proper methodology for establishing ecological flow linked with good ecological status in the second RBMPs and ensure this ecological flow is applied through review of permits.*

  Assessment: The measure 'ensuring ecological flow' has been planned in all RBMPs with specific actions, some of which make specific reference to the achievement of good ecological status and potential. No specific information was found that ecological flows in the second RBMPs go beyond the already established 10 % or that ecological flows will be applied through review of permits.

  Therefore, it is concluded that the recommendation is partially fulfilled, based on the information found as part of this assessment.

- Recommendation: *Review all existing permits in all RBDs and where necessary, amend them to ensure that they are compatible with the WFD objectives.*

  Assessment: The permitting systems are not explicitly discussed in the second RBMPs. However, the RBMPs have planned different hydromorphological measures to address pressures from different sectors (including energy) including ban of prolongation of the validity and/or change of existing permits for water abstraction from surface waters and/or use of water bodies with the purpose of energy production from hydropower plants which do not have a construction permit in accordance with the Law for Spatial Planning as of the date of adoption of the RBMP. This measure is explicitly reported for the Danube RBMP.

  Other relevant references in the RBMPs and especially the Programme of Measures include measures on the introduction of a condition in the permits for water abstraction and/or use of water bodies for compulsory monitoring by the holder of the permits to assess the ensuring of continuity of the river and the overall hydromorphological impact. The second RBMP of the Black Sea RBD also mentions the implementation of a procedure for review of issued permits for water abstraction from surface water bodies, while the RBMP of the East Aegean RBD indicates a ban on issuing permits for water abstraction by hydropower plants in the areas for protection of economically valuable fish species and other water organisms.

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Overall, based on the information found, some progress is noted with respect to this recommendation.

- Recommendation: *Implement measures to mitigate the effects of navigation and related activities in the Black sea RBD.*

  Assessment: Both the Danube RBD and the Black Sea RBD have made specific KTMs operational to address significant hydromorphological pressures from the navigation sector. In particular, in the Danube RBD, KTM7 is applied to tackle hydrological alterations from transport and in the Black Sea RBD, KTM6 and 24 are applied to address physical alterations from navigation and KTM6 and KTM5 are applied to address continuity barriers from navigation. In the Black Sea RBD, no specific KTM are made operational to tackle hydrological alterations from transport; however, this is identified as a significant pressure only for one single coastal water body.

  Based on the information found in the second RBMPs, this recommendation has been fulfilled.

- Recommendation: *Consider and prioritise the use of green infrastructure and/or natural water retention measures that provide a range of environmental (improvements in water quality, flood protection, habitat conservation etc.), social and economic benefits which can be in many cases more cost-effective than grey infrastructure.*

  Assessment: KTM23 – "Natural Water Retention Measures" has been made operational to tackle significant hydromorphological pressures in three out of four RBDs (Danube, Black Sea and East Aegean). In general, Natural Water Retention Measures are not further discussed in any of the RBMPs. The RBMPs for the Danube RBD and the East Aegean RBD mention the planned Natural Water Retention Measures and their actions only in relation to flood risk management and synergies with the Flood Risk Management Plans but no further details are provided. No information was found in the second RBMPs on prioritisation of the implementation of Natural Water Retention and green infrastructure measures compared to grey infrastructure.

  This recommendation is partially fulfilled.

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Topic 14 Economic analysis and water pricing policies

14.1. Assessment of implementation and compliance with WFD requirements in second cycle and main changes in implementation and compliance since first cycle

A broad definition of water services is used in the second cycle, in all RBDs uniformly according to a common national approach. The water services defined are:

1. Public water supply (drinking and irrigation);
2. Public conveyance of waste water (sewage);
3. Public waste water treatment;
4. Own water supply in the industry;
5. Own water supply in agriculture for irrigation;
6. Own water supply in agriculture for livestock and aquaculture;
7. Production of hydropower;
8. Flood prevention (sometimes noted as "protection from the harmful effects of water");
9. Water storage;
10. Navigation and related activities;
11. Own water supply for drinking.

For these 11 water services, cost recovery is analysed in all four RBDs. It is not explained if all activities creating significant pressures and which are not exempted according to Article 9(4) are considered water services.

In all of the RBDs five groups of water users were identified as being "significant", namely agriculture, industry, services, households and navigation. For these significant water uses, an economic analysis is provided in all RBMPs.

With regard to an adequate contribution to cost recovery, the incentive function of water pricing and the Polluter Pays Principle, the Water Act (Article 192, amended in 2015) and relevant legislation at the national level in Bulgaria are stated to cover these issues adequately, mainly by fees for water abstraction, use and pollution.

The environmental and resource costs have been calculated but they are not considered significant. Although not considered significant, the environmental and resource costs are considered to be internalised, as stated in the RBMPs (through the fees defined in the tariffs for water abstraction, the use of a water source and water pollution, plus a correction coefficient).

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The economic analysis is reported as updated. A series of national methodology and guidance documents has been prepared since the first cycle. These common national approaches were applied across all four RBMPs in the second cycle with regard to Article 9 issues.

14.2. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *The cost-recovery should address a broad range of water services, including impoundments, abstraction, storage, treatment and distribution of surface waters, and collection, treatment and discharge of waste water, also when they are "self-services", for instance self-abstraction for agriculture. The cost recovery should be transparently presented for all relevant user sectors, and environment and resource costs should be included in the costs recovered. Information should also be provided on the incentive function of water pricing for all water services, with the aim of ensuring an efficient use of water. Information on how the polluter pays principle has been taken into account should be provided in the RBMPs.*

  Assessment: A broad definition of water services is used in the second cycle, in all RBDs uniformly according to a common national approach. The water services defined are:

  1. Public water supply (drinking and irrigation);
  2. Public conveyance of waste water (sewage);
  3. Public waste water treatment;
  4. Own water supply in the industry;
  5. Own water supply in agriculture for irrigation;
  6. Own water supply in agriculture for livestock and aquaculture;
  7. Production of hydropower;
  8. Flood prevention (sometimes noted as "protection from the harmful effects of water");
  9. Water storage;
  10. Navigation and related activities;
  11. Own water supply for drinking.

For these 11 water services, cost recovery is analyzed in all four RBDs. The results of the cost recovery analysis are presented per significant water user and per water service, except for

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navigation. Here, it is stated that sufficient quantitative information about the water use in navigation was not available and, consequently, quantitative estimates are provided only for the other four types of significant water users (see below for the water users defined).

It is not explained if all activities creating significant pressures and which are not exempted according to Article 9(4) are considered water services.

While for the Danube and Black Sea RBDs, no use of Article 9(4) is indicated in WISE, in the West Aegean RBD, the use of Article 9(4) is indicated for drinking water and waste water. In the East Aegean RBD, the same two services are exempted, plus also flood protection, irrigation, self-abstraction and water storage. The reasons for these differences across RBDs, and how they are explained is not detailed

In all of the RBDs, five groups of water users were identified as being "significant", namely agriculture, industry, services, households and navigation. For these significant water uses, an economic analysis is provided in all RBMPs.

With regard to an adequate contribution to cost recovery, the incentive function of water pricing and the Polluter Pays Principle, the Water Act (Art. 192, amended in 2015) and relevant legislation at the national level in Bulgaria are stated to cover these issues adequately (the texts in the RBMPs are identical regarding this issue).

The RBMPs explain that the regulation of efficient water use is ensured mainly by the fees for water abstraction, water use and water pollution and partly by the introduction of norms for water use in certain sectors where this is feasible. According to the tariffs for the fees for water abstraction, use of a water source and pollution, the different fees are formulated as follows:

- The water abstraction fees are determined on the basis of the annual water volume used (in cubic meters) multiplied by the individual fee. Different individual fees are established for surface and groundwater bodies and according to the purpose of the water use. The highest singular water abstraction fees are applied for own water supply (drinking water and everyday use) from groundwater sources with the goal of limiting this type of abstraction and stimulating the use of the public water supply services.

- There is a fee for using a water source and disrupting its continuity/flow, this fee is paid until a facility that restores the continuity/flow is put in place.

- The fee for release of pollutants to groundwater bodies is determined on the basis of the annual amount of discharged pollution, the chemical status of the groundwater body and

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the individual fees for different types of pollutants. The maximum allowed concentration of typical pollutants established in the issued permit for discharge is taken into account in the development of the coefficients for the chemical status of the groundwater body in each case.

- The fees for discharge of waste waters of urban type from sewage and industrial facilities in surface water bodies are calculated using correction coefficients that take into account the type of water body, the number of discharges and the level of treatment.

- The fees for discharges from industrial facilities other than the urban type are calculated using correction coefficients that take into account the number of watchlist, priority and specific substances and the fee for urban waste waters calculated based on the annual amount of urban waste water discharged into surface water bodies.

- The fees for pollution from industrial waste waters other than the urban type released in sewage systems are calculated based on the amount, substances and parameters of the waste waters in accordance with the public sewage operator and correction coefficients reflecting the type of in water body, number of discharges and level of treatment.

- The fee for diffuse pollution from agricultural sources is determined on the basis of an ordinance, proposed by the Minister of Agriculture and Food and agreed with the Minister of Environment and Water, which determines the amount, procedures and method for calculation and payment of the fee. This fee is paid individually by the owner or user of the farm or by the person who releases crop protection products to the market.

Furthermore, the Ordinance on the norms for water use sets optimal water amounts for the irrigation of crops considering the irrigation norms of the different crops, the different agro-climatic conditions in the country and the different types of irrigation. The aims of this ordinance are to safeguard the quantitative status of the waters, stimulate efficient water use and ensure different water users contribute to the cost recovery of water services. The RBMPs state that these norms will be applied in the process of permit issuance for water abstraction and the calculation of the annual fees for water abstraction according to the procedures in Article 194 (6) of the Law on water for irrigation of crops.

The environmental and resource costs have been calculated but they are not considered significant. As an explanation, it is stated that when environmental and resource costs are included in the calculation of total cost recovery, the percentage of cost recovery diminishes just a little in most cases, as the sum of the environmental and resource costs is much smaller than the sum of the financial costs (which is a product of the methodology applied).

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The different RBMPs provide varying degrees of details as to the national methodology developed on the basis of the Common Implementation Strategy Guidance Document No. 1 "Economics and the Environment – The Implementation Challenge of the Water Framework Directive" and applied for the calculation of the environmental and resource costs in all RBDs. According to the information provided in the East Aegean RBMP, the environmental costs are estimated based on the financial costs. The Danube RBMP provides a list of the different costs considered for each of the 11 water services in the analysis. It shows that environmental and resource costs have been identified and considered for all of the 11 water services except "own water supply in the industry", "water storage" and "own water supply for drinking". Similarly, resource costs have been identified and considered for all 11 water services except "public conveyance of waste water (sewage)", "public waste water treatment", "protection from the harmful effects of water", "water storage" and "navigation and related activities". In the East and West Aegean River basin Districts, environmental and resource costs are not calculated for self-abstraction.

Although not considered significant, the environmental and resource costs are considered to be internalised, as stated in the RBMPs (through the fees defined in the tariffs for water abstraction, the use of a water source and water pollution, plus a correction coefficient).

It remains unclear how environmental and resource costs are exactly calculated, and whether the arguments regarding their significance are valid or not. Because of these uncertainties, how the Polluter Pays Principle has been considered is similarly not entirely clear. Water services are broadly defined, and cost recovery rates are provided for most of them. The recommendation is partially fulfilled.

Topic 15 Considerations specific to Protected Areas (identification, monitoring, objectives and measures)

15.1. Assessment of implementation and compliance with WFD requirements in second cycle

Bulgaria has reported Protected Areas of all types in the second RBMPs with respect to surface waters (Table 15.1). However, only Protected Areas designated under Article 7 of the WFD have been reported to be associated with groundwater bodies. While groundwater bodies linked with groundwater dependent terrestrial ecosystems exist in all RBDs except the Black Sea RBD[71], Protected Areas designated under the Birds or Habitats Directive have not been identified.

Table 15.1 Number of Protected Areas of all types in each RBD of Bulgaria, for surface and groundwater

Protected Area type	Number of Protected Areas associated with				
	Rivers	Lakes	Transitional	Coastal	Groundwater
Abstraction of water intended for human consumption under Article 7	197	6			156
Recreational waters, including areas designated as bathing waters under Directive 76/160/EEC[72]	4			90	
Protection of species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 79/409/EEC (Birds)[73]	109	12	16	18	
Protection of habitats or species where	209	16	21	18	

[71] Bulgaria subsequently clarified that there has been an error in reporting and the dependent ecosystems have also been identified in the Black Sea RBD.

[72] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006L0007

[73] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

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Protected Area type	Number of Protected Areas associated with				
	Rivers	Lakes	Transitional	Coastal	Groundwater
the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC (Habitats)[74]					
Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC (Nitrates Directive)[75] and areas designated as sensitive areas under Directive 91/271/EEC (Urban Wastewater Treatment Directive)[76]	18	11	5	1	5
Areas designated for the protection of economically significant aquatic species	94		9	29	
Other					

Source: Member States reports to WISE

A good overview of the status (chemical and ecological and for ground water also quantitative) of water bodies associated with Protected Areas is reported (Figure 15.1); a large proportion of surface water bodies associated with Protected Areas have unknown chemical status.

[74] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

[75] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

[76] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991L0271

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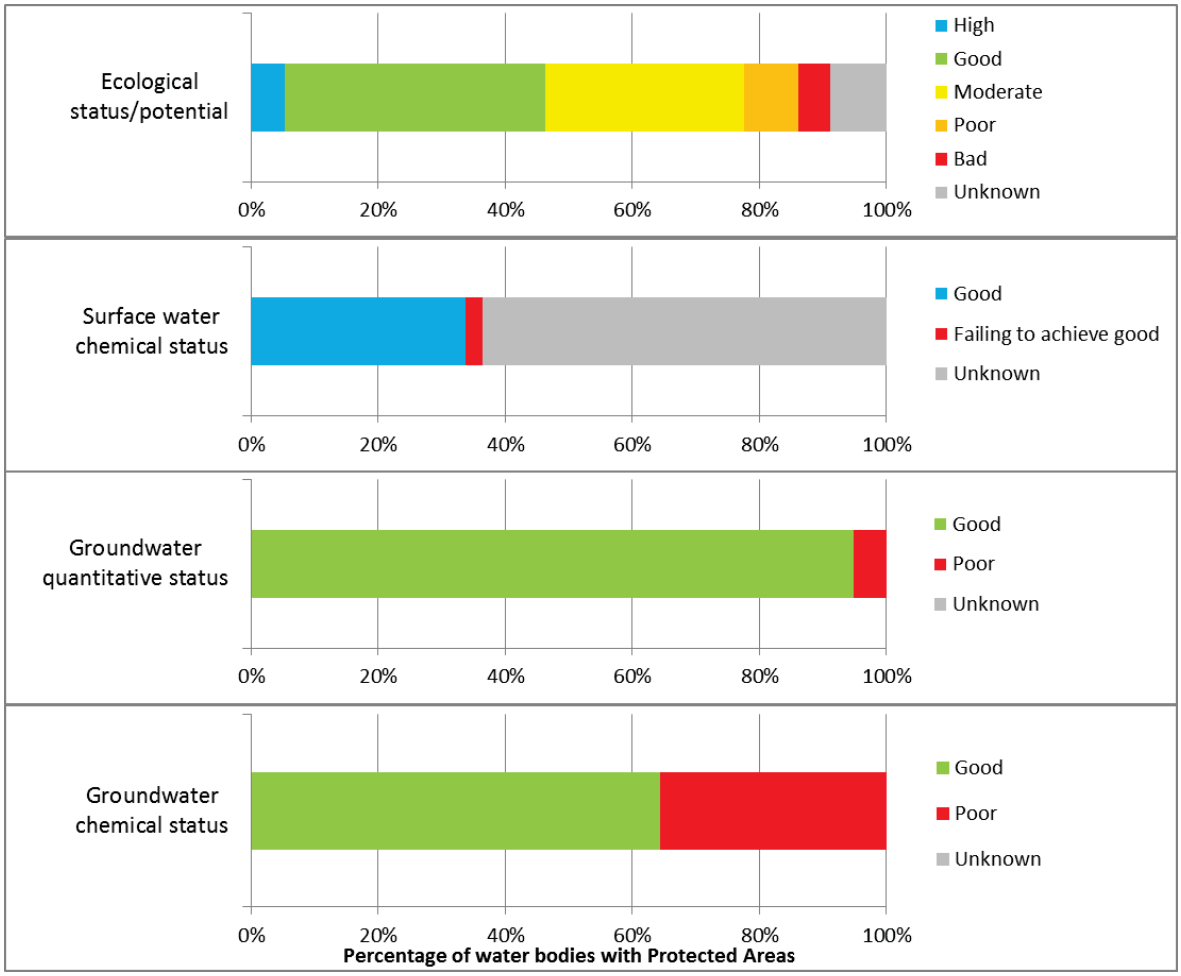
Figure 15.1 Status of water bodies associated with the Protected Areas reported for Bulgaria. Note: based on status/potential aggregated for all water bodies associated with all Protected Areas



Source: WISE electronic reporting

Bulgaria has set additional objectives for Protected Areas designated under the Habitats and Birds Directives where needed; in some Protected Areas it is reported that WFD objectives are sufficient to meet the requirements of the water dependent interest features of these Protected Area and so specific objectives have not been set. This suggests that the requirements in each Protected Area have been assessed separately to set the appropriate additional objective.

No specific objectives have been set for shellfish Protected Areas and for most drinking water areas.

The reported surface water monitoring programme covers all relevant types of Protected Areas (Table 15.2). The numbers of monitoring sites for each Protected Area type is consistent with the numbers of Protected Areas in each type suggesting that the monitoring programme is

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adequate in this regard. For Protected Areas associated with groundwater bodies monitoring is reported for drinking water and Nitrates Directive related Protected Areas and is also proportionate to the numbers of Protected Areas reported.

Table 15.2 Number of monitoring sites associated with Protected Areas in Bulgaria

Protected Area type	Number of monitoring sites associated with Protected Areas in				
	Lakes	Rivers	Transitional	Coastal	Groundwater
Abstraction of water intended for human consumption under Article 7	10	317			126
Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC (Nitrates Directive)	10	268	5	6	112
Areas designated as sensitive areas under Directive 91/271/EEC (Urban Wastewater Treatment Directive)	2	326	35	20	
Protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC (Habitats)	1	112	17	10	
Recreational waters, including areas designated as bathing waters under Directive 76/160/EEC[77]		4		90	
Shellfish designated waters - WFD Annex IV.1.ii				7	

Source: WISE electronic reporting

All RBDs have implemented Safeguard Zones for the protection of Drinking Water Protected Areas. In three of the four RBDs, changes to these Safeguard Zones are planned for the current cycle of implementation.

All RBDs have reported planned measures for all relevant types of Protected Areas. The specific measures are listed either in the general Programme of Measures or specific Programmes of Measures for Protected Areas in the RBMP annexes. No information is reported on the magnitude of these measures and whether they will be sufficient to meet the

[77] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006L0007

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objectives of the Protected Areas. The measures described in the RBMP and Programmes of Measures are mainly administrative, but to also include some physical measures.

No exemptions have been made for surface water Protected Areas.

For groundwater Drinking Water Protected Areas, exemptions have been made for 22% of the reported Protected Areas across two of the four RBDs. These exemptions are mainly based on technical feasibility and, in some cases, natural conditions.

15.2. Main changes in implementation and compliance since first cycle

In terms of the numbers of Protected Areas designated, only the number of Drinking Water Protected Areas has changed since the first RBMP. This has decreased by around a third in the second cycle.

The numbers of surface water monitoring sites for Habitat and Urban Waste Water Treatment Protected Areas have decreased significantly in the second cycle compared to the first. The number of monitoring sites for other types of surface water and groundwater Protected Areas have not changed significantly.

15.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and first Programme of Measures requested action on the following:

- Recommendation: *Set more stringent objectives for all Drinking Water Protected Areas in the* second *RBMP cycle and complete the establishment of drinking water safeguard zones. These measures should be included in the Programme of Measures.*

  Assessment: Objectives for groundwater Drinking Water Protected Areas have only been set in the West Aegean RBD. For surface water Drinking Water Protected Areas objectives have been set (and met) for all RBDs except the East Aegean RBD[78]. The recommendation has been fulfilled.

[78] Bulgaria subsequently clarified that reporting errors were made. Annex 5.3.2 Environmental objectives of areas for the protection of the protection of groundwater intended for drinking and domestic water supply are included in Tables 11 and 12, Section 5, paragraph 5.3.1, detailing the objectives of the areas for the protection of water intended for drinking and domestic water supply.

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Topic 16 Adaptation to drought and climate change

16.1. Assessment of implementation and compliance with WFD requirements in second cycle

Climate change was considered in various ways in all RBDs and it is stated that the guidance on how to adapt to climate change (Common Implementation Strategy Guidance Document No. 24) was used. All RBDs considered climate change when assessing direct and indirect climate pressures, forecasting the economics of water supply and demand and checking the effectiveness of measures. It was also considered in flood risk management and detecting climate change signals. The East Aegean RBMP also addressed climate change when monitoring change at reference sites.

KTM24 – "Adaptation to climate change" is made operational to address significant pressures in 2 of the RBDs (Black Sea and East Aegean) and national measures are mapped against KTM24. KTM24 is applied to tackle abstractions and hydromorphological pressures. No specific sub-plans addressing climate change are reported.

Bulgaria reports that droughts are not relevant for the RBDs. This is consistent with the situation in the first cycle (Topic report on: Assessment of Water Scarcity and Drought aspects in a selection of European Union RBMPs[79]) when there was no clear distinction in Bulgaria between droughts and water scarcity or the situation was unclear.

No change has occurred in terms of the development of Drought Management Plans, which are not reported in comparison to the situation in the first cycle (Topic report on: Assessment of Water Scarcity and Drought aspects in a selection of European Union RBMPs), when there were no such plans or the situation was unclear.

16.2. Main changes in implementation and compliance since first cycle

While climate proofing of measures was not carried out in the first cycle, it has now been considered in the second cycle.

16.3. Progress with Commission recommendations

No recommendation was made by the European Commission regarding adaptation to climate change.

[79] http://ec.europa.eu/environment/water/quantity/pdf/Assessment%20WSD.pdf

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